DEPARTMENT OF SCHOOL EDUCATION

RIGHT TO EDUCATION
SAMAGRA SHIKSHA - A.P.
EDUCATION FOR ALL

STRUCTURED LESSON PLANS FOR CBSE-AFFILIATED SCHOOLS

CHEMISTRY

GRADE-10

A Teacher Resource Book for
Competency Based Teaching-Learning

STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING (SCERT)

Committee for Development of Structured Lesson Plans

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MESSAGE BY PRINCIPAL SECRETARY

It brings me a great joy to invite all the teachers of CBSE-affiliated government schools to this valuable resource book of structured lesson plans. Inspired by the vision of our honorable Chief Minister, we are committed to supporting the teachers in shaping a bright future for all the children in Andhra Pradesh. We envision our children transforming into global citizens, excelling in academics and being ready for the world of work. In order to aid the teachers in this pivotal task of preparing the students to emerge as global citizens, the School Education Department is committed to making available the best resources and training. This lesson plans resource book is a transformational step in that direction. Utilized appropriately, this resource books will transform the teaching-learning process and experience in the classroom and lead to deeply engaging the students.

I hope you make the best use of this resource, which has been put together by our own teachers trained by experts from Azim Premji University and facilitated by the Center for Research in Schemes and Policies (CRISP). They have taken into consideration the teaching-learning needs of all types of learners and created lesson plans that are rich in activities, examples, and assessments. They have followed the CBSE Learning Framework and NCERT Learning Outcomes for Secondary Stage, along with principles from the National Curriculum Framework: School Education 2023.

At the crucial juncture of secondary school, our children need spirited teachers like you to prepare them for the changing and dynamic world. You bear the power and responsibility to shape their minds and hearts and guide them to step out into the world and contribute to our state's growth and country's economy.

Your dedication and efforts in implementing these structured pedagogical approaches will not only enhance the learning experience of our students but also equip them with the necessary skills and knowledge to thrive in an ever-evolving global landscape. Together, let us embark on this journey of educational excellence and empower our students to become the leaders of tomorrow.

With great hope and appreciation,

Shri Praveen Prakash, IAS
Principal Secretary, Department of School Education
Government of Andhra Pradesh

MESSAGE BY COMMISSIONER

The United Nations Sustainable Development Goal 4 (SDG 4) underscores the pivotal role of education in unleashing human potential and fostering self-respect. As the Commissioner of School Education, I am privileged to champion a vision that empowers the children of Andhra Pradesh with boundless possibilities and opportunities. Through pioneering reforms in education, encompassing cutting-edge infrastructure, ongoing professional development for educators and administrators, innovative digital initiatives, and an unwavering commitment to providing top-tier educational resources, our state stands as a beacon of educational transformation.

Government of Andhra Pradesh is committed to implement best initiatives to enhance rthe quality of education in the State. Obtaining CBSE affiliation to 1000 schools is one of such key initiatives. This lesson plan resource book developed for the use of teachers working in CBSE schools represents yet another milestone in our journey. Recognizing teachers as the cornerstone of our education system, we have entrusted them to craft these lesson plans for your benefit. After undergoing rigorous training in pedagogy, subject matter, learning outcomes and competencies, our educators have infused these lesson plans with their profound knowledge of the subject, and understanding of our students and their diverse contexts. It is a labor of love and thought, an amalgamation of explorations and experiments, presented for you to embrace and utilize effectively.

These lesson plans are created with the aim of providing a rich repository of ideas to enhance classroom engagement and productivity, and provide yet another innovative resource that teachers can employ. Feel free to adapt and supplement these plans as you see fit. The teacher reflections section serves as a tool for self-assessment and improvement, allowing you to augment your lessons and address any gaps you may identify.

I am optimistic about our state's trajectory towards competency-based teaching, with a focus on measurable learning outcomes that can be continually evaluated and enhanced. The decision to affiliate 1000 schools with CBSE and implement a curriculum aligned with national standards is indeed a significant stride in the right direction. Together, let us embrace this transformative journey towards educational excellence and empower our students to thrive in an ever-evolving world.

I congratulate everyone who worked towards bringing this excellent resource book for the teachers. I thank Center for Research in Schemes and Policies (CRISP) for the innovative ideas they presented to the Government, including development of structured lesson plans. The support of SPD Samagra Shiksha, continuous facilitation by CRISP, expert technical advice of Azim Premji University faculty, hard work of our teachers, CBSE team in Commissionerate office and SCERT made it possible to bring out this resource book in time for the 2024-25 academic year.

With sincere optimism and appreciation,
Shri S Suresh Kumar, IAS
Commissioner,
Department of School Education,
Government of Andhra Pradesh

MESSAGE BY THE STATE PROJECT DIRECTOR

The National Education Policy 2020 highlights that the purpose of education is to develop good human beings capable of rational thought and action, possessing compassion and empathy, courage and resilience, scientific temper and creative imagination, with sound ethical moorings and values. It aims at producing engaged, productive, and contributing citizens for building an equitable, inclusive, and plural society as envisaged by our Constitution. To realize the NEP's vision, it is essential for educators to align with this goal and transition from curriculum-centric to competency-driven teaching methods.

The State's commitment to this shared vision is visible in the Strengthening Andhra's Learning Transformation (SALT) Project, where one of the pivotal focus areas is the professional development of teachers. This entails utilizing insights from self-assessments, academic performance data from school-based evaluations, and classroom observations to enhance pedagogical skills. With continuous support from the education department, teachers will refine their pedagogical approaches, ensuring effective delivery of lessons.

In the same vein, I am delighted to introduce this Lesson Plan resource book for our CBSE-affiliated schools, crafted by experts from both within our state and across the nation. These lesson plans signify a shift away from rote memorization and content accumulation towards a structured approach aimed at fostering values, dispositions, and competencies in students. Rooted in the vision of the NEP and operationalized by the National Curriculum Framework: School Education 2023, each plan corresponds to a 40-minute class targeting specific learning outcomes from NCERT's Secondary Stage. These outcomes collectively contribute to observable learning achievements and the development of competencies over time. Moreover, this resource book empowers teachers to tailor their content and assessments dynamically by monitoring and addressing students' learning needs continuously.

I hope the teachers will find these resources valuable and helpful in transforming classroom transactions. Together I hope we will reshape the educational landscape of Andhra Pradesh in the years ahead. Best wishes for your endeavors!

Shri B Srinivasa Rao, IAS
State Project Director, Samagra Shiksha
Government of Andhra Pradesh

MESSAGE BY JOINT DIRECTOR, CBSE

In a landmark decision, the Government of Andhra Pradesh affiliated 1000 Government schools with the Central Board of Secondary Education (CBSE). This transition marks a significant milestone in our efforts to provide standardized and high-quality education to our students. The CBSE curriculum is widely recognized for its comprehensive and contemporary approach to learning, offering students a competitive edge on a national scale. The Board emphasizes holistic development of learners by providing a stress-free learning environment that will develop competent, confident and enterprising citizens who will promote harmony and peace. It is committed to providing quality education to promote intellectual, social and cultural vivacity among its learners.

By aligning our schools with CBSE, we aim to ensure our students are well-prepared to compete on a national level and excel in today's dynamic world. In order to achieve this, our utmost efforts have gone into developing these structured lesson plans incorporating NCERT's Secondary Stage Learning Outcomes, the National Curricular Framework: School Education 2023, and CBSE Learning Framework document developed by Azim Premji University. 'Structured Pedagogy' is a scientific, evidence-based, learner-centric approach for teaching that equips every teacher with clearly defined objectives, proven methods, well-structured tools, and practical training. After many rounds of rigorous training, expert teachers from our CBSE schools integrated the conceptual and practical aspects of their subjects and condensed them into these easy-to-use lesson plans.

We thank the Center for Research in Schemes and Policies (CRISP) and Azim Premji University for their innovative ideas and tireless support.

I encourage each of you to fully utilize these plans and personalize them to fit your teaching style. May this invaluable resource serve as a valuable tool as you guide Grade 10 students through this critical stage of their education. Your dedication as teachers brings us immense joy and pride, as we entrust the future of our state's children to your capable hands. Wishing you all the best!

Mr Krishna Reddy
Joint Director, CBSE
Department of School Education
Government of Andhra Pradesh

MESSAGE BY CENTRE FOR RESEARCH IN SCHEMES AND POLICIES (CRISP)

Shri. **R. Subrahmanyam**
I.A.S.(Retd), Secratary of CRISP

Ms. K. Sandhya Rani
IPoS.(Retd), Founding member of CRISP

Mrs. P. Usha Kumari
I.A.S.(Retd), State Lead of AP Team CRISP

In October 2023, the Centre for Research in Schemes and Policies (CRISP) forged a significant partnership with the Government of Andhra Pradesh, to help bring about a transformation for the state's School Education system. Our inaugural initiative was designed to cultivate excellence within the 1000 CBSE-affiliated schools. CRISP's primary focus was to support both teachers and students during the transition from the State Board to the CBSE Board.

Research reveals that an average teacher grapples with approximately 1,500 decisions daily. While it may be impractical to intervene in every decision-making process, our aim was to alleviate the cognitive load associated with tasks such as lesson planning, question formulation, activity design, and assessment creation. Recognizing the novelty of transitioning from the State Syllabus to CBSE, our initiative encompassed the provision of essential resources alongside comprehensive training for all educators involved.

To enhance our efforts, we collaborated with Central Square Foundation, a renowned organization in the field of Education, to train our teachers in their Structured Pedagogy approach. This evidence-based, learner-centric methodology equips educators with clearly defined objectives, proven methods, well-structured tools, and practical training.

We are thankful to professors from Azim Premji University who provided invaluable support by mentoring the core group of teachers over a six-month period, guiding them through NCERT's Learning Outcomes for the Secondary Stage and the National Curriculum Framework: School Education 2023. The culmination of these efforts is the creation of this resource book, comprising structured lesson plans for the benefit of teachers, and vetted meticulously by the SCERT. We hope that the tremendous effort of our teachers serves as an inspiration to continue shaping the minds of our youth.

We extend our sincere gratitude to Dr. Emmanuel Joseph, Joint Commissioner (Academics) at CBSE, New Delhi, professors from Azim Premji University, experts from Central Square Foundation, the State CBSE team, SCERT, and the entire Department of School Education for their invaluable guidance and support throughout this endeavor. Their deep commitment to enhance the quality of education and to transform the teaching-learning process in the classrooms made it possible to bring this initiative to life within a remarkably short span of time.

We thank the Government of Andhra Pradesh for giving us this opportunity, for the trust they reposed in accepting the innovative idea and facilitating it to germinate and fructify.

Centre for Research in Schemes and Policies
February, 2024

FOREWORD BY DIRECTOR, SCERT

At the heart of quality education lie two indispensable pillars: the teacher and the student. While textbooks, digital resources, infrastructure, and curriculum play crucial roles in the educational landscape, it is the teacher who bears the primary responsibility of delivering lessons, facilitating comprehension of complex concepts, nurturing independent thinking, and molding individuals into responsible members of society. The Department of School Education, Government of Andhra Pradesh aspires to create citizens equipped with the skills and competencies to succeed and solve problems at a global scale, while remaining locally rooted and aware.

To achieve this goal, we have developed a comprehensive resource book to support teachers across the state, enhancing their planning and teaching processes with ease and creativity.

These meticulously crafted lesson plans have been curated by trained educators and thoroughly reviewed by SCERT experts. Each lesson plan is structured into distinct period plans, addressing specific topics within the lesson. Clear learning outcomes are outlined at the beginning of each lesson and progressively addressed throughout the class session. Furthermore, each period plan is divided into sections including Learning Outcomes, Teaching-Learning Process, Pointers for Assessment, and Material Required, offering teachers a flexible framework to tailor to their preferences. The provided questions to assess prior knowledge, suggested activities, and prompts for understanding checks serve as guides, encouraging teachers to adapt the plans to suit the unique needs of their classroom and students.

The SCERT extends its sincere appreciation to the dedicated members of its textbook committee, source material reviewers, lesson plan creators, and technical partners for their invaluable contributions in realizing this vision. We also express our gratitude to the Principal Secretary and Commissioner, Department of School Education, and State Project Director, Samagra Siksha, Department of School Education for their steadfast commitment to promoting quality education, consistently driving us toward excellence in all facets. We appreciate the steadfast support of Center for Research in Schemes and Policies (CRISP) and professors from Azim Premji University in developing the lesson plans.

Dr B Pratap Reddy
Director,
State Council of Educational, Research, and
Training Government of Andhra Pradesh

INTRODUCTION AND BACKGROUND TO THE STRUCTURED LESSON PLANS RESOURCE BOOK

The National Education Policy, 2020 (NEP) focuses strongly on a need for a well-defined Curriculum and a Structured Pedagogy in schools, to ensure holistic, integrated, enjoyable and engaging learning of the students.[1] In pursuance of the Memorandum of Understanding (MoU) signed between Government of Andhra Pradesh (GoAP) and Centre for Research in Schemes and Policies (CRISP), and the recommendation made by CRISP in the Action Plan for CBSE, GoAP agreed that *"Structured pedagogy should be adopted for Classes 8 and above in the newly converted CBSE schools. For this purpose, while using material already available, standard lesson plans should be prepared."* In furtherance of adapting structured pedagogy approach in Government CBSE Schools to improve the quality of teaching-learning, the GoAP organized the following:

1. Organised a Structured Pedagogy workshop was organized in collaboration with CRISP in Vijayawada from 11th to 13th July 2023. Experts from Central Square Foundation and Azim Premji University (APU) anchored the workshop, with additional sessions by Room to Read, Leadership for Equity, Ambitus World School, and SCERT Telangana. Sessions focused on the need for a structured way of teaching and learning, shifting from rote method to competency based curriculum, and delved into the NCERT Learning Outcome Framework for the Secondary Stage. A total of 60 subject teachers along with A.P SCERT subject experts participated in the workshop representing English, Mathematics, Social Science, Biology, Chemistry, and Physics. Each subject group consisted of 10 teachers, 1 SCERT expert, and 1 CBSE School Principal acting as a Coordinator. With guidance from CSF and APU, the subject groups prepared one sample lesson plan per subject by the end of the 3-day workshop.
2. Post the workshop, facilitated the expert subject teachers to work on lesson plan development, with virtual support from APU faculty virtually.
3. Organised a Capacity Building workshop from 11th to 14th October 2023 in Vijayawada with expert support of experts from APU. Sessions were held on mapping content to specific learning competencies, designing and using creative Teaching-Learning Materials, adding Check for Understanding questions, using interdisciplinary approach in the lessons, addressing student misconceptions, and creating a diverse range of assessments. The workshop enhanced the ability of the teachers to

[1]Chapter 4 & 5, National Education Policy, 2020 (NEP, 2020)

a. understand the principles and practices underpinning competency-based curriculum as outlined in NEP 2020 and NCF-SE 2023;

b. equip the teachers to analyse the need to effectively align curriculum content, competencies, pedagogical practices, and assessment methods in the classroom;

c. helped them to learn to develop competency-based lesson plans that integrate NCF-SE 2023 guidelines, ensuring that learning outcomes are aligned to the desired competencies with the help of model lesson plans

d. trained them to gain practical insights into designing and implementing both formative and summative assessments that accurately measure students' progress toward achieving the competencies set forth in NCF-SE 2023

4. Held a physical camp for the core team of teachers to develop and quality check the lesson plans for all the subjects in Vijayawada for 12-days, from 20th November to 1st December 2023. APU teachers and Leadership for Equity team provided technical support.

5. In early February 2024 the lesson plans developed for Grade 9 and 10 were vetted and finalised by AP SCERT and sent to the Textbook Press for printing and distribution.

ELEMENTS OF THE STRUCTURED LESSON PLANS

All lesson plans are meticulously organized into detailed period plans, each focusing on a specific topic and its corresponding Learning Outcomes. These period plans are then subdivided into four essential sections:

1. Topic and Learning Outcomes, along with associated Indicators
2. Teaching-Learning Process, highlighting Pedagogical Strategies
3. Assessment Strategies to gauge student understanding and progress
4. Materials required, ensuring all necessary resources are readily available for effective instruction.

Within these sections, the following elements have been covered:

- **Higher order thinking questions** have been added to encourage critical thinking, problem-solving, creativity, and analysis. These questions usually move beyond ‘What’, and ‘When’, and focus on ‘Why’, or ‘How’. Some examples of these are:
  “Explain the twinkling of stars.” [Physics]
  “How does trade help connect the countries in the world?” [History]

"Why can amphibians and reptiles tolerate mixing of blood to some extent?" [Biology]
"Do you think it was right for the farmer to be angry with the postmaster? Why or why not? [English]
"What should India do or achieve to become a developed country?" [Economics]
"Why does a snail change its sex?" [Biology]
"How did Gendhadhur, a backward village in Mysore, Karnataka, become rich in rain water?" [Geography]
"Why can't astronauts see the rainbow from the surface of the moon?" [Physics]

- **Keywords and key concepts** are stated in the beginning of every chapter so that the teacher can be sure to cover them during the course of the lesson
- **Prior knowledge and skills are tested** at the beginning of every period to assess whether students have retained concepts covered in previous lessons, and to gauge the overall level of knowledge on the topic to be covered
- **Prompts and questions to address common misconceptions** about the topic have been given in the plans to clarify any incorrect ideas students may have. For example: "A woman in your neighborhood is blamed for giving birth to a baby girl. Is the sex of the baby determined by her? Remove the misconception through your argument." [Biology]
- **Discussion prompts** for class or group discussions have been given, especially for the humanities subjects. For example:
  "Why do you think men receive higher wages than women for the same job? Discuss." [Economics]
  "Human societies have steadily become more interlinked. Comment." [History]
  "Discuss the benefits and drawbacks of using chemical fertilizers." [Geography]
- **Assessment and remedial periods** have been allocated after every lesson plan to gauge student learning, and revise concepts that students need more clarity or practice in, before moving to the next lesson
- **Inter-disciplinary nature of subjects and topics** has been encouraged in the plans so that students recognize the value of all subjects equally. It also promotes a holistic understanding of the topic and opens them up to thinking about an issue from various lenses
- **Formative and summative assessments, check for understanding questions, and worksheets** are given for every lesson to assess student learning at every stage of the lesson
- **Space for teachers to reflect on every period** has been provided at the end of the plan. The prompts are designed to assist teachers in assessing the alignment of their plan with overarching curricular goals and competencies, evaluating student engagement levels, ensuring effectiveness of assessment strategies in measuring student understanding, and gauging the efficacy of teaching materials, activities, and case studies utilized

HOW TO USE THESE LESSON PLANS

Teachers should have a comprehensive understanding of the curricular goals, competencies, and the nature of the subject they teach. It is essential to thoroughly review the section on "Pedagogical Practices" to gain deeper insight into teaching methodologies. With this groundwork, teachers can then delve into the lesson plans for their subject. It is highly recommended to study the entire lesson plan before initiating the lesson in class. Throughout the lesson, teachers can refer to each period plan and manage class time effectively to cover the elements outlined in the plan. Additionally, teachers are encouraged to modify the plan as needed, incorporating or removing content, questions, or activities to address the specific needs of their students and contextual requirements.

PEDAGOGICAL PRACTICES

Broad Aims of School Education

The Learning Standards are guided by certain widely agreed upon broad Aims of School Education that are articulated in this NCF. These aims have been arrived at from the vision and purpose of education as envisaged by NEP 2020:

1. **Rational Thought and Autonomy:** An individual should have the capacity of rational reasoning and sufficient knowledge to understand the world around them. An individual should be able to make an informed decision. This fundamentally requires knowledge in breadth and depth.
2. **Health and wellbeing**: School education should be a wholesome experience for students. Students should acquire Knowledge, Capacities, and Dispositions that promote mind-body wellness.
3. **Democratic participation:** This requires appropriate knowledge capacities, values, and dispositions so that an individual may be oriented towards sustaining and improving the democratic functions of Indian society.
4. **Economic participation:** Education should work as an enabler for a healthy democracy as well as a healthy economy.
5. **Cultural and social participation:** Along with democracy and economy, society, and culture also play an important role in the mode of associated living. An individual should acquire capacities and a disposition to contribute meaningfully to culture.

NATURE OF THE SUBJECT: SCIENCE

(Adapted from the CBSE Learning Standards document. Please refer to it here: https://cbseacademic.nic.in/cbe/documents/Learning_Standards_Science.pdf)

Among many ways in which the inquiring and imaginative human mind engages, expresses, and explains nature's wonder is through science. It is a human endeavour that observes the physical and biological environment carefully, looks for any meaningful patterns, processes,

and relations, making and using new tools to interact with nature, and building conceptual models to understand the world. Also, the knowledge developed helps understand the evolutionary past, current state and predict the future of humanity and nature. It provides us with a way to present ideas that can be tested, repeated, and verified. Scientists gather evidence (as opposed to "proof") to support or falsify hypotheses. Theories, laws, and principles are supported, modified, or replaced as new evidence appears and are central to scientific thinking.

Despite many attempts to shrug it off in textbook chapters and a note to the teacher section, the prevailing perception on the nature of doing science is through the scientific method and not a scientific method. And that method is linear. This perception of the nature of doing science needs countering, for the art of doing science is a creative, iterative, and interconnected process built on curiosity, healthy scepticism, and questioning.

While science is at its best in understanding simple linear systems of nature, its predictive or explanatory power is limited when it comes to dealing with nonlinear complex systems of nature. Yet, with all its limitations and failings, science is unquestionably the most reliable and powerful knowledge system about the physical world known to humans, augmenting the spirit of enquiry, creativity, objectivity, and aesthetic sensibility leading towards the development of scientific temper. The school science curriculum across classes could gradually nurture scientific temper through appropriate learning opportunities.

NCF 2005 position paper on teaching of science at secondary stage emphasises the learning of science as a composite discipline, in doing so, it encourages the designing of advanced technological modules, analysing issues of health and the surrounding environment, and experimenting systematically to discover and verify theoretical principles.

In a progressive forward-looking society, science can play a truly liberating role, helping people out of the vicious circle of poverty, ignorance, and superstition. In a democratic political framework, the possible aberrations and misuse of science can be checked by the people themselves. Science, tempered with wisdom, is the surest and the only way to human welfare. This conviction provides the basic rationale for science education.

The structured lesson plans in this book are rooted in the vision of the National Education Policy 2020, operationalized by the National Curriculum Framework: School Education 2023, and based on the Learning Outcomes from NCERT's Learning Outcomes at the Secondary Stage. The following content has been adapted from the original documents to provide context and explanation for the pedagogical practice behind the development of these lesson plans.

NCERT Curricular Expectations for the Secondary Stage:

For detailed Learning Outcomes and suggested Pedagogical Processes, please refer to the **NCERT Learning Outcomes at Secondary Stage**

SCIENCE Curricular Expectations

At this stage learners are expected to:

- develop understanding of concepts, principles, theories, and laws governing the physical world, consistent with the stage of cognitive development.
- develop the ability to acquire and use the methods and processes of science, such as observing, questioning, planning investigations, hypothesising, collecting, analysing and interpreting data, communicating explanations with evidence, justifying explanations, thinking critically to consider and evaluate alternative explanations, etc.
- conduct experiments, also involving quantitative measurements.
- appreciate how concepts of science evolve with time giving importance to its historical perspective.
- develop scientific temper (objectivity, critical thinking, freedom from fear and prejudice, etc.).
- nurture natural curiosity, aesthetic sense, and creativity.
- imbibe the values of honesty, integrity, cooperation, concern for life and preservation of the environment.
- develop respect for human dignity and rights, equity and equality.

For a more detailed explanation, please refer to the National Curriculum Framework: School Education 2023 (p.45-51, p.88-92, p.101-102, p.116-121)

Aims of Science:

Science aims to develop an understanding of the natural and physical world through systematic inquiry. Learning Science also builds important capacities such as observation, analysis, and inference. This in turn enables the meaningful participation of individuals in society and the world of work with scientific temper, critical and evidence-based thinking, asking relevant questions, analysing practices and norms, and acting for necessary change. Science Education aims to achieve:

a. **Scientific understanding of the natural and physical world:** Scientific understanding develops through scientific observations, questions, experiments, theories, laws, principles and concepts. An adequate knowledge of these is essential to build a systematic and verifiable understanding of the way the natural and physical world functions.
b. **Capacities for Scientific enquiry:** The abilities to put forth hypotheses, arguments, predictions and analyses, and to test hypotheses, evaluate situations, and draw logical

conclusions, are fundamental to the learning of science. Science education must thus build these skills in students systematically over the stage in school.

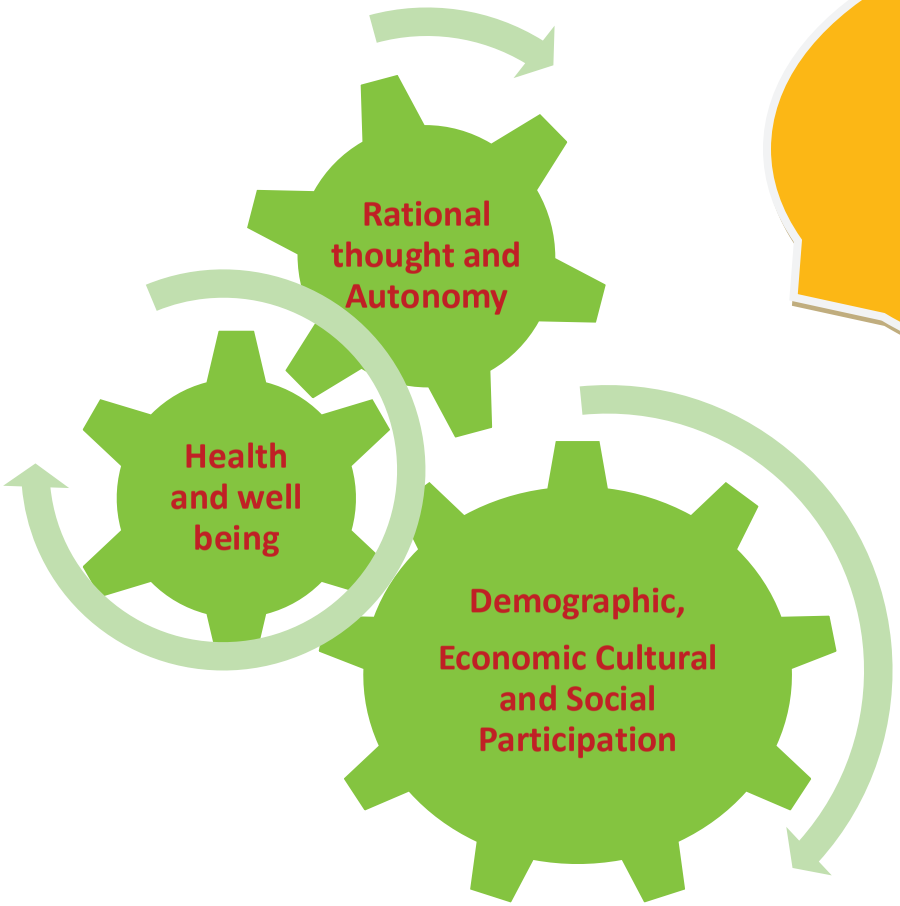
c. **Understanding the evolution of scientific knowledge.** There are crucial historical moments in the development of Science and scientific knowledge that could not have occurred without the efforts of various individuals and organisations over thousands of years. Understanding these key moments and discoveries will develop students' understanding of how scientific knowledge and the methods of science evolved and still evolve over time.
d. **Interdisciplinary understanding between Science and other curricular areas:** Learning in science involves understanding interlinkages across disciplines. Students would learn to inquire and learn about the world through such an interdisciplinary approach.
e. **Understanding of relationship between science, technology and society:** Engaging with issues related to connections between Science, Technology and Society including the ethical aspects and implications, and appreciating the role of science in addressing the challenges and the world is undergoing, will add to the breadth of students' learning.
f. **Scientific temper:** Students will imbibe scientific values and dispositions such as honesty, integrity, scepticism, objectivity, tenacity, preservance, collaboration and cooperation, concern for life, and preservation of the environment.
g. **Creativity:** Asking good questions, formulating hypotheses and designing good experiments to test those hypotheses often require artistry and creativity. Developing such creativity and a sense of aesthetic in the pursuit of scientific understanding and exploration is very important.

For more details on the Aims of specific subjects please refer to the NCFSE following pages: English: p234-267; Mathematics: p268-293; Science: p294-319; Social Science: p320-352.

LESSON PLAN

CLASS-10 CHAPTER-1 CHEMICAL REACTIONS AND EQUATIONS

AIMS OF EDUCATION:



Rational Thought and Autonomy: An individual should have the capacity of rational reasoning and sufficient knowledge to understand the world around them. An individual should be able to make an informed decision. This fundamentally requires knowledge in breadth and depth.

Health and wellbeing:

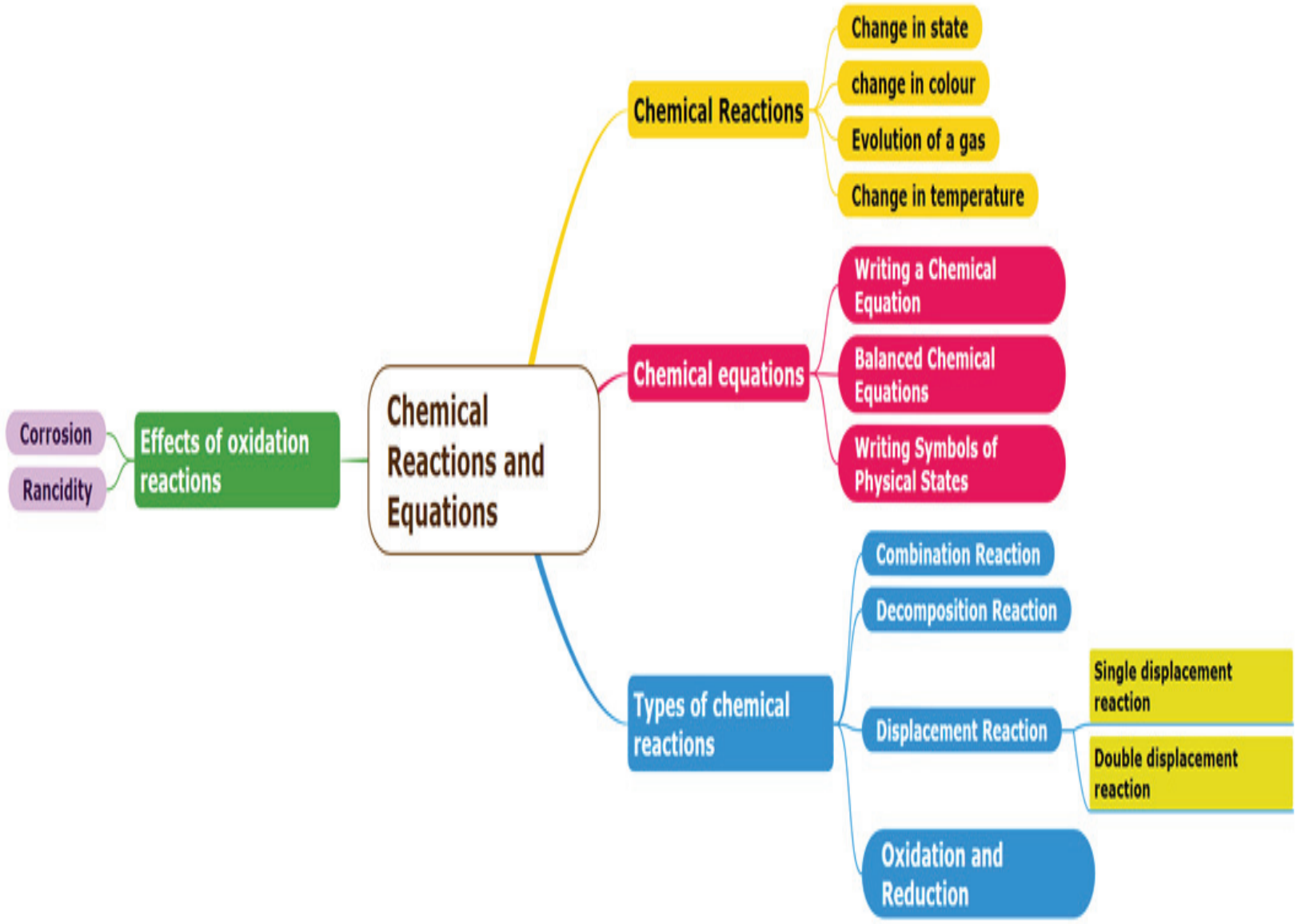
Democratic participation: This requires appropriate knowledge capacities, values, and dispositions so that an individual may be oriented towards sustaining and improving the democratic functions of Indian society.

NATURE OF SCIENCE: Science is an organized system of knowledge, that evolves as a result of curiosity followed by inquiry, logical reasoning, experimentation, and the examination of empirical evidence. It enables an understanding of the physical and natural environments and phenomena, the identification of meaningful patterns and relations including causes and effects, and supports the development of models, theories, laws, and principles.

CURRICULAR AIMS OF SCIENCE:
Scientific understanding of the natural and physical world: Scientific understanding develops through scientific observations, questions, experiments, theories, laws, principles and concepts. An adequate knowledge of these is essential to build a systematic and verifiable understanding of the way the natural and physical world functions.
Capacities for Scientific enquiry: The abilities to put forth hypotheses, arguments, predictions and analyses, and to test hypotheses, evaluate situations, and draw logical conclusions, are fundamental to the learning of science. Science education must does build these skills in students systematically over the stage in school.
Interdisciplinary understanding between Science and other curricular areas:Learning in science involves understanding interlinkages across disciplines. Students would learn to inquire and learn about the world through such an in disciplinary approach.
Understanding of relationship between science, technology and society: Engaging with issues related to connections between Science, Technology and Society including the ethical aspects and implications, and appreciating the role of science place in addressing the challenges and the world is undergoing, will add to the breadth of students learning.
Scientific temper: Students will imbibe scientific values and dispositions such as honesty, integrity, scepticism, objectivity, tenacity, preservance, collaboration and cooperation, concern for life, and preservation of the environment.
Creativity: Asking good questions, formulating hypotheses and designing good experiments to test those hypotheses often require artistry and creativity. Developing such creativity and a sense of aesthetic in the pursuit of scientific understanding and exploration is very important.

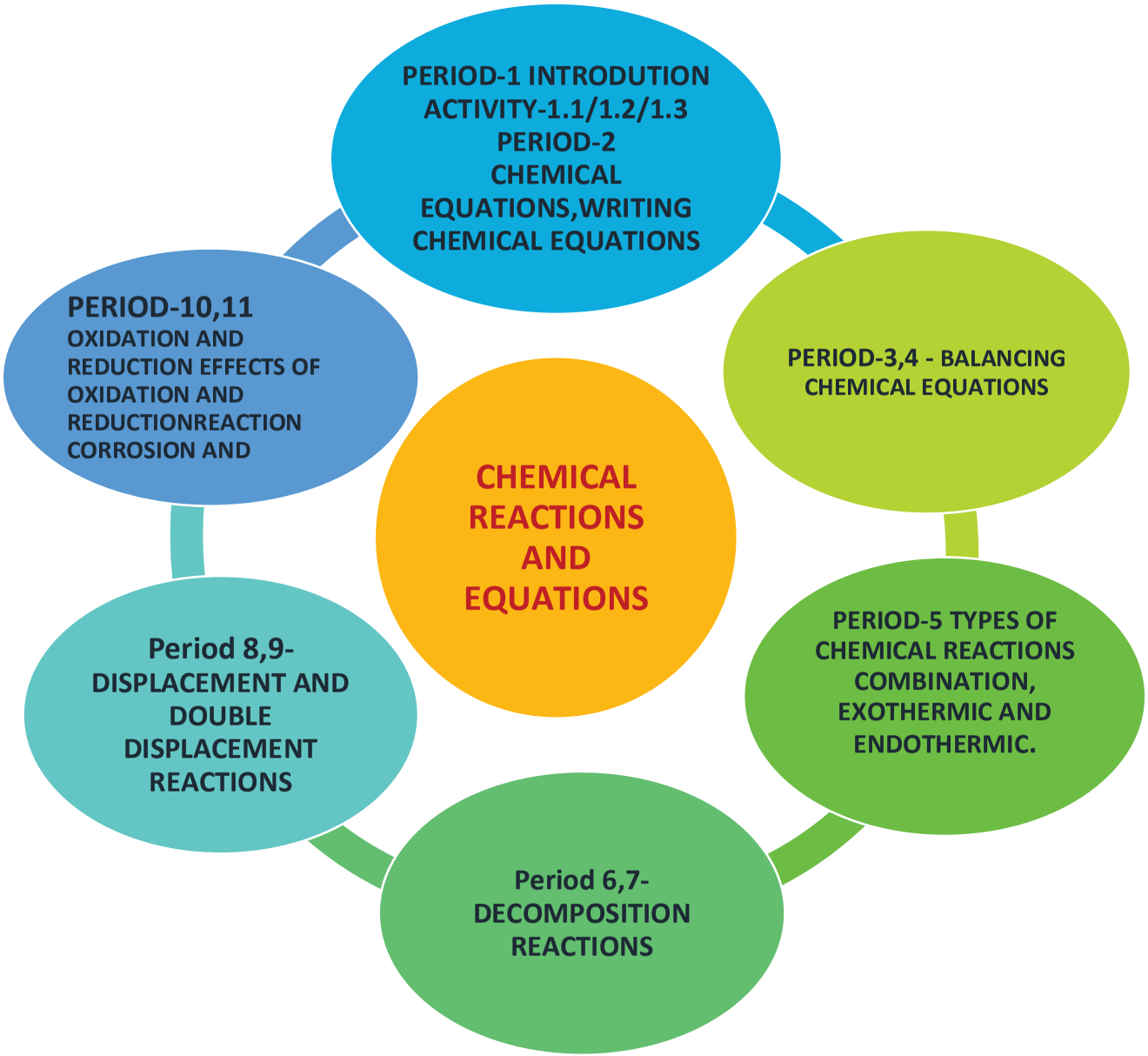
CURRICULAR GOALS	COMPETENCIES
Explores the world of matter, its interactions, and properties at the atomic level	Describes and identify the three subatomic particles: protons, neutrons, and electrons.
	Investigates the nature and properties of sub-atomic particles.
	Define and understand the concept of atomic number and mass number. Use the notation ${}_{Z}X^{A}$ to represent an atomic species, where *Z* is the atomic number and *A* is the mass number. Describes Isotopes and Isobars
Explores the physical world around them, and understands scientific principles and laws based on observations and analysis	Explains the relationship between atomic number and atomic mass,Isotopes and Isobars.
	Applies scientific principles to explain phenomena in other subjects
Develops awareness of the most current discoveries, ideas, and frontiers in all areas of scientific knowledge in order to appreciate that Science is ever evolving, and that there are still many unanswered questions	States concepts that represent the most current understanding of the stucture of atom being studied .
	States questions related to structure of atom in the quantum mechanics for which current scientific understanding is well recognised to be inadequate
Explores the nature of Science by doing Science	Develops accurate and appropriate atomic models.
	Designs and implements a plan for scientific inquiry formulates hypotheses, makes predictions, identifies variables.

PERIOD	KEY CONCEPTS	LEARNING OUTCOMES
1	**Introduction to Chemical changes**	**1)P**erforms activity or experiment to classify the types of changes.
2	**Chemical Equations. Writing a chemical Equation.**	**2)D**educes the kind of chemical reactions seen in nature based on observations
3	**Law of conservation of mass, balancing chemical equations**	1)**D**ifferentiates the types of chemical reactions. 2)**D**educes the kind of chemical reactions seen in nature based on observations.
4	**Types of chemical reactions, combination reactions, exothermic**	1)**D**ifferentiates the types of chemical reactions. 2)**D**educes the kind of chemical reactions seen in nature based on observations.
5	**Decomposition reactions caused by using heat energy**	Student describes discrete energy levels around the nucleus Student describes and represents the arrangement of the subatomic particles in Bohr's point of view. Students develops accurate and appropriate models to represent Thomson's models and Rutherford model of an atom Students designs various orbits around the nucleus
6	**Decomposition reactions causing by electrical energy and light energy**	1)**D**ifferentiates the types of chemical reactions. 2)**P**erforms experiments to classify the types of reactions.
7	**Displacement Reactions**	1)**D**ifferentiates the types of chemical reactions. 2)**P**erforms experiments to classify the types of reactions.
8	**Double Displacement Reaction**	1)**D**ifferentiates the types of chemical reactions. 2)**P**erforms experiments to classify the types of reactions.
9	**Oxidation and Reduction**	1)**D**ifferentiates the types of chemical reactions. 2)**P**erforms experiments to classify the types of reactions.
10	**Effects of Oxidation in everyday life: Corrosion and Rancidity**	1)**D**ifferentiates the types of chemical reactions. 2)**P**erforms experiments to classify the types of reactions. 3)**D**educes the kind of chemical reactions seen in nature, based on observations.


Chemical Reactions and Equations
Chemical Reactions
Change in state
change in colour
Evolution of a gas
Change in temperature
Chemical equations
Writing a Chemical Equation
Balanced Chemical Equations
Writing Symbols of Physical States
Types of chemical reactions
Combination Reaction
Decomposition Reaction
Displacement Reaction
Single displacement reaction
Double displacement reaction
Oxidation and Reduction
Effects of oxidation reactions
Corrosion
Rancidity

LESSON PLAN

Class 10 - Chapter 1-CHEMICAL REACTIONS AND CHEMICAL EQUATIONS-10 Periods

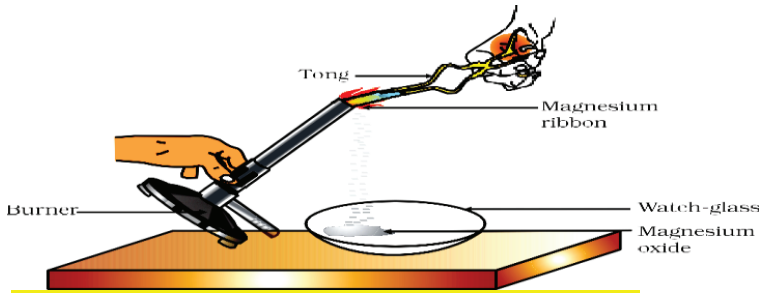


Class: 10
Chapter: CHEMICAL REACTIONS AND EQUATIONS
No.of Periods:10
Period No: 01
Key concepts: Introduction to Chemical changes.

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	T-L Material required
Performs activity or experiments to identify the chemical changes. **D**educes the kind of chemical reactions seen in nature, based on observations.	The teacher will start the lesson with a discussion to check for prior knowledge: Probing questions - What happens when milk is left at room temperature during summer? - Why milk would be spoiled?  - - What happens when iron tawa or pan or nail is left exposed to humid atmosphere? - Why do fire flies glow at night?  -Why grapes get fermented?	Q.1)What happens when a)food is cooked b)food gets digested in our body c)We respire Q.2) Which one of the following processes involve chemical reactions? (a) Storing of oxygen gas under pressure in a gas cylinder (b) Liquefaction of air (c) Keeping petrol in a china dish in the open (d) Heating copper wire in presence of air at high temperature	**Chemicals required:-** Magnesium Ribbon Lead nitrate Potassium Iodide Zinc Granules Dil.Sulphuric acid. **Apparatus required:-** Burner Watch glass Tongs Conical Flask Test tube Delivery tube Rubber cork https://youtu.be/KMBSy4DBels

Grapes hanging on the plant do not ferment but after being plucked from the plant can be fermented?
Under what conditions do these grapes ferment?
Is it a chemical or a physical change?
From the above examples we can understand there are changes in matter.

Activity-1.1 What happens when a magnesium ribbon burns on spirit lamp or burner?



Burning of a magnesium ribbon in air and collection of magnesium oxide in a watch-glass

Q.3) Why should a magnesium ribbon be cleaned before burning in air?

Q.4) Why is it suggested to wear dark coloured goggles while watching the burning of magnesium ribbon in air?

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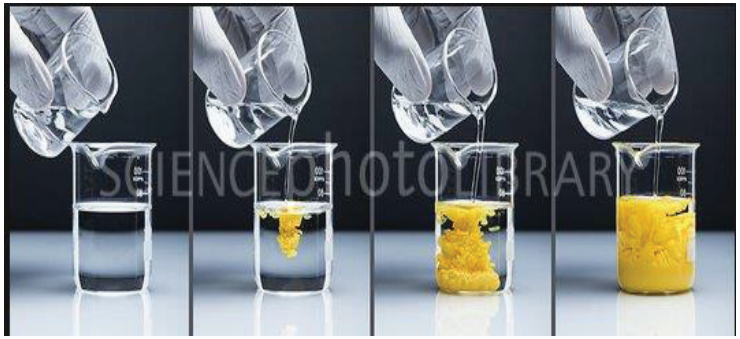
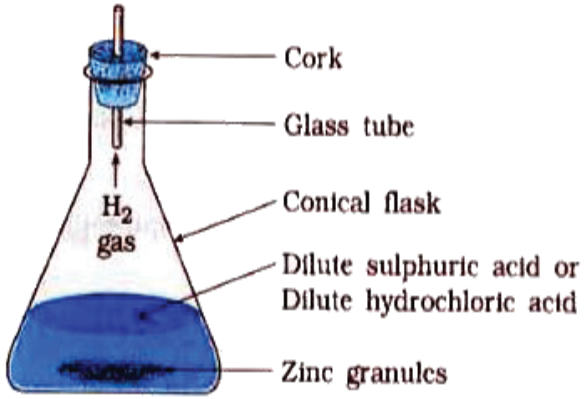
https://diksha.gov.in/play/collection/do_3130736097954938881187 3?contentId=do_31344177324985548811871

	What do you observe? Why dazzling white flame is formed? Why white powder is formed? The white powder formed is Magnesium Oxide. Is there a possibility of a compound other than MgO formed in the above reaction? Why does the red litmus paper turn blue when touched with aqueous solution of magnesium oxide? **Activity 1.2** What happens when we add potassium iodide solution to a test tube which contains lead nitrate? What do you observe?  Formation of bright yellow colour precipitate. Why bright yellow colour precipitate is formed? What is the name of Yellow coloured precipitate? It is Lead-iodide. **Activity-1.3** What do you observe when you add dil.Sulphuric acid to conical flask containing zinc granules.	Q.5) Which reaction that takes place when magnesium burns in air? Why is it called a combination reaction? Q.6) Is there any similarity between compounds LiH, MgO, and K_2S? Q.7)When magnesium burns in air identify the compound that fumes out? A)Magnesium oxide B)Carbondioxide C)Unreacted Magnesium D) Magnesium Oxide vapour Q.8) What is the formula of Lead iodide? Q.9) How hydrogen gas is evolved in the conical flask?	https://diksha.gov.in/play/collection/do_3130736097954938881187 3?contentId=do_31364419076090 2656169 https://www.youtube.com/watch?v=epDGHnwaVJY&pp=ygUpdmlkZW8gc2hvd2luZyBidXJuaW5nIG9mIG1hZ25lc2l1bSBpbiBhaXI%3D



How to test for any gas is evolved?

What is the name of the gas?

The colourless gas evolved is hydrogen.

Hydrogen gas gives a pop sound when burning match stick is brought near to it.

How do you feel when you touch the conical flask?

Student responds Feels warm.

From the above three activities, we can say that any of the following observations helps us to determine whether a chemical reaction has taken place –

- change in state
- change in colour
- evolution of a gas
- change in temperature.

Q.10)Check for understanding

From the activities mentioned above find out the changes taking place (each activity may have one or more changes)

Activity	Change in state	Change in colour	Evolution of gas	Change in temperature
Activity-1				
Activity-2				
Activity-3				

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TEACHERS REFLECTIONS:

1)Students Investigates the reaction of acids with metals.

2)Students Understands activities or experiments to classify the types of changes.

PERIOD PLAN-2

Class: 10

Chapter: CHEMICAL REACTIONS AND EQUATIONS

No.of Periods:10

Period No: 02

Key concepts: Chemical Equations. Writing a chemical Equation.

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	T-L Material required
Describes and represents chemical interactions and changes using symbols and formulas. **W**rites balanced word and symbol skeletal and complete equations for the reactions.	The teacher will start the lesson with a discussion to check for prior knowledge: In Activity 1.1 we learned – when a magnesium ribbon is burnt in oxygen, it gets converted to magnesium oxide. This description of a chemical reaction in a sentence form is quite long. How can we represent it in short form? Expected response:- The word-equation for the above reaction would be – Magnesium + Oxygen → Magnesium oxide (Reactants) (Product)	Q.1)Write reactants and products in the following chemical equations? **(a)** $Zn+HCl \rightarrow ZnCl_2+H_2$ **(b)** $2Mg+O_2 \rightarrow 2MgO$ **(c)** $Pb(NO_3)_2+2KI \rightarrow PbI_2+2KNO_3$ **(d)** $2H_2+O_2 \rightarrow 2H_2O$. Q.2)Write the chemical equations for the following reactions using symbols and formulae? (A)Calcium hydroxide + Carbon	**Chemicals required:-** Magnesium Ribbon Lead nitrate Potassium Iodide Zinc Granules Dil.Sulphuric acid. **Apparatus**

Is there any other shorter way for representing chemical equations?

Can we use chemical formulae instead of words?

What are the formulae of Magnesium, Oxygen and Magnesium Oxide?

Oxygen gas contain atoms or molecules?

ELEMENT/MOLECULE	FORMULAE
Magnesium	Mg
Oxygen	O_2
MagnesiumOxide	MgO

If you apply formulae of magnesium, oxygen and magnesium oxide, the above word-equation can be written as – $2Mg + O_2 \rightarrow 2MgO$.

The substances when combined lose their identity and convert into new substances are called reactants

The substances formed from the reactants are called products

In a chemical equation we use mainly two symbols like '**+**' and '→'.

What does they represent in chemical equation?

'**+**' indicates combination of two or more reactants or two or more products formed.

dioxide→ Calcium carbonate + Water

(B)Zinc + Silver nitrate → Zinc nitrate + Silver

(C)Aluminium + Copper chloride → Aluminium chloride + Copper

(D)Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride

Q.3)Write the chemical equation for the following chemical reactions using symbols/formulae?

(i) Hydrogen + Chlorine → Hydrogen chloride

(ii) Barium chloride + Aluminium sulphate →Barium sulphate +

Aluminium chloride

(iii) Sodium + Water→ Sodium hydroxide + Hydrogen

Q.4) Write word-equation and short form with symbols for the chemical reaction "carbon burns in oxygen or air to give carbon di

required:-

Burner

Watch glass

Tongs

Conical Flask

Test tube

Delivery tube

Rubber cork

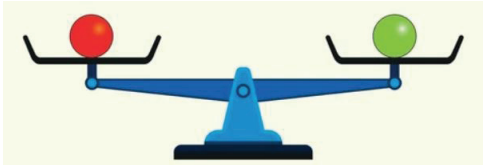
https://byjus.com/ncert-solutions-class-10-science-chapter-1-chemical-reactions-and-equation/

https://www.youtube.com/watch?

	'→' indicates conversion of reactants into products. Arrow headed to products. Tail is towards reactants. **Let us look in the above example .** **Mg + O →MgO.** **LHS: Mg+O----Reactants.** **RHS: MgO------Products.**	oxide gas". Q.5) Write a chemical equation with state symbols for the following reactions. (i) Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride. (ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and Water	v=epDGHnwaVJY&pp=ygUpdmlkZW8gc2hvd2luZyBidXJuaW5nIG9mIG1hZ25lc2l1bSBpbiBhaXI%3D
TEACHERS REFLECTIONS: 1) Students Understand how to write chemical equations using symbols. 2) Students identifies reactants and products in chemical equations.			

PERIOD PLAN-3

CLASS: 10
CHAPTER: CHEMICAL REACTIONS AND EQUATIONS
TOTAL NUMBER OF PERIODS FOR THIS LESSON: 10
NUMBER OF LESSON PLAN:3
KEY CONCEPTS: Law of conservation of mass, balancing chemical equations

Learning out comes	Teaching learning process	Pointers for assessment	T–L Material required
1)**D**ifferentiates the types of chemical reactions. 2)**D**educes the kind of chemicalreactions seen in nature, basedon observations. **Indicators** 1)Manipulates and analyses of the reactants and products in chemical equations 2)Knows and explains the significant of balanced chemical equations	Interaction with students to know their previous knowledge regarding to the Concept of the topic Q. what do you observe from given pictures (a)  (b)  Q. Which picture is balanced? Q. why picture (a) is not balanced? Q. Why picture (b) is balanced? Q. Write shorter way for representing chemical		

	reaction for burning of magnesium ribbon in air? Q. Count the number of atoms of each element in in LHS / reactants side and RHS/product side? Q. Is number of atoms of each element in LHS and RHS sides equal Q. What is Law of conservation of mass? Mass can neither be created nor destroyed in a chemical reaction Q. What is the meaning of it? According to Law of conservation of mass total mass / number of atoms of each elements present in the products of a chemical reaction has to be equal to the total mass / total number atom of each elements present in the reactants Let us balance a chemical equation Consider the chemical equation of reaction of Fe? **$Fe + H_2O \rightarrow Fe_3O_4 + H_2$** .....(1) Q.Count the number of atoms of different elements on both sides of the arrow and write in below table Q. Is the number of atoms of each element on	1. Who postulated law conservation of mass? 2) Find out whether the given equation is balanced or not? $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$	IFP black board https://www.youtube.com/watch?v=N7SbiJXUANo

both sides equal?

To balance the above reactions we have to follow the steps

Step I:

To balance a chemical equation, first draw boxes around each formula. Do not change anything inside the boxes while balancing the equation.

.....(1.1)

Step II:

List the number of atoms of different elements present in the unbalanced equation

Element	Number of atoms in reactants	Number of Atoms in products

Step III:

In the above reaction, Select Fe_3O_4 and the element oxygen in it. How many oxygen atoms on the RHS and LHS ?

To balance the oxygen atoms in it.

Atoms	In reactants	In products

3) Balance the following chemical equations.

(a) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$

(b) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$

3) Translate the following statements into chemical equations and then balance them.

a) Hydrogen gas combines with nitrogen to form ammonia.

(i) Initial	1(in H_2O)	4(in Fe_3O_4)
(ii)To balance	1 X 4	4

Note: To equalise the number of atoms, it must be remembered that we cannot alter the formulae of the compounds or elements involved in the reactions.

Now the (1.1) becomes

..... (1.2)

(partly balanced equation)

Step IV:

follow the same procedure to balance Hydrogen in equation 1.2

For Hydrogen atoms

Atoms	In reactants	In products
(i) Initial	8(in H_2O)	2(in H_2)
(ii)To balance	8	2X4

Now the equation (1.2) becomes

.....(1.3)

b) Hydrogen sulphide gas burns in air to give water andsulphur dioxide.

c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

d) Potassium metal reacts with water to give potassium hydroxide and hydrogen

4. Write balanced chemical reaction of photosynthesis reaction?

5)A student performs an experiment to form aluminium chloride from aluminium and chlorine. Which options gives the chemical equation of the

(partly balanced equation)

Step V:
Follow the same procedure to balance Fe atoms in equation 1.3

Atoms	In reactants	In Products
(i) Initial	1 (in Fe)	3(in Fe_3O_4)
ii)To balance	1X3	3

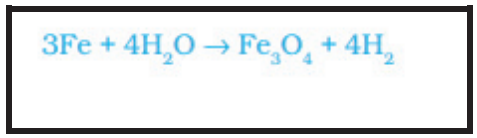
Now the (1.3) becomes

.....(1.4)

(Balanced equation)

Step VI:
Finally check the correctness of the balanced equation, i.e count atoms of each element on both sides of the equation.

Q) Are atoms of each element on both sides of the equation?



This is called balanced equation

reaction?
(a) $Al + Cl_2 \rightarrow AlCl_2$
(b) $2Al + Cl_2 \rightarrow 2AlCl$
(c) $2Al + 3\ Cl_2 \rightarrow 2AlCl_3$
(d) $3Al + 3\ Cl_2 \rightarrow 3AlCl_3$

This method of balancing chemical equations is called hit-and-trial method as we make trials to balance the equation by using the smallest whole number coefficient.

Q) Can we make above balance equation more informative?

To make a chemical equation more informative, the physical states of the reactants and products are mentioned along with their chemical formulae. The gaseous, liquid, aqueous and solid states of reactants and products are represented by the notations (g), (l), (aq) and (s), respectively. The word aqueous (aq) is written if the reactant or product is present as a solution in water.

Step VII:

Write above balance equation (1.4) by using symbols of physical states?

$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$

Note:

Sometimes the reaction conditions, such as temperature, pressure, catalyst, etc., for the reaction are indicated above and/or below the arrow in the equation.

For example –

$$CO(g) + 2H_2(g) \xrightarrow{340\ atm} CH_2OH(l)$$

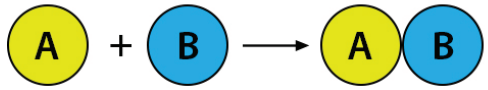
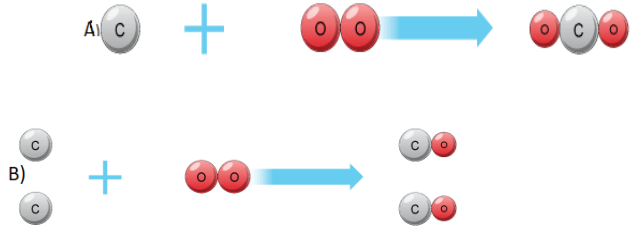
Teacher's reflections and experiences::

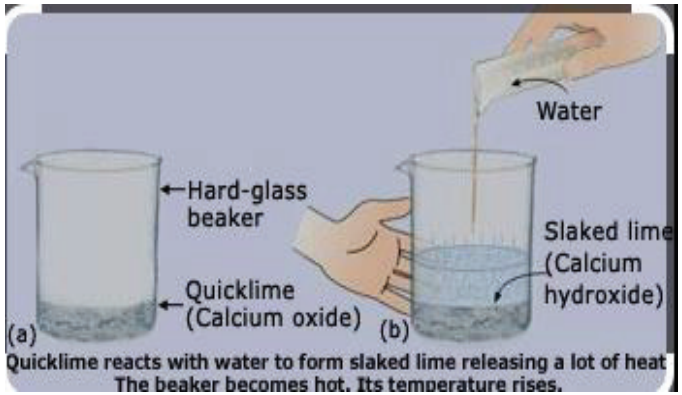
1) Students Understands and defines Law of conservation of mass.
2) Students Write balanced chemical equations for the given chemical reactions on their own.

PERIOD PLAN-4

CLASS: 10
CHAPTER: CHEMICAL REACTIONS AND EQUATIONS
TOTAL NUMBER OF PERIODS FOR THIS LESSON:10
NUMBER OF LESSON PLAN:4
KEY CONCEPTS:Types of chemical reactions, combination reactions, exothermic reaction

Learning out comes	Teaching learning process	Pointers for assessment	T-L Material required
1)**D**ifferentiates the types of chemical reactions. 2)**D**educes the kind of chemical reactions seen in nature, based on observations. 3) States concepts that represents chemical reactions	Interaction with students to know their previous knowledge regarding to the Concept of the topic Q) What is balanced chemical equation? Q) What happens during chemical reactions? Based on the bond breaking and bond making between the atoms chemical reactions are classified in to 1. Combination reactions		

Indicators Applies scientific principles to explain phenomenon in chemical reactions Identifies exothermic and endothermic based on observations of experiments performed	2. Decomposition reactions 3. Displacement reactions 4. Double displacement reactions Q) what do you observe from the below picture  Reactants Product ➢ **Combination Reactions** Q).Describe the given picture  (a) carbon combines with two oxygen atoms to give carbon dioxide as product (b)Each carbon atom combines with one oxygen atom to form carbon monoxide Actvity:1.4 Q)what you observed when you add water slowly to a beaker which contains calcium oxide?	1. Write down formulae of the given compounds? a) slaked lime b) quick lime c) Calcium carbonate 2) Identified the combination reaction a) $C(s) + O_2(g) \rightarrow CO_2(g)$ b) $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$ c) $4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$ d) All the above reactions 3)Define Chemical combination reactions? 4) What is a exothermic reaction?	https://www.youtube.com/watch?v=TX6BYceUSL0 https://byjus.com/ncert-solutions https://www.youtube.com/watch?v=J5A0PoKJGEM



Quicklime reacts with water to form slaked lime releasing a lot of heat
The beaker becomes hot. Its temperature rises.

Q) Write chemical equation of above reaction?

$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2\ (aq) + Heat$
(Quick lime) (Slaked lime)

Q)How slaked lime is formed in the reaction?

In activity 1.4, calcium oxide and water combine to form a single product, calcium hydroxide.

A reaction in which a single product is formed from two or more reactants is known as a combination reaction.

Q. Touch the beaker do you feel any change in temperature?

Reactions in which heat is released along with the formation of products are called exothermic chemical reactions.

5) Identify the exothermic reaction
a)Respiration
b)Digestion
c)Decomposition of vegetable matter into compost
d) All above

6) Write chemical equation of burning of natural gas? Is it exothermic reaction? Why?

7) A student writes a chemical equation of the reaction between carbon monoxide and hydrogen. $CO_2 + 2H_2 \rightarrow CH_3OH$ How can the reaction be classified?
(a) The reaction is an example of a combination reaction as a compound separate into two compounds.
(b) The reaction is an example of a decomposition reaction as a compound dissociates into two compounds.
(c) The reaction is an

Chemicals:
Calcium oxide and, water
Apparatus:
Beaker and test tube

https://www.youtube.com/watch?v=TX6BYceUSL0

https://www.youtube.com/watch?v=UsBWJqwho6U

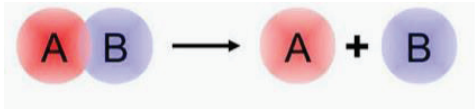
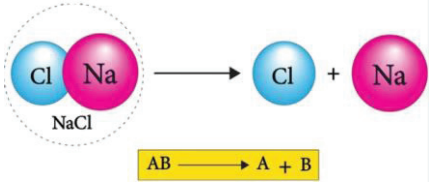
	NOTE: A solution of slaked lime produced by the activity 1.4 is used for whitewashing walls. Calcium hydroxide reacts slowly with the carbon dioxide in air to form a thin layer of calcium carbonate on the walls. Calcium carbonate is formed after two to three days of whitewashing and gives a shiny finish to the walls.	example of a combination reaction as two compounds react to form a single compound. (d) The reaction is an example of a decomposition reaction as two compounds react to form a single compound	

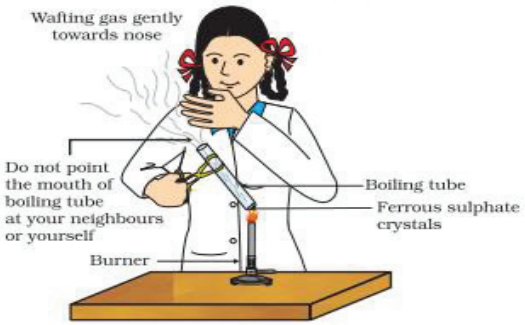
Teacher's reflections and experiences: **1) Students D**efines combination and exothermic reactions.

2) Students Understands the types of chemical reactions.

PERIOD PLAN-5

CLASS: 10
CHAPTER: CHEMICAL REACTIONS AND EQUATIONS
TOTAL NUMBER OF PERIODS FOR THIS LESSON:10
NUMBER OF LESSON PLAN:5
KEY CONCEPTS: Decomposition reactions caused by using heat energy

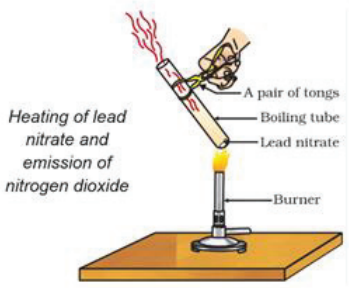
Learning out comes	Teaching learning process	Pointers for assessment	T-L Material required
1)**D**ifferentiates the types of chemical reactions. 2)**P**erforms experiments to classifythe types of reactions. 3)**D**educes the kind of chemicalreactions seen in nature, basedon observations. **Indicators** Plans and conducts	Interaction with students to know their previous knowledge regarding to the Concept of the topic Q) How product will be formed in chemical combination reactions? Q) what do you observe from the given pictures  Decomposition Reaction 3) Describe below reaction?  	Q) Write the chemical decomposition of $CaCO_3$ in to CaO and Carbon dioxide?	

investigations / experiments to arrive at and verify the facts, principle phenomena or to seek answers to queries on their own Draws conclusions	Activity:1.5 Q)what happens when we heat light green colour Ferrous sulphate in a test tube on Bunsen burner?  *Correct way of heating the boiling tube containing crystals of ferrous sulphate and of smelling the odour* Q) Why the light green colour of Ferrous Sulphate crystals has changed? Q) Have you observed the smell the evolved gas? How gas evolved from the mouth of test tube? Q) Write the chemical equation of above reaction? $2FeSO4\ (_S) \xrightarrow{Heat} Fe_2O_3 + SO_2\ (g) + SO_3$ Ferrous Sulphate — Ferric Oxide Q) How Ferric oxide Sulphur dioxide and Sulphur tri oxide formed from Ferrous Sulphate?	Q) The reaction is example of a $2AgCl\ (S) \xrightarrow{sunlight} 2Ag\ (S) + Cl_2\ (g)$ a) Combination reaction b) Double displacement reaction c) Decomposition reaction d)Displacement reaction Q) What happens in decomposition reactions? a) Bond breaking b)Bond making c)Atoms transfer d)All the above	**Chemicals :** Ferrous sulphate and Lead nitrate **Apparartus**: Bolling tubes, pair of tongs And Bunsen burner https://www.youtube.com/watch?v=UndMvcd7ZqY

In this reaction you can observe that a Ferrous Sulphate breaks down to give simpler products as Ferric oxide Sulphur dioxide and Sulphur tri oxide.

Activity:1.5

Q) What do you observe when 2 g of Lead nitrate powder heated in a tube heated over a flame a of burner?



Q) Why brown colour fumes evolved?

Q) Which chemical is present in brown colour fumes?

Q) Write the chemical equation of the above reactions?

$$2Pb(NO_3)_2(s) \xrightarrow{Heat} 2PbO(s) + 4NO_2(g) + O_2(g)$$

(Lead nitrate) (Lead oxide) (Nitrogen dioxide) (Oxygen)

Q) Why Lead oxide, Nitrogen dioxide and oxygen formed from lead nitrate?

Q)Zinc carbonate(s) → Zinc oxide(s) + Carbon dioxide(g) Write above reaction in balanced chemical equation form?

Q) Which is responsible for light green colour of Ferrous sulphate?

Q)Fill the table

Name of reaction	Energy	Temperature	Spontaneous
Exothermic			
Endothermic			

Q) observe the following reactions

Reaction P - $CaO + SO_2 \longrightarrow CaSO_3$

Reaction Q - $ZnCO_3 \longrightarrow ZnO + CO_2$

Which reaction is an example of a combination reaction and a decomposition reaction?

https://www.youtube.com/watch?v=OAoiYPUZvU4

	In this reaction we observe that a lead nitrate breaks down to give simpler products as Lead oxide and oxygen. From activities 1.5 & 1.6 we observed that heat energy is required for breaking down the reactants in to products, these type of reaction known as thermal decomposition reactions Decomposition Reactions which are caused by heat energy are called as thermal decomposition reactions **NOTE** Reactions in which energy is absorbed are known as endothermic reactions. According to the definition we can say that above two activities are examples endothermic reactions.	(a) both the reactions are examples of combination reaction (b) both the reactions are examples of a decomposition reaction (c) reaction P is an example of a combination reaction while reaction Q is an example of a decomposition reaction (d) P is an example of a decomposition reaction while reaction Q is an example of a combination reaction	

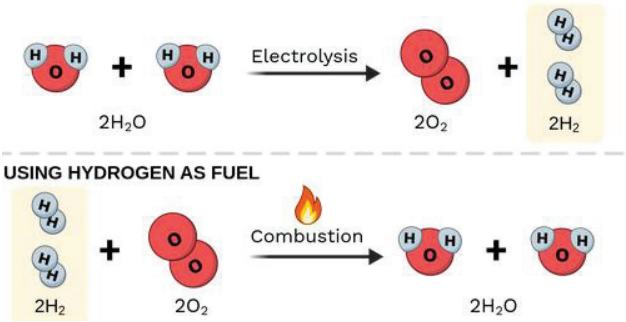
Teacher's reflections and experiences:

1) Students differentiates the types of chemical reactions.

2) Students deduces or identifies the kind of chemical reactions seen in nature, based on observations.

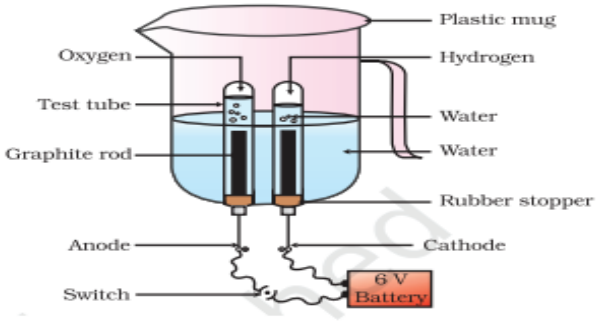
PERIOD PLAN-6

CLASS: 10
CHAPTER: CHEMICAL REACTIONS AND EQUATIONS
TOTAL NUMBER OF PERIODS FOR THIS LESSON:10
NUMBER OF LESSON PLAN:6
KEY CONCEPTS: Decomposition reactions causing by electrical energy and light energy

Learning out comes	Teaching learning process	Pointers for assessment	T-LMaterial required
1)**D**ifferentiates the types of chemical reactions. 2)**P**erforms experiments to classify the types of reactions **Indicators** Plans and conducts investigations / experiments to arrive at and verify the facts, principle phenomena or to seek answers to queries on their own Draws conclusions	Interaction with students to know their previous knowledge regarding to the Concept of the topic Q)What happens in decomposition reaction? Q)What is thermal decomposition reaction? Q)Give one example of thermal decomposition reaction? Q)What happens in the below reaction?  **Decomposition Reaction**	Q) Define electrolysis reaction. Give one example? Q) Define photochemical decomposition reaction? Give one example?	Chemicals : Silver chloride, dilute sulphuric acid , water Apparatus: China dish, mug, carbon electrodes, rubber stopper, two test tubes

Activity 1.7:

Q) What do you observe during decomposition of water by passing electricity through it?



Electrolysis of water

Q) What happens in each case?

Q) Which gas is present in each test tube?

Q) Write chemical equation of the reactions?

$$2H_2O \xrightarrow{\text{Electricity}} 2H_2 + O_2$$

(Water) (Hydrogen) (Oxygen)

Q) How to test the evolved gas whether it is oxygen or not?

Decomposition reaction caused by electricity is known as Electrolysis reaction

We can say that activity 1.7 is an example of electrolysis reaction

Activity 1.8:

Q) Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions?.

Q) By observing following data fill the following table

A) Respiration reaction

B) Photosynthesis

C) cooking food

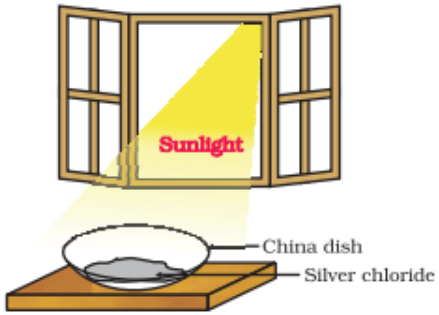
D) Decomposition of vegetable oil?

E)Formation of Slaked lime

https://www.youtube.com/watch?v=rcD1YhaCHUU&pp=ygUsZWxlY3Ryb3lzeXMgb2Ygd2F0ZXIgYnkgdXNpZyBjYWJvbiBlbGVjdHJvZGU%3D

https://youtu.be/wfg7Erx-GlA

Q) Keep white colour silver chloride in china dish in sun light for some what does you observe?



Silver chloride turns grey in sunlight to form silver metal

Q) Why white colour of silver chloride changed into grey colour?

Q) Which chemical substance is sensible to sunlight?

Q) write chemical equation for the reaction takes place in the activity 1.8

$$2AgCl(s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Cl_2(g)$$

Q) How to test whether the evolved gas is chlorine or not?

Decomposition reaction caused by sunlight is called as photochemical decomposition reaction

F) Heating of Lead Nitrate
G)Digestion Process
F)Reaction of Sodium with water

Exothermic reaction	Endothermic reaction

Q) Why sodium is not stored in water?

We can say That activity 1.8 is an example of photochemical reaction.

Based on the activities 1.5/ 1.6/1.7/1.8 we can say that decomposition reactions require energy either in the form of heat, light or electricity for breaking down the reactants.

NOTE
Reactions in which energy is absorbed are known as endothermic reactions.

According to the definition we can say that above 4 activities are examples endothermic reactions.

Q) Fill the bellow table

Name of the reaction	**Type of energy required**	**Exo-thermic (or) Endo-thermic**
	Heat	Endo-thermic
Electrolysis		Endo-thermic
Photochemical decomposition	Light	

Teacher's reflections and experiences:

1) Students Differentiates between photochemical decomposition reactions and thermal decomposition reactions.
2) Students Define decomposition reaction.

PERIOD PLAN-7

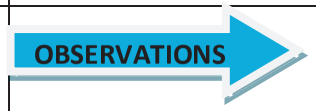
Class: 10

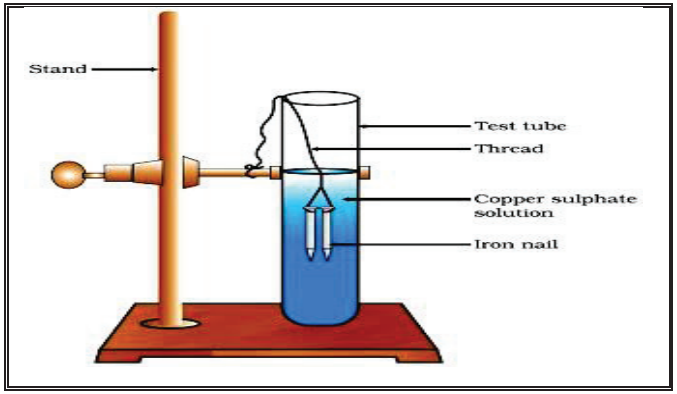
Chapter: CHEMICAL REACTIONS AND EQUATIONS

No.Of Periods:10

Period No: 07

Key concepts: Displacement Reactions

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	T-L Material required
Describes and represents chemical interactions and changes using symbols and formulas **D**ifferentiates the types of chemical reactions. **D**istinguishes between combination	**T**he teacher will start the lesson with a discussion to check for prior knowledge: What are Rolled gold ornaments? How they look like pure gold ornaments at low cost? How bridges made of iron are protected from rusting? 1) When zinc granules are added to dil.Hydrochloric acid or Sulphuric acid, what are the products formed? 2) What is the balanced chemical equation for the above reactions? 3) What type of reaction it is? A)Combination reaction B)Decomposition reaction	 S.No | Property | Before Experiment | After Experiment | | | | | | | | Q.2Why does the colour of copper sulphate solution change, when an iron nail is dipped in it?	**Chemicals required:-** Iron nails Copper Sulphate Zinc pieces Lead Hydrochloric acid Copper chloride **Apparatus required:-** Test tubes Test tube stand Test tube holder Threads

decomposition, displacement, double displacement, precipitation, oxidation and reduction reactions.	Student responds it does not belong to either of them. Let us find out the nature of reaction from the activity given below. **Activity** ▪ Take three clean iron nails Take two test tubes (A) and (B) containing 10 mL copper sulphate solution in each ▪ Tie two iron nails with a thread and immerse them carefully in the copper sulphate solution in test tube B for about 20 minutes.  ▪ Keep one iron nail aside for comparison. ▪ After 20 minutes, take out the iron nails from the copper sulphate solution.	**HOTS** Q.3How would you devise the procedure to show that Mg > Fe > Cu in reactivity series? **Q.4**What is the basic principle involved in this experiment? **Statement for linked answer questions 5-9** To investigate the relative activity of metals, four metals, Cu, Ag, Zn, and Pb, as well as their salts $CuSO_4$, $AgNO_3$, $ZnSO_4$, and $PbSO_4$, were used. In four separate beakers, the salts were dissolved inwater. Small amounts of these solutions were placed in four test tubes, and each of these four testtubes was dipped in a strip of copper. The process was repeated for each of the Ag, Zn, and Pb strips. **Q-5**: Which of the following reactions will take place?	Sand paper Safety equipment IFP PANEL DISPLAY https://epathshala.nic.in/QR/books/desm/NCERT_Science_Lab_Manual_X_Expt_01.pdf https://diksha.gov.in/play/collection/do_3130736097954938881873?contentId=do_

- Compare the intensity of the blue colour of copper sulphate solutions in test tubes

  (A) and (B).

Also, compare the colour of the iron nails dipped in the copper sulphate solution with the one kept aside.

fig-11(a):Iron nail dipped in copper sulphate solution

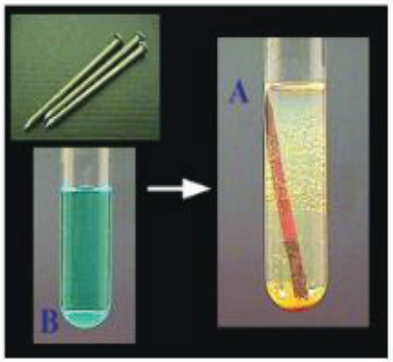


fig-11(b): Iron nail and copper sulphate solutions compared before and after the experiment

Why does the iron nail become brownish in colour?

- Why does the blue colourof copper sulphate solution fades?
- Can you write down the equation for this?
- The following chemical reaction takes place in this Activity–

$$Fe_{(s)} + CuSO_{4(aq)} \rightarrow FeSO_{4(aq)} + Cu_{(s)}$$

(Copper sulphate) (Iron sulphate)

In this reaction, iron has displaced or removed another element, copper, from copper sulphate solution.

a) Pb in ZnSO4 solution

b) Ag in CuSO4 solution

c) Zn in PbSO4 solution

d) Cu in PbSO4 solution

Q-6: For the reaction, chosen in Q-5, what will be the colour of the solution?

a) Red

b) Yellow

c) Black

d) White

Q-7: What type of reaction is involved in the reaction chosen above?

a) Double Displacement

b) Displacement

c) Decomposition

d) Precipitation

Q-8: On the basis of your study, what will be the correct order of their activity?

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	This reaction is known as displacement reaction. Why Iron replaces copper from copper sulphate? Iron is more reactive than copper. If Iron is less reactive than copper what happens? What happens when zinc or lead pieces in place of iron is used in the above activity? Zinc displaces copper from copper sulphate? What are the chemical equations for the above reaction? Zinc and lead are more reactive elements than copper. They displace copper from its compounds. $Zn_{(s)}+CuSO_{4(aq)} \rightarrow ZnSO_{4(aq)}+Cu_{(s)}$ $Pb_{(s)}+CuCl_{2(aq)} \rightarrow PbCl_{2(aq)}+ Cu_{(s)}$.		

TEACHERS REFLECTIONS:

1) Students Differentiates the types of chemical reactions.
2) Students Distinguishes between combination, decomposition, displacement reactions.

PERIOD PLAN -8

Class: 10

Chapter: CHEMICAL REACTIONS AND EQUATIONS

No.Of Periods: 10

Period No: 08

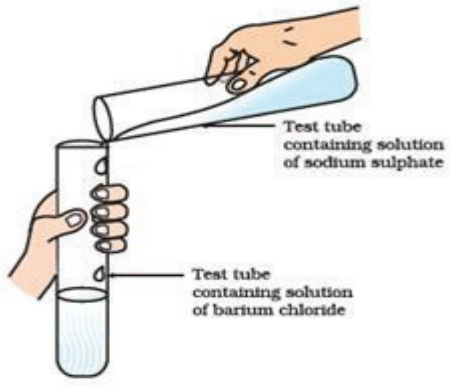
Key concepts: Double Displacement Reaction

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	T-L Material required
❖ Differentiates the types of chemical reactions. ❖ Performs experiments to classify the types of reactions. ❖ Deduces the kind of chemical reactions seen in nature, based on observations.	The teacher will start the lesson with a discussion to check for prior knowledge: How many types of chemical reactions are there? **(1)*Recall Activity 1.2***, where you have mixed the solutions of lead(II) nitrate and potassium iodide. (i) What was the colour of the precipitate formed? (ii) Can you name the compound precipitated? (iii) Write the balanced chemical equation for this reaction. (iv) Is this also a displacement reaction?		**Chemicals required:-** **1)**Sodium sulphate solution 2)Barium Chloride solution 3)Lead nitrate 4)Potassium Chloride. **Apparatus required:-** Test tubes Safety devices

Activity 1.10

Take about 3 mL of sodium sulphate solution in a test tube.

- In another test tube, take about 3 mL of barium chloride solution.
- Mix the two solutions .
- What is the colour of the two solutions in test tubes A and B before mixing them.
- Does anything precipitates in the test tube?
- If so, what is the colour of it?



You will observe that a white substance, which is insoluble in water, is formed.

What is this insoluble substance?

How it is formed?

This insoluble substance formed is known as a precipitate.

(1) Give an example of a double displacement reaction other than the one given in Activity 1.10

(2) $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$

The above reaction is an example of a

(a)combination reaction.

(b)double displacement reaction

(c) decomposition reaction

(d) displacement reaction

HOTS:-

(3)As the white precipitate of barium sulphate is formed _____ (immediately/sometime after mixing the two solutions),

the reaction between _____ (ionic/ covalent) compounds is

_____(instantaneous/ slow).

https://www.youtube.com/watch?v=_AiYmM1OTJI

	The white precipitate of $BaSO_4$ is formed by the reaction of SO_4^{2-} and Ba^{2+} Any reaction that produces a precipitate can be called a precipitation reaction. Is there any other product formed in the reaction? The other product formed is sodium chloride which remains in the solution. What ions are present in the other product sodium chloride? Such reactions in which there is an exchange of ions between the reactants are called double displacement reactions. Na_2SO_4+ $BaCl_2$ → $BaSO_{4(S)}$ +2NaCl(aq) Sodium Barium Barium Sodium Sulphate chloride sulphate chloride	(4) What may happen on mixing $Pb(NO_3)_2$ and KCl solutions? Predict (you may try to experimentally verify). (5) Why do the persons suffering from the ailment of stone formation advised not to take too much milk and tomato juice? (6) Which among the following is(are) double displacement reaction(s)? (i) **$Pb + CuCl_2 \rightarrow PbCl_2 + Cu$** **(ii) $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$** **(iii) $C + O_2 \rightarrow CO_2$** **(iv) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$** (a) (i) and (iv) (b) (ii) only (c) (i) and (ii) (d) (iii) and (iv) TRY THESE:- (7) In the double displacement reaction between aqueous	https://diksha.gov.in/play/collection/do_3130736097954938881187 3?contentId=do_31307735878953 3696111717

		potassium iodide and aqueous lead nitrate, a yellow precipitate of lead iodide is formed. While performing the activity if lead nitrate is not available, which of the following can be used in place of lead nitrate? (a) Lead sulphate (insoluble) (b) Lead acetate (c) Ammonium nitrate (d) Potassium sulphate	

TEACHERS REFLECTIONS:-

1)Students differentiates between double decomposition reaction and other reactions

2) Students Performs experiments to classify the types of reactions.

PERIOD PLAN - 9

Class: 10

Chapter: CHEMICAL REACTIONS AND CHEMICAL EQUATIONS

No.Of Periods: 10

Period No: 9

Key concepts: Oxidation and Reduction.

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	T-L Material required
Describes classification of oxidation and reduction. Describes and represents chemical interactions and changes in oxidation and reduction reactions.	The teacher will start the lesson with a discussion to check for prior knowledge: ***Recall Activity 1.1***, where a magnesium ribbon burns with a dazzling flame in air (oxygen) and changes into a white substance, magnesium oxide. **S.NO** | **PROPERTY** | **BEFORE EXPERIMENT** | **AFTER EXPERIMENT** 1 | COLOUR | | | 2 | PHYSICAL STATE | | | What is the formula of Magnesium Oxide? Is oxygen reactant added to Magnesium reactant during the reaction?	Q.1)Which of the following statements about the given reaction are correct? **$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$** (i) Iron metal is getting oxidised (ii) Water is getting reduced (iii) Water is acting as reducing agent (iv) Water is acting as oxidising agent (a) (i), (ii) and (iii) (b) (iii) and (iv) (c) (i), (ii) and (iv) (d) (ii) and (iv	**Chemicals required:-** Copper Powder Zinc Pieces Carbon Manganese Di oxide Dil.Hydrochloric acid.

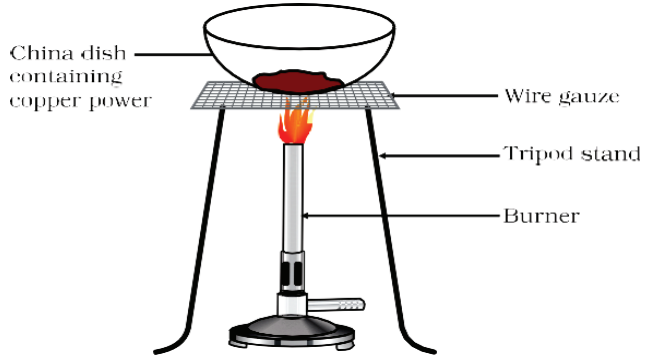
Activity:-1.11

Heat a china dish containing about 1 g copper powder. What do you observe?

The surface of copper powder becomes coated with black copper(II) oxide.

Why has this black substance formed?

The black substance formed is Copper oxide.



$2Cu + O_2 \longrightarrow 2CuO$

If a substance gains oxygen during a reaction, it is said to be oxidised

What happens if hydrogen gas is passed on to

HOTS:-

Q.2)A dilute ferrous sulphate solution was gradually added to the beaker containing acidified permanganate solution. The light purple colour of the solution fades and finally disappears.

Which of the following is the correct explanation for the observation?

(a) $KMnO_4$ is an oxidising agent, it oxidises $FeSO_4$

(b) $FeSO_4$ acts as an oxidising agent and oxidises $KMnO_4$

(c) The colour disappears due to dilution; no reaction is involved

(d) $KMnO_4$ is an unstable compound and decomposes in presence of $FeSO_4$ to a colourless compound

Apparatus required:-

Burner

Watch glass

Tongs

Wire guaze

Tripod stand

China Crucible

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https://youtu.be/pYqL0ngWUiY?si=K-9y8zPu8rRpcOzx

this CuO formed?

If hydrogen gas is passed over this heated material (CuO), the black coating on the surface turns brown.

Why CuO turns Brown?

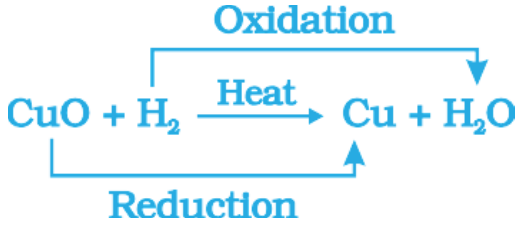
The reverse reaction takes place and copper is obtained.

$CuO + H_2 \longrightarrow Cu + H_2$

What do you observe in the equation?

The copper(II)oxide is losing oxygen and is being reduced.

The hydrogen is gaining oxygen and is being oxidised.
In other words, one reactant gets oxidised while the other gets reduced during a reaction.
Such reactions are called oxidation-reduction reactions or redox reactions.



Look at some other examples of redox reactions and find out which is oxidised and reduced?

Q.3) Identify the reducing agent in the following reactions

CHEMICAL REACTION	REDUCTANT
(a) $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$	
(b) $H_2O + F2 \rightarrow HF + HOF$	
(c) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$	
(d) $2H_2 + O_2 \rightarrow 2H_2O$	

Q.4)Identify the oxidising agent (oxidant)in the following reactions

CHEMICAL REACTION	OXIDISING AGENT
(a) $Pb_3O_4 + 8HCl \rightarrow 3PbCl_2 + Cl_2 + 4H2O$	
(b) $2Mg + O_2 \rightarrow 2MgO$	
(c) $CuSO4 + Zn \rightarrow Cu + ZnSO_4$	
(d) $V_2O_5 + 5Ca \rightarrow 2V + 5CaO$	
(e) $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H2$	
(f) $CuO + H_2 \rightarrow Cu + H_2O$	

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https://youtu.be/wq_Cw16-70Q?si=D6JxMo86BlAzIctY

Equation	Element/ molecule reduced	Element/ Molecule/ Ion Oxidised
$ZnO+C \rightarrow Zn+CO$		
$MnO_2+4HCl \rightarrow MnCl_2+H_2O+Cl_2$		

Carbon is oxidised to CO and ZnO is reduced to Zn.

In reaction HCl is oxidised to Cl_2 whereas MnO_2 is reduced to $MnCl_2$.

If a substance gains oxygen

or loses hydrogen during a reaction, it is oxidised.

If a substance loses oxygen or gains hydrogen during a reaction, it is reduced.

What is a Reducing agent or Reductant?

What is Oxidising agent or Oxidant?

Find out the oxidising and reducing agents in the above examples?

The substance that undergoes oxidation is reducing agent or reductant.

The substance that undergoes reduction is

Q.5)A silver article generally turns black when kept in the open for a few days.

The article when rubbed with toothpaste again starts shining.

(1) Why do silver articles turn black when kept in the open for a few days?

(2)Name the phenomenon involved.

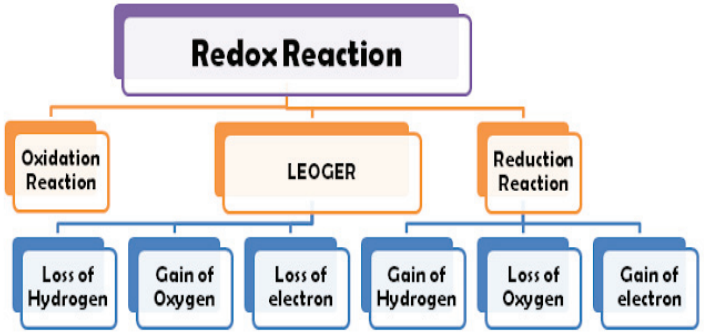
(3) Name the black substance formed.

(4) Give its chemical formula

Q.6)A shiny brown coloured element 'X' on heating in air becomes black in colour.

Name the element 'X' and the black colour compound formed?

oxidising agent or oxidant.



Q-7) Which of the following statements is correct?

a) Metals act as reducing agent and non metals act as oxidising agent

b) Metals act as oxidising agent and non- metals acts as reducing agent

c) Metals and nonmetals both acts as reducing agents

d) Metals and nonmetals both acts as oxidising agents

Q.8)**Assertion:** When copper powder is heated in air, it turns black.

Reason: Copper reacts with the H_2S gas of the air forming black CuS.

a) Both A and R are true and R is the correct explanation of the assertion.

b) Both A and R are true but R is

		not the correct explanation of the assertion. c) A is true but R is false d) A is false but R is true 9)The image shows a reaction between zinc and hydrogen. $Zn + 2H^+ \rightarrow Zn^{2+} + H_2$ Which option shows oxidation? (a) $Zn \rightarrow Zn^{+2}$ (b) $2H^+ \rightarrow H_2$ (c) $Zn^{+2} \rightarrow Zn$ (d) $H_2 \rightarrow 2H^+$	
TEACHERS REFLECTIONS:-	1) Students differentiates between oxidation and reduction. 2) Students gives definitions and examples for oxidation and reduction.		

PERIOD PLAN -10

Class: 10

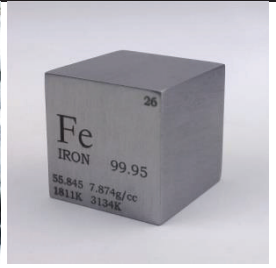
Chapter: CHEMICAL REACTIONS AND EQUATIONS

No.Of Periods: 10

Period No: 10

Key concepts: Effects of Oxidation in everyday life - Corrosion and Rancidity

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	T-L Material required
1)Deduces the kind of chemical reactions seen in nature, based on observations. ❖ Infers that corrosion/rusting is an oxidation-reduction reaction. ❖ Deduces that rancidity in oils, fats and chips is due to the process of oxidation. ❖ Plans and conducts investigations/ experiments to arrive	The teacher will start the lesson with a discussion to check for prior knowledge: ➢ Which metals we use mostly in our daily life? ➢ Why we paint our iron grills or window panels frequently? ➢ Why copper utensils are often cleaned ➢ Why silver ornaments are blackened on use? ➢ Why iron articles are shiny when new, but get coated with a reddish brown powder when left for some time?	Q.1). Why do we apply paint on iron articles? Q.2)Oil and fat containing food items are flushed with nitrogen. Why? Q.3)Why does stale food gives a bad smell and bad taste?	Rusted Iron nails Tarnished silver Tarnished copper Fresh Iron nails Fresh copper Articles Fresh Silver articles Rancid food items. Chart showing Precautions to prevent rancidity

at and verify the facts, principles, phenomena or to seek answers to queries on their own, such as investigates conditions necessary forrusting.	  ➢ Why house hold iron articles turn brown on long use? ➢ What is this process most commonly called? ➢ Have you noticed the colour of the coating formed on copper and silver? ➢  ➢ What is this process named as? When a metal is attacked by substances around it such as moisture, acids, etc., it is said to corrode. this process is called corrosion. This process in iron is commonly known as **rusting of iron.** The black coating on silver and the green coating on copper are other examples of corrosion.	How can this be prevented? Q.4)Which of the following gases can be used to store a fresh sample of oil for an extended period of time? a) N_2 and O_2 b) CO_2 and O_2 c) He and N_2 d) CO_2 and He Q.5)Give reasons for the following **i)** Zinc and Aluminium are reactive metals and still they don't	and corrosion. E-content from Byjustabs,Scertof ficial,Ncert official you-tube channels, e-patashala,PM-e-vidya,DIKSHA app. https://diksha.gov.in/play/collection/do_3130736097952235211783?contentId=do_31364496407548723215 3

	This process is known as **Tarnishing.** ➢ Will corrosion strengthens or weakens the metal? ➢ Corrosion of metal is useful to industry? Corrosion causes damage to car bodies, bridges, iron railings, ships and to all objects made of metals, specially those of iron. Corrosion of iron is a serious problem. Every year an enormous amount of money is spent to replace damaged iron. ❖ How to rectify this problem? Or ➢ What is the solution to control rusting? ➢ You will learn more about corrosion inChapter 3.  ➢ Have you ever tasted or smelt the fat/oil containing food materials left for a long time? ➢ Why chips or snacks or biscuits packed in air tight containers?	corrode easily. **ii)** Bronze metals get coated with a greenish layer if not stored/cleaned properly Q.6)List two methods for preventing rancidity? Q.7)Why is it rusting faster in the rainy season? **Q.8)**Why do silver articles turn black in the air? Q.9)Why does copper get coated with a green layer? **Q.10)** Aluminium oxide is formed as a result of the attack of moist air on aluminium. How is this attack beneficial?	https://diksha.gov.in/play/collection/do_3130736097954938881187 3?contentId=do_31333773125367398414603.

- Which gas is filled in chips packets?

a) Dry air b)Oxygen

c)Nitrogen d)Carbon-di-oxide

- How pickels are stored for months?
- What precautions are taken to store pickels?

When fats and oils are oxidised, their smell and taste change. This is known as 'Rancidity'.

We say they became rancid.


- How to prevent rancidity?

- How pickles and sweets in sweet stalls are stored for long days?

Anti-oxidants are added to food prepared from fats & oils to prevent rancidity.

Q)A student notices that the bread kept out has a green coloured coating over it after a few days.

What explains the reason for the student's observation?

(a) the oils in the bread oxidises and causes rancidity

(b) bread comes in contact with atmospheric moisture and corrodes

(c) the oils in the bread reduces and cause the change in the colour of the bread

(d) comes in contact with the atmospheric nitrogen and a layer deposit over it

	➢ What are anti-oxidants? The chemicals that prevent oxidation are called anti oxidants. ➢ What are anti oxidants used chips packets? ➢ What are anti oxidants used in pickles? Chips manufacturers usually flush bags of chips with gas such as nitrogen to prevent the chips from getting oxidised.		
TEACHERS REFLECTIONS:-	1) Students give examples for effects of oxidation in everyday life. 2) Students defines corrosion and rancidity with examples.		

WORKSHEET-1

Q.1) Write the skeleton equation for each of the following reactions.Then balance each of the following chemical equations.

1. Hydrogen + Oxygen→ Water
2.Iron(III) oxide + hydrogen→water + iron
3. Sodium + water→ sodium hydroxide + hydrogen
4. Copper + Oxygen→Copper(II) Oxide
5. Potassium iodide + chlorine→potassium chloride + iodine
6. Chromium + tin(IV) chloride→chromium(III) chloride + tin
7. Magnesium + copper(II) sulphate→magnesium sulphate + copper
8. Zinc sulphate + strontium chloride→ zinc chloride + strontium sulphate
9. Ammonium chloride + lead(III) nitrate→ ammonium nitrate + lead(III) chloride
10. Iron(III) nitrate + magnesium sulphide→ iron(III) sulphide + magnesium nitrate
11. Aluminum chloride + sodium carbonate→ aluminum carbonate + sodium chloride
12. Sodium phosphate + calcium hydroxide→ sodium hydroxide +calcium Phosphate

Q.2) Indicate which type of chemical reaction (Combination, decomposition, single displacement,double-displacement or combustion) is being represented in the following reactions:

1. $Na_3PO_4 + 3\ KOH \rightarrow 3\ NaOH + K_3PO_4$
2. $MgCl_2 + Li_2CO_3 \rightarrow MgCO_3 + 2\ LiCl$
3. $C_6H_{12} + 9\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$
4. $2\ AgNO_3 + Cu \rightarrow Cu(NO_3)_2 + 2\ Ag$
5. $C_3H_6O + 4\ O_2 \rightarrow 3\ CO_2 + 3\ H_2O$
6. $2\ C_5H_5 + Fe \rightarrow Fe(C_5H_5)_2$
7. $SeCl_6 + O2 \rightarrow SeO_2 + 3Cl_2$
8. $2\ MgI_2 + Mn(SO_3)_2 \rightarrow 2\ MgSO_3 + MnI_4$
9. $O_3 \rightarrow O + O2$
10. $2\ NO_2 \rightarrow 2\ O_2 + N_2$

Q.3) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

Study the above reaction and name the following:

- Substance getting reduced
- Substance getting oxidized
- Oxidizing agent
- Reducing agent.

WORKSHEET-2

Q.1) Give reasons for the following:

- Silver Nitrate solution cannot be stored in Copper containers.
- Gold and Silver do not corrode in air
- Blue colour of copper sulphate solution starts fading when a zinc rod is dipped in it.
- Respiration is an endothermic reaction.
- Photo chemical decomposition reaction finds application in photography.

Q.2) If you think a reaction will happen:
write down why you think it will happen,what you expect to see, and the word equation to go with it.

- iron heated with copper(II) oxide
- aluminium heated with iron oxide
- copper heated with iron oxide
- magnesium heated with zinc oxide

Q.3)Give examples for the following:

- Precipitation reaction.
- Thermal decomposition.
- Natural oxidation.
- Exothermic reaction.

Q.4) Identify the substances that are oxidized and the substances that are reduced in the following reactions.

- **$4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$**
- **$CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(l)$**

WORKSHEET-3

Q-1: Write the equations for the following reactions in the ionic form and balance the ionic equations.

i) Magnesium is treated with dilute sulphuric acid

ii) Stannous chloride solution is added into mercuric chloride solution

iii) H_2S gas is passed into copper(II) sulphate solution.

iv) Liquid bromine is added to the container of sodium iodide crystals

v) Aluminium is treated with dilute hydrochloric acid

Q-2: Fill in the blanks

a) Aluminium reacts with NaOH to form _____ and _____.

b) In the activity series of metal, aluminium is _____ active than iron.

c) Copper sulphate solution is _____ in nature.

d) A reaction between an acid and base is called _____.

e) _____ slows down the process of oxidation in packaged food.

Q-3: What is the correct representation of the reaction that occurs during the chlor alkali process?

a) $2NaCl(l) + 2H_2O(l) \rightarrow 2NaOH(l) + Cl_2(g) + H_2(g)$

b) $2NaCl(aq) + 2H_2O(aq) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$

c) $2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(aq) + H_2(aq)$

d) $2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$

Q-4: Which of the following statements is correct?

a) Metals act as reducing agent and non metals act as oxidising agent

b) Metals act as oxidising agent and non metals acts as reducing agent

c) Metals and nonmetals both acts as reducing agents

d) Metals and nonmetals both acts as oxidising agents

Q-5: What do you expect to happen when the $AgNO_3$ solution is added to

i) NaCl solution ii) CCl_4?

Give reasons.

Q-6: Give reasons for the following

i) Zinc and Aluminium are reactive metals and still they don't corrode easily.

ii) Bronze metals get coated with a greenish layer if not stored/cleaned properly.

Q-7: The following aqueous solutions are given to you:

$ZnSO_4$, $PbSO_4$, $Ni(SO_4)_2$ and $Al_2(SO4)_3$

You are also given vessels made of Zn, Pb , Al and Ni.

LESSON PLAN
Chapter-2

Class: 10th

Subject: Chemistry

Name of the lesson: Acids, Bases and Salts

Total number of Periods: 14 (12+2)

Key concepts: Acids, Bases and Salts; Indicators, chemical reactions of Metals, metal carbonates, metal bicarbonates and metal oxides & non-metal oxides with acids & bases, dilution of acids and bases, strength of acids & bases, PH scale and applications of PH, Salts family & PH of salts, Chemicals from common salt and water of crystallisation.

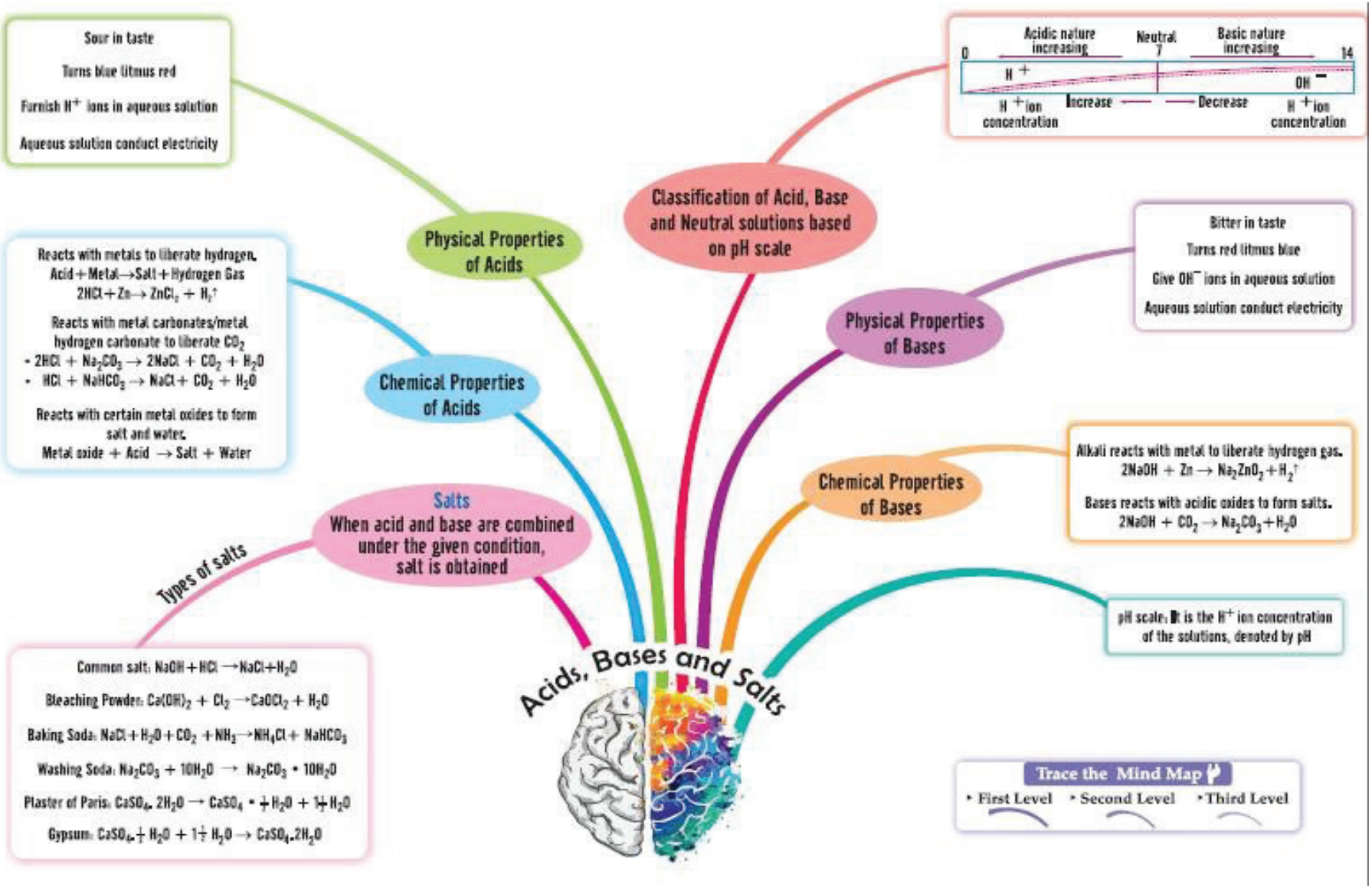
Aims of Education:

1. **Rational Thought and Autonomy:** An individual should have the capacity of rational reasoning and sufficient knowledge to understand the world around them. An individual should be able to make an informed decision. This fundamentally requires knowledge in breadth and depth.
2. **Health and wellbeing**
3. **Democratic participation:** This requires appropriate knowledge capacities, values, and dispositions so that an individual may be oriented towards sustaining and improving the democratic functions of Indian society.
4. **Economic participation:** Education should work as an enabler for a healthy democracy as well as a healthy economy.
5. **Cultural and social participation:** Along with democracy and economy, society, and culture also play an important role in the mode of associated living. An individual should acquire capacities and a disposition to contribute meaningfully to culture.

Aims of Science:

1. **Scientific understanding of the natural and physical world:** Scientific understanding develops through scientific observations, questions, experiments, theories, laws, principles and concepts. An adequate knowledge of these is essential to build a systematic and verifiable understanding of the way the natural and physical world functions.
2. **Capacities for Scientific enquiry:** The abilities to put forth hypotheses, arguments, predictions and analyses, and to test hypotheses, evaluate situations, and draw logical conclusions, are fundamental to the learning of science. Science education must does build these skills in students systematically over the stage in school.
3. **Interdisciplinary understanding between Science and other curricular areas:** Learning in science involves understanding interlinkages across disciplines. Students would learn to inquire and learn about the world through such an indisciplinary approach.
4. **Understanding of relationship between science, technology and society:** Engaging with issues related to connections between Science, Technology and Society including the ethical aspects and implications, and appreciating the role of science place in addressing the challenges and the world is undergoing, will add to the breadth of students learning.
5. **Scientific temper:** Students will imbibe scientific values and dispositions such as honesty, integrity, scepticism, objectivity, tenacity, preservance, collaboration and cooperation, concern for life, and preservation of the environment.
6. **Creativity:** Asking good questions, formulating hypotheses and designing good experiments to test those hypotheses often require artistry and creativity. Developing such creativity and a sense of aesthetic in the pursuit of scientific understanding and exploration is very important.

CONCEPT MAPPING



Curricular Goals:

CG-1: Explores the world of matter, its interactions, and properties at the atomic level:

Competencies:

1. Describes the classification of indicators, acids & Bases, Salts
2. Investigates the nature and properties of acids, bases and different salts based on experiments, PH values
3. Describes and represents chemical interactions and changes using symbols and chemical equations.

CG-2: Explores the physical world around them and understands scientific principles and laws based on observations and analysis:

Competencies:

1. Applies the concept of P^H to explain nature of salts
2. Manipulates and analyses different characteristics of Acids, Bases and salts based on chemical properties.

CG-4: Explores interconnection between molecules of matter and environment:

Competencies:

1. Applies the effect of PH in daily life and observe the uses of different salts in daily life.
2. Analyses the causes for the change of PH of environment

CG-5: Draws linkages between scientific knowledge and knowledge across other curricular areas

Competencies: Examines a case study related to the use of science in human life from the perspective of social sciences and ethics.

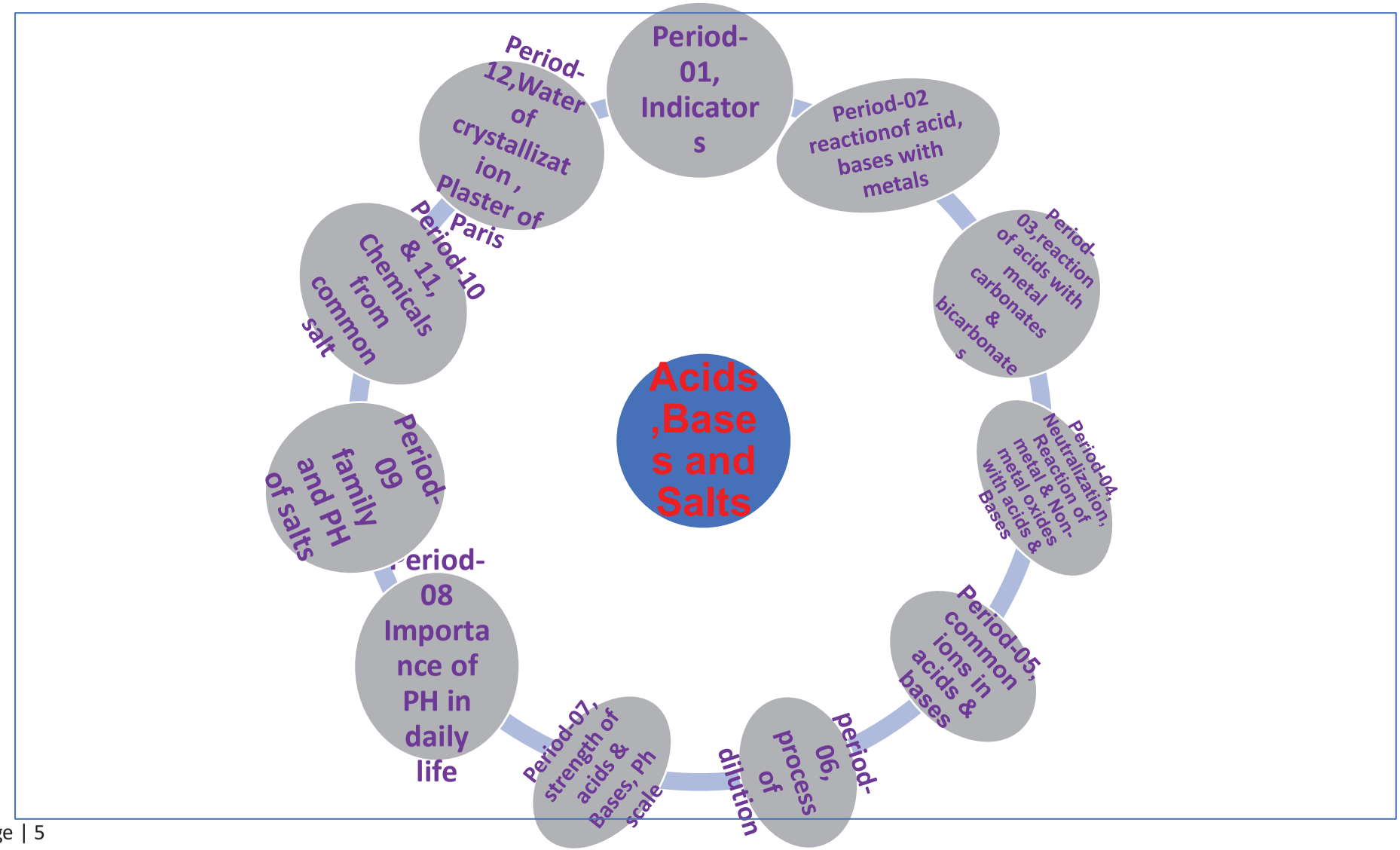
CG-8: Explores the nature of science by doing science

Competencies:

1. Develops a model to represent indicators and chemical properties of acids and bases.

2. Designs and implements a plan for scientific enquiry, formulates, draw inferences based on the data and communicate findings using scientific terminology

Period Map:



Period No	Key-concept	Learning outcomes
Period-01	Indicators, Distinguishing Acids and Bases by using indicators	1).Describes the classification of indicators. 2). Investigates the nature and properties of chemical substances based colour changes. 3).Analyses and applies different acids and bases to everyday life. 4).Develops a model of own indicator
Period-02	Reaction of Acids & Bases with metals, liberation of Hydrogen gas	1). Investigate the chemical nature of acids and bases with metals 2). Describes and represents chemical interaction and changes using symbols and chemical equations. 3). Designs and implements a plan for scientific enquiry through experiment.
Period-03	Reaction of metal carbonates & bicarbonates with acids, liberation of CO_2 gas	1). Investigate the chemical nature of acids and bases with metal carbonates & Bicarbonates 2). Describes and represents chemical interaction and changes using symbols and chemical equations. 3). Designs and implements a plan for scientific enquiry
Period-04	Neutralization reaction, Reactions of metal oxides & Non-metal oxides with acids & bases	1). Investigate the chemical nature of acids and bases 2). Describes and represents chemical interactions and changes using symbols and chemical equations. 3). Designs and implements a plan for scientific enquiry
Period-05	Common ions of acids & bases, conductivity of Aqueous acid & base solutions	1). Investigate the electrical conductivity of aqueous solutions of acids and bases 2). Describes and represents chemical interactionsand changes during electrical conductivity

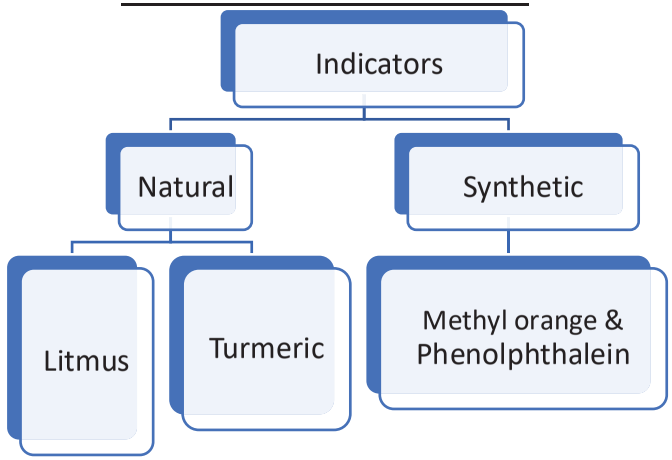
		3). Designs and implements a plan for scientific enquiry of electrical conductivity of acids and bases.
Period-06	Dilution of acids and bases, effect of dilution on concentration of the acids and bases	1). Investigate the nature and behavior of strong acids and bases. 2). Describes and represents chemical interactionsand changes during dilution. 3). Implements a plan for scientific enquiry to observe the behavior of acids and bases. → Develops the habit of careful handling of scientific instruments&hazardous Acids and bases.
Period-07	Strength of acids and bases, P^H scale & P^H values	1). Classify the acids and bases as strong & weak acids and bases based on their strength. 2). Describes the concept of P^H scale and its values 3). Draws inferences by conducting experiments using P^H paper or universal indicator
Period-08	Importance of P^H in everyday life, P^H of soil, digestive system and teeth decay	1). Describes the importance of P^H in everyday life. 2). Analyses the causes for the change of PH of environment. 3). Applies the knowledge of PH in everyday life.
Period-09	Family of different salts, PH of Salts and the nature of Salts	1). Classifies the Salts as different families 2). Analyses the characteristics of Salts 3). Applies the concept of P^H to explain nature of salts. 4). Plans and conduct experiments for scientific enquiry to verify P^H values of different salts
Period-10 & 11	Preparation of NaOH, $CaOCl_2$, $Na_2CO_3.10\ H_2O$, $NaHCO_3$ and their uses.	1). Explains the preparation of Compound from common salt 2). Describes and represents chemical interactions and changes using symbols and chemical equations 3). Applies the knowledge of uses of salts in our daily life 4). Examines a case study related to the use of science in human life from the perspective of social sciences (Dandy Marche).

Period-12	Water of crystallization, Plaster of Paris, Gypsum and their uses.	1). Describes the process of water of crystallization 2). Analyses the importance of water in the formation of crystal salts 3). Describes and represents chemical interactions and changes using symbols and chemical equations.

Period Plan-1

Class: 10TH CLASS
Chapter: Acids, Bases and Salts
Total no. of periods: 12
Period number:01
Key concepts: Indicators, Distinguishing Acids and Bases by using indicators

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1).Describes the classification of indicators. 2). Investigates the nature and properties of chemical substances based colour changes. 3).Analyses and applies different acids and bases to everyday life. 4).Develops a model of own indicator	1). What is the taste of lemon juice? 2). What is the taste of detergent or soap solution? 3). How do you feel when you touch soap or detergent? 4) What will happen, when you put your hands in lemon juice more times? Yes, acids and bases are substances which give sour and bitter taste and are corrosive in nature.	1). Name the acids present in the following compounds. (a). Orange, (b). Curd, (c). Apple, (d).Ant sting.	https://byjus.co Byju's content and e-patasala

	By giving samples of lemon juice and shampoo solution, ask the students to distinguish them without touching and tasting. 6). Which substance is used to distinguish acids and bases without tasting? **Introduction of Indicators:**  **Activity-2.1:** Teacher demonstrates the activity -2.1 of colour changes of different samples of acids and bases with the use of litmus papers, phenolphthalein and methyl orange indicators, and ask the students to complete the following table by indicating colour changes.	2). You have been provided with three test tubes. One of them contains distilled water and the other two contain an acidic solution and a basic solution, respectively. If you are given only red litmus paper, how will you identify the contents of each test tube? 3). Complete the following table **Sample name** / **Red litmus** / **Blue litmus** / **Phenolphthalein** / **Methyl orange**	https://diksha.gov.in/play/collection/do_3130736097955840011903?contentId=do_313092945301282816111 77 https://diksha.gov.in

Sample solution	Red litmus solution	Blue litmus solution	Phenolphthalein	Methyl orange
HCl				
H_2SO_4				
CH_3COOH				
HNO_3				
NaOH				
KOH				
$Mg(OH)_2$				
NH_4OH				
Lemon juice				
Soap solution				

Floor cleaner				
Mango juice				
Blood				
Tap water				

/play/collection/do_3130736097955840011903?contentId=do_313093716620353536116 19

Activity-2.2:

Teacher asks the two students of the class to perform activity-2.2 on their own and ask other students to observe the odour changes and note down.

7). Do the cloth strips have onion odour?

8). Do you observe any odour change of cloth strips by adding dil HCl followed by water wash?

4). Write few examples for olfactory indicators.

5) Name the indicators used by blind people.

6) When a sample of NaOH solution is tested with the following indicators,

$HCl, H_2SO_4, CH_3COOH, HNO_3, NaOH, KOH, Mg(OH)_2, NH_4OH$ solutions and Red & Blue litmus papers, Methyl

<table>
<tr>
<td></td>
<td>9). Do you observe any odour change of cloth strips by adding aq. NaOH solution followed by water wash?

Repeat the same experiment with clove oil and vanilla essence.

10). Will you achieve the same results with clove oil and vanilla essence as like onions?

11). Can we say that these substances act as olfactory indicators to identify acids and bases?

12). Is olfactory indicator a natural indicator?

Based on the observations of the above activities Teacher explains that indicators give the idea whether a substance is acidic or basic by change in colour or odour.</td>
<td>note down the colour and odour changes in the table.

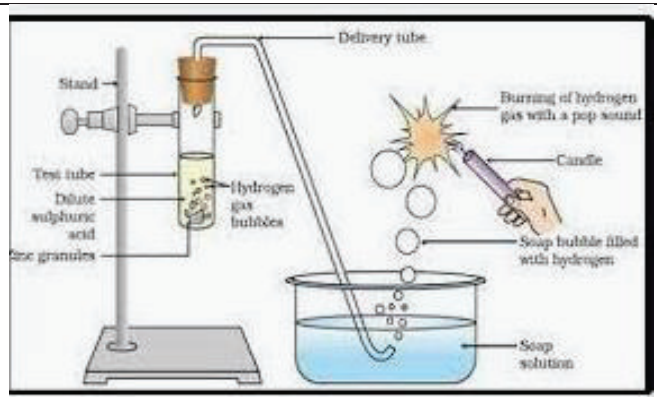
<table>
<tr><th>Name of the indicator</th><th>Colour change(YES/NO)</th><th>Odour change(YES/NO)</th></tr>
<tr><td>Methyl orange</td><td></td><td></td></tr>
<tr><td>Phenolphthalein</td><td></td><td></td></tr>
<tr><td>Turmeric</td><td></td><td></td></tr>
<tr><td>Litmus</td><td></td><td></td></tr>
<tr><td>Onion</td><td></td><td></td></tr>
<tr><td>Clove oil</td><td></td><td></td></tr>
<tr><td>Vanilla essence</td><td></td><td></td></tr>
</table>
</td>
<td>orange & Phenolphthalein indicators.

Chopped onions, cotton strips, Acid (HCl or H_2SO_4), Base.</td>
</tr>
<tr>
<td colspan="4">Teachers’ reflections and experiences:1) Students differentiates acids and bases
2)Students identifies acids and bases using indicators</td>
</tr>
</table>

Period Plan-2

Class: 10TH CLASS
Chapter: Acids, Bases and Salts
Total no. of periods: 12
Period number:02
Key concepts: Reaction of Acids & Bases with metals, liberation of Hydrogen gas

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Investigate the chemical nature of acids and bases 2). Describes and represents chemical interaction and changes using symbols and chemical equations. 3). Designs and implements a plan for scientific enquiry → Accurately uses scientific instruments	1). Why pickles get blacked when stored in metal vessels? 2). Give reasons for colour change of apple when cut with knife To answer the above questions we do an activity of the reaction of metal with dil Acids & Bases. **Activity-2.3:** Teacher demonstrates the activity-2.3 and asks the students to record observations. Teacher discuss the results of experiment by asking the following questions.	1. Why should curd and sour substances not be kept in brass and copper vessels?	Dilute HCl solution, NaOH solution, Zinc granules, soap solution, Boiling test tube, one holed rubber cork, delivery tube, beaker or trough, iron stand, candle, match box and burner

→Draws inferences based on the data →Communicate findings using scientific terminology	 3). What do you observe on the surface of Zinc granules? 4). How can you infer gas released in the experiment? 5). What do you observe when a burning candle kept near gas filled bubbles? 6). Are the observations same or different when sulphuric acid is replaced with other acids? From the answers of the above questions, teacher generalizes that most of the acids when react with metals to liberate hydrogen gas which burns with pop-up sound.	2. Which gas is usually liberated when an acid reacts with a metal? Illustrate with an example. How will you test for the presence of this gas? 3) What is the type of reaction of acid with metal? 4). Why hydrogen gas rises up from the soap water? 5). Do all metals liberate H_2 gas with acids?	**Reaction of metal with acid link** https://youtu.be/vN9elcU-9QI https://youtu.be/9bdqOWMUD8U https://youtu.be/MHRl0jG-RII

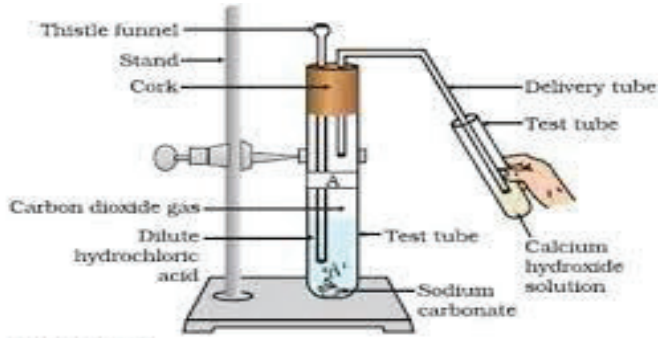
	Activity-2.4: Place a few pieces of granulated zinc metal in a test tube. Add 2 ml of sodium hydroxide solution and warm the contents of the test tube. Repeat the rest of the steps as in Activity 2.3 and record your observations. The reaction that takes place can be written as follows. **Alkali+ Metal→Salt + Hydrogen gas** **$2NaOH(aq)+Zn(s) \rightarrow Na_2ZnO_2(s) + H_2(g)$** **(Sodium zincate)** Teacher clarify that hydrogen is formed in the reaction. But such reactions are not possible with all metals------clarified by teacher with suitable examples like Zinc Hydroxide does not liberate hydrogen gas with metals like Iron, manganese …..etc.	6). Do all Bases react with metals to liberate H_2 gas? 7). **(A)Assertion:** Copper Hydroxide does not liberate hydrogen gas with Zinc. **(B)Reason:**Copper Hydroxide is a weak base. (a). Both (A) & (B) are correct, (b). Both (A) & (B) are incorrect, (c). (A) is correct, (B) is incorrect, (d). (A) is incorrect, (B) is correct 8). Write word equations and then balanced equations for the reaction taking place when – (a) Dilute sulphuric acid reacts with zinc granules. (b) Dilute hydrochloric acid reacts with magnesium ribbon. (c) Dilute sulphuric acid reacts with Aluminum powder. (d) Dilute hydrochloric acid reacts with iron filings.	https://youtu.be/afXPkSE0KNM https://youtu.be/BVt-Kwh30cg https://diksha.gov.in/play/collection/do_31307360

			9795584000 11903?conte ntId=do_313 0994077856 481281544 https://diksh a.gov.in/play /collection/d o_31307360 9795584000 11903?conte ntId=do_313 0994081939 619841552
Teachers' reflections and experiences:1)Students understands reactions of acids and bases with metals 2)Students identifies the difference in products formed with different reactants			

Period Plan-3

Class: 10TH CLASS
Chapter: Acids, Bases and Salts
Total no. of periods: 12
Period number:03
Key concepts: Reaction of metal carbonates & bicarbonates with acids, liberation of CO_2 gas

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Investigate the chemical nature of acids and bases 2). Describes and represents chemical interaction and changes using symbols and chemical equations. 3). Designs and implements a plan for scientific enquiry → Accurately uses scientific instruments →Draws inferences based on the data	1). How do acids react with metals? 2). Name the gas liberated when strong base reacts with metal. 3). Write the name of the substances present in egg shell, marble and chalk piece. 4). Why colour of Tajmahal changes now-a-days? Teacher explains that this is due to the metal carbonates & bicarbonates present in the above compounds react with acids responsible for the above changes observed. **Activity-2.5:** Teacher demonstrates the activity-2.5 and asks the students to record observations.	1). A solution reacts with crushed egg-shells to give a gas that turns lime-water milky. The solution contains (a) NaCl,(b).HCl (c). LiCl, (d) KCl	Byju's content and e-patasala Dilute HCl solution, Sodium carbonate, Sodium bicarbonate, two Boiling

→Communicate findings using scientific terminology 4). Differentiate the nature of gases liberated based on the chemical nature.	Teacher discusses the results of experiment by asking the following questions.  *Figure 2.2* *Passing carbon dioxide gas through calcium hydroxide solution* 5). What do you observe when HCl solution is added to Sodium carbonate? 6). Name the gas liberated which turns lime water milky 7). What happens if we pass excess CO_2 gas through lime water? 8). Are the results same when metal bicarbonates react with acids?	2). Metal compound **A** reacts with dilute hydrochloric acid to produce effervescence. The gas evolved extinguishes a burning candle. (a). Write a balanced chemical equation for the reaction if one of the compounds formed is calcium chloride. (b). What is the chemical name of compound **A** 3). Write three forms of Calcium carbonate in our daily life.	test tubes, one holed rubber cork, delivery tube, iron stand, lime water, 10 ml test tubes and burner Reaction of Metal carbonates& bicarbonates with acids link https://youtu.be/CkEyhwdfP7I https://diksha.gov.in/play/collection/do_31307360

	From the answers of the above questions teacher generalized that the reaction of metal carbonates & bicarbonates with the acids liberate Carbon dioxide gas which turns lime water milky, if passes in excess milky white disappears due to the formation of Calcium bicarbonate. Teacher quotes the all relevant balanced chemical equations and ask the student s to practice.		9795584000 11903?conte ntId=do_313 0994034380 881921541
Teachers' reflections and experiences:1)Students differentiates reaction products with carbonates and bicarbonates 2)Students identifies the gases released in two reactions.			

Period Plan-4

Class: 10 TH CLASS
Chapter: Acids, Bases and Salts
Total no. of periods: 12
Period number:04
Key concepts: Neutralization reaction, Reactions of metal oxides & Non-metal oxides with acids & bases

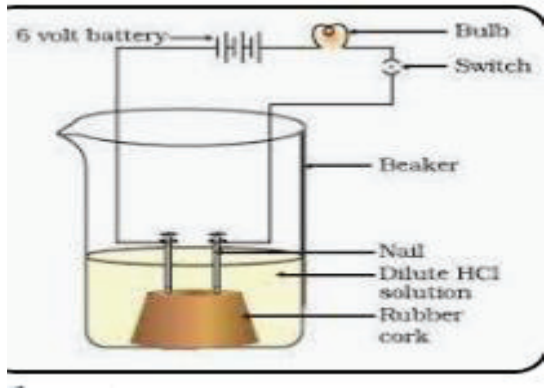
Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Investigate the chemical nature of acids and bases 2). Describes and represents chemical interactions and changes using symbols and chemical equations. 3). Designs and implements a plan for scientific enquiry → Accurately handle scientific instruments & Acids and bases	1) What is the nature of the compound present in Antacid tablet? 2) What happens in stomach while consuming Antacid tablet? 3) Can you name the reaction takes place in stomach after consuming antacid tablet? **Activity-2.6:** Teacher performs the activity-2.6 and asks the students to record observations. Teacher explains neutralization reaction by asking the following questions. 1). What is the colour of the aqueous NaOH solution when phenolphthalein added?	1). Is neutralization reaction considered as a double displacement reaction? 2). Why brass and bronze vessels washed with Pithambari powder?	Byju's content and e-patasala -->>> Link https://youtu.be/1TMxDlfPWC4

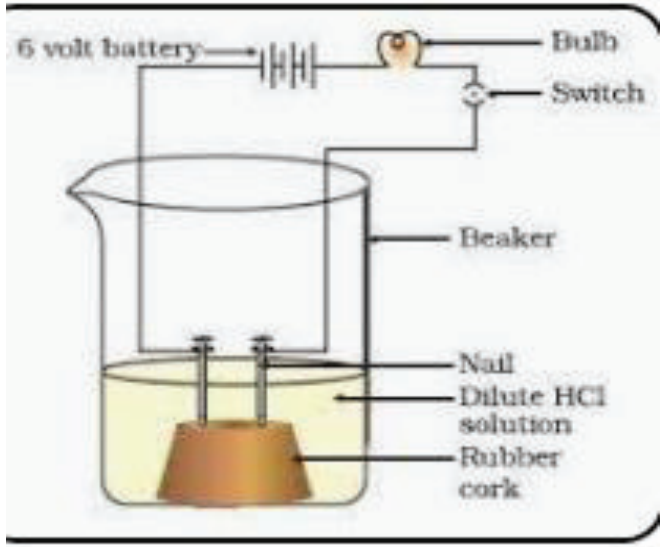
→Draws inferences based on the data →Communicate findings using scientific terminology .	2). Is there any colour change when adding dilute HCl to the above NaOH solution? 3). Why did the colour of Solution changes after addition of acid? 4). Does the pink colour of phenolphthalein reappear while adding excess NaOH solution? 5). Why this has happened? Explain. From the answers of the above questions teacher explains the neutralization reaction and give more examples. 1). Cleaning of metal articles with lemon or tamarind 2). Rubbing the ant or bee sting place with tooth paste or lime. And other relevant examples **Activity-2.7:** Teacher performs the activity-2.7 and asks the students to observe. Teacher discusses the observations of the activity -2.7 with the	3). Write the nature of metal oxides and Non-metal oxides.	Dilute NaOH solution, Phenolphthalein, dilute HCl solution, test tube and dropper. https://diksha.gov.in/play/collection/do_3130736097955840001190 3?contentId=do_3130838005057126401927 Study of properties of acid and basis link:

	students and clarifies the concept of the reaction of metal oxide with acid. 1). Write the colour of Copper oxide. 2). What is the colour of copper oxide after adding dilute hydrochloric acid? 3). Why colour change occurred? 4). Write the balanced chemical equation and names of the products formed. **2.1.6 Reaction of a non-metallic oxide with Base:** With Reference to Activity-2.5, teacher explains the concept of the reaction of Non-metal oxide with base.	4). What is the type of chemical reaction occurred when copper oxide reacts with dilute HCl? Explain 5). Complete the following equations (a). $Mg(OH)_2+H_2SO_4$→----------+---------- (b). ZnO+2HCl→--------+---------- (c). $Ca(OH)_2+CO_2$→----------+----------	https://diksha.gov.in/play/collection/do_3130736097955840001190 3?contentId=do_3131551029465661441137 Copper oxide, dilute HCl, test tubes and dropper
Teachers' reflections and experiences: 1)Students defines neutralization reaction 2)Students differentiates metal oxides and non-metal oxides			

Period Plan-5

Class: 10TH CLASS
Chapter: Acids, Bases and Salts
Total no. of periods: 12
Period number:05
Key concepts: Common ions of acids & bases, conductivity of Aqueous acid & base solutions

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Investigate the electrical conductivity of aqueous solutions of acids and bases 2). Describes and represents chemical interactionsand changes during electrical conductivity 3). Designs and implements a plan for scientific enquiry of electrical conductivity of acids and bases.	1).Which gas liberated when acids react with metal? 2). Why all acids liberate hydrogen gas with metals? 3). Which element is in common in all acids? 4). What are conductors? 5). What are insulators? 6). How salt water conducts electricity? 7). Do Acids and bases conduct electricity? **Activity-2.8:** Teacher performs the activity-2.8to test the conductivity of acids and bases. Then asks the students to observe the intensity of the bulb for		Battery, bulb, switch, beakers, connecting wires, iron nails, rubber cork, dil HCl , dil H2SO4, dil CH3COOH, NaOH, KOH Or Chart

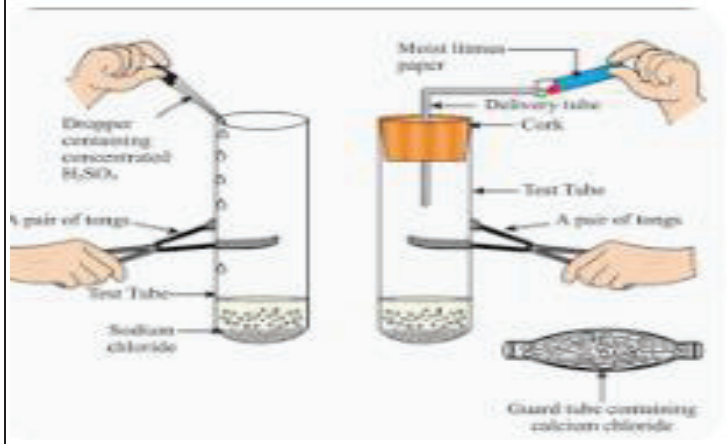
→ Accurately handle scientific instruments& Acids and bases →Draws inferences based on the data →Communicate findings using scientific terminology	different solutions of acids & bases and complete the following table.  Sample solution / Bulb glow (Yes/No) Aq HCl solution Aq H_2SO_4 solution Aq CH_3COOH solution Aq Glucose solution Aq alcohol solution Aq NaOH solution Aq KOH solution	1). From the above diagram, choose the true statement from the following (a). Bulb glow because HCl is a strong acid and furnishes ions for conduction. (b). Bulb will not glow because electrolyte is not basic. (c). Bulb will not glow because circuit is incomplete. (d). Bulb will not glow because it depends on the type of electrolytic solution. 2). Why does distilled water not conduct electricity whereas rain water does? 3). Name the cations and anions present in the following acids and bases. (a) HCl, (b) H_2SO_4,(c) CH_3COOH, (d) NaOH, (e) KOH, (f) NH_4OH 4). Give the reasons for the following	Conductivity of acids & Bases link https://youtu.be/4_IkSB9pYw4 Why does distilled water not conduct electricity link https://youtu.be/MQ49cUP14O4

	1). Why the bulb glow in case of dil HCl or dil H_2SO_4? 2). Why the bulb does not glow in case of Glucose or Alcohol solutions? 3).Why Glucose or alcohol does not liberate H^+ ion even though they have hydrogen? By discussing the above questions with students, Teacher makes the learners to understand why aqueous solutions of some acids & bases conduct electricity and why not other compounds (Glucose & alcohol).	(a) High intensity of bulb glow in the case of dil HCl or H_2SO_4 or NaOH (b) Low intensity of bulb glow in the case of dil CH_3COOH or NH_4OH.	
Teachers' reflections and experiences:1)Students identifies common ions of acids & bases, 2)Students understands conductivity of aqueous acid & base solutions			

Period Plan-6

Class: 10TH CLASS
Chapter: Acids, Bases and Salts
Total no. of periods: 12
Period number:06
Key concepts: Dilution of acids and bases, effect of dilution on concentration of the acids and bases

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Investigate the nature and behavior of strong acids and bases. 2). Describes and represents chemical interactions and changes during dilution. 3). Implements a plan for scientific enquiry to observe the behavior of acids and bases. → Develops the habit of careful handling of scientific	1).Which ions are common in all bases? 2). Which ions are common in all acids? 3).When do acids and bases produce ions? 4). Do acids or bases produce ions in pure state? **Activity-2.9:** Teacher performs the activity-2.9,to understand the presence of water or moisture is necessary for the ionization of acids and bases. Ask the students to observe and record the colour changes of litmus paper.	1). What do you infer about the acidic character of (a) dry HCl gas and (b) aq HCl solution. 2) Name the ions formed in the following chemical reactions (a). HCl added to water, (b). NaOH added to water	Solid NaCl, dry test tubes, Concentrated H_2SO_4, water, dry blue litmus paper and wet blue litmus paper or chart Why do acids not show acidic

instruments & hazardous Acids and bases →Draws inferences based on the data →Communicate findings using scientific terminology	 1) What do you observe when concentrated sulphuric acid is added to solid Sodium chloride? 2) Is there a gas coming out of the delivery tube? If liberated, Can you name the liberated gas? 3) Does the liberated gas change the colour of the dry litmus paper or wet litmus paper? 4) Why wet litmus paper changes its colour with liberated gas? But why not with dry litmus paper?	3). Why do acids not show acidic behavior in the absence of water? 4). **(A). ASSERTION:** All alkalis are strong bases. **(B) REASON**: Alkalis are the bases that are completely soluble in water. (a). Both (A) & (B) are correct (b). Both (A) & (B) are incorrect (c). (A) is correct & (B) is incorrect (d). (A) is incorrect & (B) is correct 1). While diluting an acid, why is it recommended that the acid should	behavior link: https://youtu.be/V4xcRuM29-k

	By the discussion of the above questions with learners from the activity teacher explains water or moisture is necessary for the ionization of acids or bases. And ask the students to practice the related chemical equations. **Activity-2.10:** Teacher demonstrates the activity -2.10, to explain the dilution process, relates it with heat energy and concentration changes. 1). Is there a change in temperature while adding concentrated H_2SO_4 to excess of water? 2). Is the dilution of acid exothermic or endothermic? 3). Is the same reaction takes place with the dilution of NaOH pellets? 4). How is the concentration of **H_3O^+ or OH^-** ions effected when an acid or a base is diluted?	be added to water and not water to the acid?  2). The above warning sign indicates the ----------nature of an acid or a base. (a). corrosive, (b). Poisonous, (c). Eco-friendly, (d). None	Water ,beakers, concentrated H_2SO_4, NaOH pallets https://diksha.gov.in/play/collection/do_3130736097955840001190 3?contentId=do_3130851925305589761171 4

	Precaution: **1). Always add acid to water not water to acid.** **2). Handle the hazardous acids and bases carefully.**	3). Which of the following phenomena occur, when small amount of an acid is added to water? (i). Ionization, (ii) Neutralization, (iii). Dilution, (iv). Salt formation. (a). (i) & (ii) (b). (i) & (iii) (c). (ii) & (iii) (d). (ii) & (iv)	
Teacher's reflections and experiences: 1)Students understand the difference between concentrated and dilute solutions 2)Students can explain how to dilute a solution to get the desirable concentration.			

Period Plan-7

Class: 10TH CLASS
Chapter: Acids, Bases and Salts
Total no. of periods: 12
Period number:07
Key concepts: Strength of acids and bases, P^H scale & P^H values

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Classify the acids and bases as strong & weak acids and bases based on their strength. 2). Describes the concept of P^H scale and its values 3). Draws inferences by conducting experiments using P^H paper or universal indicator	1). What we use to distinguish an acid or a base? 2). Which ions are responsible for acidic nature? 3). Which ions are responsible for the basic nature? **Activity:** Pour few drops of concentrated Sulphuric acid on one paper strip and pour few drops of lemon/orange juice on another paper strip. Ask the learners to observe **(Note: Teacher should instruct the learners to handle acids carefully as they are hazardous and harmful)** 4). Why paper strip with concentrated H_2SO_4 burnt?		Concentrated H_2SO_4, Lemon/orange juice, dropper, paper strips. P^H determination links https://diksha.gov.in/play/collection/d

	5) Why paper strip does not burn with lemon/orange juice? 6). Do you observe any difference in the effect of H_2SO_4 and lemon/orange juice on the paper/ 7). Which property of the H_2SO_4 and lemon/orange is responsible for the different effect on the paper? 8). How can we define a strong acid or a strong base? 9). How can you define a weak acid or a weak base? 10). Is there any relation between the strength of an acid or a base and the concentration of the ions(H^+/OH^-)? 10). How can you measure H^+/OH^- ions present in solutions of an acid /a base respectively? 11). Is there any method to measure number of H^+/OH^- ions in solution? By discussing the above questions, Teacher introduces and explains the concept of P^H scale and P^H values.	1). Complete the following table **Sample name** / **PH (<7 or ,>7,or =7)** Vinegar Battery acid Household Ammonia Gastric juice Tap water Tooth paste Distilled water	o_313073609795584000119 03?contentId=do_3131544156603351041102 1 https://diksha.gov.in/play/collection/do_313073609795584000119 03?contentId=do_3131545861803540481177 5 P^H Scale:

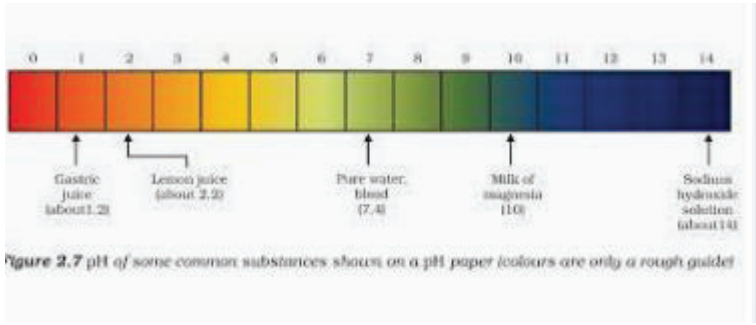


Figure 2.7 pH of some common substances shown on a pH paper (colours are only a rough guide)

P^H values(from 1 to 14)

Acid	**P^H<7**
Base	**P^H>7**
Neutral	**P^H=7**

Dear students

12). How do we test the PH of acid, base and neutral solutions in the lab?

With the above question teacher introduces universal indicator and P^H papers.

Activity-2.11:

Teacher make the class in to 10 groups, provide different samples(one sample to each group) to

2). Do basic solutions also have H+ (aq) ions? If yes, then why are these basic?

3). A solution turns red litmus blue, its pH is likely to be (a) 1 (b) 4 (c) 5 (d) 10

4). You have two solutions, A and B. The pH of solution A is 6 and pH of solution B is 8. Which solution has more hydrogen ion concentration? Which of this is acidic and which one is basic?

5). Five solutions A,B,C,D and E when tested with universal indicator showed pH as 4,1,11,7 and 9, respectively. Which solution is
(a) neutral?
(b) Strongly alkaline?
(c) Strongly acidic?
(d) Weakly acidic?
(e) Weakly alkaline?

https://diksha.gov.in/play/collection/do_3130736097952235521178 3?contentId=do_3136435146052485121226 3

P^H scale explanation link: https://youtu.be/L9V2fV8xri4

→link

10 groups and ask to test the samples with P^H paper/Universal indicator the colour changes and note down the P^H values by using Universal indicator /p^H paper and enter the observations in the following table.

Solution	Colour of PH paper/universal indicator	Approximate P^H value	Nature of substance
Saliva(before meal)			
Saliva(after meal)			
Lemon juice			
Colorless aerated drink			
Carrot juice			
Coffee			
Tomato juice			
Tap water			
1M NaOH			
1M HCl			

6).Arrange the pH in increasing order of hydrogen-ion concentration. 10. Equal lengths of magnesium ribbons are taken in test tubes A and B. Hydrochloric acid (HCl) is added to test tube A, while acetic acid (CH_3COOH) is added to test tube B. Amount and concentration taken for both the acids are same. In which test tube will the fizzing occur more vigorously and why?

https://youtu.be/HJtJs5bh3Qc

→Link https://youtu.be/0hfU83hnxIk

Saliva(before meal), Saliva(after meal), Lemon juice, Colorless aerated drink, Carrot juice, Coffee,

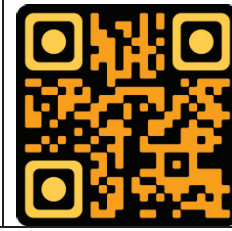
	From the table 13). What are the samples that show $_P$H values less than 3? 14). What are the samples that show $_P$H values more than 4? 15). Do you observe any colour difference of the above solutions 16). Can you relate the P^H values with the concentration of H^+/OH^- ions and the strength of acids/bases. From the answers of the above questions teacher conclude that P^H is inversely proportional to H^+ ion concentration.		Tomato juice, Tap water, 1M NaOH, 1M HCl, Colour of PH paper/universal indicator
Teachers' reflections and experiences:1)Students understands Strength of acids and bases from P^H scale 2)Students differentiates acids, bases and neutral substances based on P^H values			

Period plan-8

Class: 10 TH CLASS
Chapter: Acids, Bases and Salts
Total no. of periods: 12
Period number:08
Key concepts: Importance of P^H in everyday life, P^H of soil, digestive system and teeth decay

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Describes the importance of PH in everyday life 2). Analyses the causes for the change of PH of environment 3). Applies the knowledge of PH in everyday life	1). Why the colour of old monuments changes now-a-days? 2). Why we rub with tooth paste but not with NaOH, When bee stings us? 3). What happens to ours skin, when exposed to slaked lime for long time? 4). What is the P^H of gastric juice? 5). What is the P^H of stomach after consuming ant-acid tablet? 6). Why some people teeth are sensitive towards some fruit juices or cold food?		

	With the answers of the above questions, teacher discusses the importance of $_{P}H$ in daily life and environment and **Explains 2.3.1** **Applications of $_{P}H$:** (i). Plants and Animals are P^{H} sensitive (ii). P^{H} of the soil (iii). Tooth decay (iv). Digestive system (v). self defense Animals and plants by through chemical warfare. 1). What is the survival P^{H} range of living organisms? 2). Write the PH value of acid rain. **Activity-2.12:** Teacher demonstrates the activity-2.12, to find the P^{H} of given soil and ask the students to find out the PH of different soils around them. 3). What is the ideal soil P^{H} for the healthy growth of plants in your region?	1). Match the following **Column-A** **Column-B** (i). Acid rain (a). **$_{P}H$** <5.5 (ii).Digestive system (b). **$_{P}H$** =5.6 (iii). Tooth decay (c). **$_{P}H$** =7 (iv). Ideal soil (d). **$_{P}H$** <1.5 2). Under what soil condition do you think a farmer would treat the soil of his fields with quick lime (calcium oxide) or slaked lime (calcium hydroxide) or chalk (calcium carbonate)? 3). Which one of the following types of medicines is used for treating indigestion? (a) Antibiotic (b) Analgesic (c) Antacid (d) Antiseptic	Effect of P^{H} in digestive system link: https://youtu.be/VWTG6GLrl-A . Different soil samples, water, funnel, test tubes and P^{H}

	4). How the P^H of soil changes? 5). What is acidity? How it could affect the digestive system? 6). What is the name of the substance used to neutralize excess acid in our stomach? 7). When tooth decay occurs? 8). Name the acid released when bee sting us.	4). Fresh milk has a p^H of 6. How do you think the P^H will change as it turns into curd? Explain your answer. 5). A milkman adds a very small amount of baking soda to fresh milk. (a) Why does he shift the P^H of the fresh milk from 6 to slightly alkaline? (b) Why does this milk take a long time to set as curd? 6). Write any two domestic substances used as ant-acids. 7) What is the nature of the following plants (a). Nettle plant, (b). Dock plant	papers/universal indicator →links https://youtu.be/SwnmN_cznt4  https://youtu.be/Kiay9D0zyf4 
Teachers' reflections and experiences:1) Students understands Importance of P^H in everyday life. 2)Students investigates P^H of soil, digestive system and teeth decay.			

Period Plan-9

Class: 10TH CLASS
Chapter: Acids, Bases and Salts
Total no. of periods: 12
Period number:09
Key concepts: Family of different salts, PH of Salts and the nature of Salts

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Classifies the Salts as different families 2). Analyses the characteristics of Salts 3). Applies the concept of P^H to explain nature of salts. 4). Plans and conduct experiments for scientific enquiry to verify P^H values of different salts	1). What is neutralization reaction? 2). Write the products of neutralization? 3). Complete the following word equations. (a). Acid + Metal→----------+---------- (b). Base + Metal→----------+---------- (c). Acid + Metal carbonate→--------+-------+------- (d). Base + Non-metal oxide→-------+------- 4). What is the common product in all the above equations? By discussion of the above questions and answers, teacher introduces the topic of salts and explains the concept of salts.	1). (i). Classify the following salts into different families. (a). Calcium carbonate, (b). Magnesium chloride, (c). Zinc sulphate, (d). Aluminum sulphate, (e). Ferric chloride, (f). Ammonium carbonate. (ii). Similarly write the examples for cation family salts. (Potassium family, Calcium family and	Potassium sulphate, Calcium sulphate, copper

	Activity-2.13: Divide the class into 3 groups; ask them to perform the activity-2.13. **Group** / **Salts allotted** Group-A: Potassium sulphate, Calcium sulphate, copper sulphate, Magnesium sulphate Group-B: Sodium chloride, Ammonium chloride, Calcium Chloride Group-C: Sodium carbonate, Sodium nitrate, sodium sulphate Make them to get the clarity on the concept by asking the following questions. 1). Write down the chemical formulae of the given salts. 2). Identify the cation and anion present in the given salts.	Aluminum family (2 salts for each family)).	sulphate, Magnesium sulphate, Sodium chloride, Ammonium chloride, Calcium Chloride, Sodium carbonate, Sodium nitrate, sodium sulphate .

	3). Do you find any common cation or common anion in given salts? 4). Identify the acids and bases from which the given salts are formed. 5). What we call the above given salts with the common cation or anion? From the above activity and discussion, teacher concludes that the family of different salts and explains the acids and bases from which the salts are formed. **Activity-2.14:** Teacher performs the activity -2.14 to test the P^H of different salts and explains the nature of different salts based on P^H values. And asks the students to record observations in the following table	2). Complete the following table and compare the nature of given salts. **Salt name** | **P^H(<7, =7, >7)** | **Acid used** | **Base used** Potassium chloride | | | Sodium acetate | | | Barium nitrate | | | 3). Write the common and chemical names of the following salts. (i). NaCl (ii). $Na_2CO_3.10H_2O$ (iii). $NaHCO_3$ 4). Justify the statement "all salts are not neutral".	Sodium chloride, Potassium nitrate, Zinc sulphate, Sodium bicarbonate, P^H papers, test tubes and DM water. https://diksha.gov.in/play/collection/do_31307360979558400011903?contentId=do_3131544364840878081 1796

Salt name	Solubility in DM water	Colour of P^H paper	P^H value	Nature of the salt
Sodium chloride				
Potassium nitrate				
Aluminum chloride				
Zinc sulphate				
Sodium bicarbonate				

From the above table.

1). Which of the salts are

(a). Acidic:----------

(b). Basic :----------

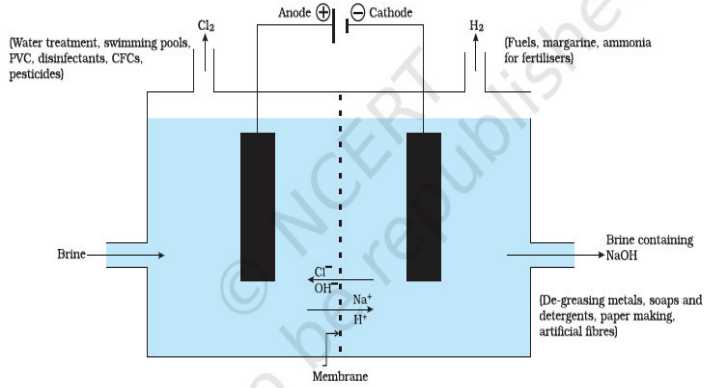
(c). Neutral:----------

Teacher's reflections and experiences: 1) Students identifies Family of different salts
2) Students understands $_P$H of Salts and the nature of Salts

Period Plan- 10 & 11

Class: 10TH CLASS
Chapter: Acids, Bases and Salts
Total no. of periods: 12
Period number:10 & 11
Key concepts: Preparation of NaOH, $CaOCl_2$, $Na_2CO_3.10\ H_2O$, $NaHCO_3$ and their uses.

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Explains the preparation of Compound from common salt 2). Describes and represents chemical interactions and changes using symbols and chemical equations 3). Applies the knowledge of uses of salts in our daily life 4). Examines a case study related to the use of science in	1). What is the name of the salt used in food stuff? 2). What is the chemical name of the table salt or common salt? 3). How is common salt prepared? 4). Is the salt extracted from the sea beds consumable directly? 5). How the common salt extracted from rock salt? With these questions, teacher introduces the common salt extraction, importance of table salt in freedom struggle and how the chemicals are prepared from common salt.	1). What is the common name of the compound $CaOCl_2$? 2). Name the substance which on treatment with chlorine yields bleaching powder.	

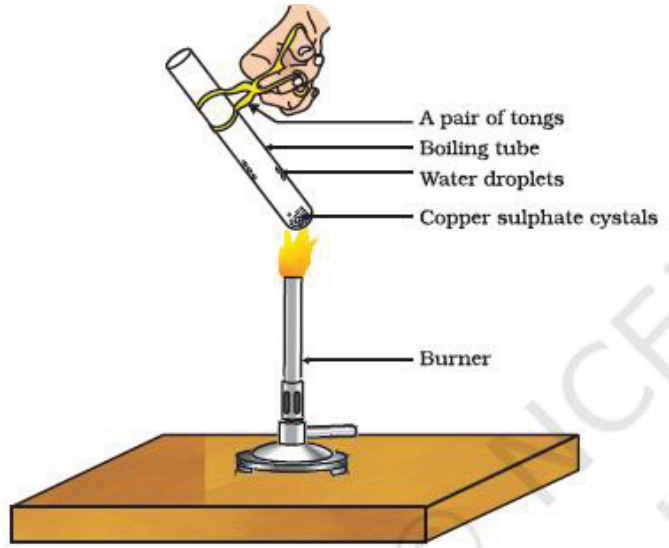
human life from the perspective of social sciences.	**By explaining the concepts in 2.4.3 (From text book, page no: 30 to 32).** **<u>Topics to be covered:</u>** ➔ **Chlor-alkali process (Preparation of NaOH, H_2& Cl_2)**  ***Figure 2.8** Important products from the chlor-alkali process* ➔ **Preparation & uses of Bleaching powder** ➔ **Preparation & uses of baking soda and Washing soda.**	3). Name the sodium compound which is used for softening hard water 4). What will happen if a solution of sodium hydrogen carbonate is heated? Give the equation of the reaction involved. 5) Match the following **COLUMN-A** **COLUMN-B** (i). Caustic soda (a).Na2CO3 (ii). Baking soda (b).NaOH (iii). Washing Soda (c).CaOCl2 (iv). Bleaching powder (d).NaHCO3 6). Why cake or bread become soft and spongy while heating with baking powder? 7). Write the difference between Baking powder and Baking soda. 8). Name the substances used in the following.	https://diksha.gov.in/play/collection/do_31307360979558400011903?contentId=do_3132565092383703041300007 Uses of Na_2CO_3 & $NaHCO_3$ link https://youtu.be/ySoE5sZmm_U

		(a). In removal of permanent hardness of water---------- (b). In antacid and soda acid fire extinguisher---------- (c). An oxidizing agent in chemical reactions------	
Teacher's reflections and experiences:1) Students understands Preparation of NaOH, $CaOCl_2$, $Na_2CO_3.10\ H_2O$, $NaHCO_3$. 2) Students gives the uses of the bleaching powder, baking soda, washing soda.			

Period Plan-12

Class: 10TH CLASS
Chapter: Acids, Bases and Salts
Total no. of periods: 12
Period number:12
Key concepts: Water of crystallization, Plaster of Paris, Gypsum and their uses.

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Describes the process of water of crystallization 2). Analyses the importance of water in the formation of crystal salts 3). Describes and represents chemical interactions and changes using symbols and chemical equations.	By showing Copper sulphate crystals , teacher asks the following questions 1).What is the colour of the Copper sulphate crystals? 2). Are copper sulphate crystals dry or wet? 3). Do you think that Any water present in the crystals? For giving answers to the above questions, let us do the activity-2.15. **Activity-2.15:** Teacher performs or asks the students to perform the activity-2.15 and asks them to note down the observations.	1). Why the colour of copper sulphate reappears after adding water drops?	Copper sulphate crystals, boiling test tubes ,burner,

	 1).What is the colour of the copper sulphate after heating? 2). Do you notice water droplets in the boiling tube? Where have these come from? 3). What do you observe after adding few drops of water? 4). Is the blue colour of copper sulphate restored?	2). What is the water of crystallization for the following substances? (a). Blue vitriol (b). Green Vitriol (c). Epsum salt (d). Plaster of Paris (e). Gypsum (f). Washing soda	test tube holder https://diksha.gov.in/play/collection/do_31307360979558400011903?contentId=do_3132217695175311361 3019 →Link https://youtu.be/VwIlIDPBZjM

	From the results of the above experiment and discussing the above questions, teacher explains the concept of (a). Water of crystallization (b). Define Hydrated salts (c). Examples of Hydrated salts: $CuSO_4.5H_2O$, $MgSO_4.7H_2O$, $Na_2CO_3.10H_2O$ (d). Examples of Anhydrous salts: $CaCl_2$, $NaHCO_3$, $MgCl_2$ **Plaster of Paris:** 1). What is the Name of the white material used in making of Ganesh idols and gift articles? By discussing the above question, teacher explains the preparation, properties and uses of plaster of Paris. **Assignment:** Asks the students to collect the information about other uses of plaster of Paris and Gypsum.	1).Plaster of Paris should be stored in a moisture-proof container. Explain why? 2). Write an equation to show the reaction between Plaster of Paris and water. 3). Write the uses of plaster of Paris in daily life.	
Teachers' reflections and experiences: 1) Students explains water of crystalisation. 2) Students identifies difference in formula.			

Chemistry Worksheets Class 10 on Chapter 2 Acids, Bases and Salts - Set 1 Q1.

Q1. The property which is not shown by acids is

a.) they have a sour taste. b.) they feel soapy. c.) they turn litmus red. d.) their pH is less than 7.

Q2. A solution reacts with zinc granules to give a gas which burns with a pop sound. The solution contains: a.) $Mg(OH)_2$ b.) Na_2CO_3 c.) NaCl d.) HCl

Q3. A solution turns red litmus blue. Its pH is likely to be: a.) 1 b.) 4 c.) 5 d.) 10

Q4. Which of the following salts does not contain water of crystallisation? a.) Blue vitriol b.) Baking soda c.) Washing soda d.) Gypsum

Q5. Bases generate ___ ions in water. a.) H – b.) H + c.) OH – d.) OH +

Q6. What is the role of tartaric acid in baking powder?

Q7. What is the chemical formula of blue vitriol?

Q8. What is the role of HCl present in the stomach?

Q9. What is the effect of dilution on an acid or base?

Q10. Explain why bases are not kept in metal containers?

Q11. State the chemical property in each case on which the following uses of baking soda are based: i.) As an antacid

ii.) As a constituent of baking powder.

Q12. What is the water of crystallisation?

Q13. Define olfactory indicators.

Q14. While diluting an acid why is it recommended that the acid should be added to water and not water to the acid?

Q15. Sea water contains many salts dissolved in it. How can the salt that we use in the food is obtained?

Q16. a.) What happens when zinc granules are heated with sodium hydroxide solution? b.) What does pH stand for? What does it indicate?

Q17. a.) What is gypsum? What happens when gypsum is heated at 100°C?

b.) What is the common name of the compound $CaOCl_2$? c.) Explain why chlorine is used for sterilising the drinking water supply?

Q18. a.) What is baking powder? How does it make the cake soft and spongy?

b.) In addition to sodium hydrogen carbonate, baking powder contains a substance X. Name the substance X. What is the role of substance X in the baking powder?

c.) State the two uses of sodium hydroxide.

Q19. a.) A knife, which is used to cut fruit, was immediately dipped into water containing drops of blue litmus solution. If the colour of the solution is changed to red, what inference can be drawn about the nature of the fruit and why?

b.) What should be done if someone accidentally touches the leaves of a nettle plant in the wild? c.) Two solutions X and Y have pH = 4 and pH = 8, respectively. Which solution will give an alkaline reaction and which one acidic?

Q20. Answer the following- a.) Compounds such as alcohol and glucose also contain hydrogen but are not categorised as acids. Why?

b.) Why do acids not show acidic behaviour in the absence of water?

c.) Why should curd and other sour foodstuffs not be kept in the metal container?

d.) Name three common indicators

Chemistry Worksheets Class 10 on Chapter 2 Acids, Bases and Salts - Set 2

Q1. Fresh milk has a pH of 6. When milk changes into curd, the pH value will:

a.) become 7

b.) become less than 6

c.) become more than 7

d.) remains unchanged

Q2. Which of the following is medicine for indigestion?

a.) sodium hydroxide

b.) manganese hydroxide

c.) magnesium hydroxide

d.) potassium hydroxide

Q3. How many number of water of crystallisation is present in copper sulphate crystals?

a.) 3

b.) 5

c.) 7

d.) None

Q4. The indicators which turn red in acid solution are:

a.) turmeric and litmus

b.) phenolphthalein and methyl orange

c.) litmus and methyl orange

d.) phenolphthalein and litmus

Q5. The salt which will give an acidic solution on dissolving in water is:

a.) KCl

b.) NH4Cl

c.) Na2CO3

d.) CH3COONa

Q6. What are the observations when quick lime is added to water?

Q7. Which indicator gives pink colour in the basic solution?

Q8. Fill in the blanks.

a.) The chemical formula of washing soda is ___.

b.) The chemical formula of sodium carbonate decahydrate is ___.

Q9. Write the formula of the calcium sulphate and identify the acid and base.

Q10. Name the acids present in the following:

I). Lemon juice

ii.) Vinegar

iii.) Vitamin C tablet

iv.) Tamarind

v.) Sour milk

Q11. What happens when carbon dioxide is passed through lime water?

Q12. How does toothpaste prevent tooth decay?

Q13. Explain how the pH change in the lake water can endanger the lives of aquatic animals. What can be done to lessen the danger to the lives of aquatic animals in the lake?

Q14. Describe how sodium hydrogen carbonate is produced on a large scale.

Q15. How would you show that blue copper sulphate crystals contain water of crystallisation?

Q16. What is the 'Chlor-alkali' process and what products are formed during the process?

Q17. a.) What happens during a bee sting? What is its remedy?

b.) What happens during a wasp sting? What is its remedy?

c.) Name any two chemical materials which can mix with the acidic soil to adjust its pH?

Q18. You are given two solutions A and B. The pH of solution A is 6 and pH of solution B is 8.

i). which solution is acidic and which is basic?

ii). which solution has more H + ion concentration?

iii). Why is HCl a stronger acid than acetic acid?

Q19. a.) A sample of bleaching powder was kept in an air-tight container. After a month, it lost some of its chlorine content. How will you account for it?

b.) A solution has a pH of 7. Explain how you would

i.) increase its pH

ii.) decrease its pH

c.) On exposure to the atmosphere, Glauber's salt loses weight while quicklime gains weight.

Q20. Answer the following questions:

a.) What is plaster of paris? Write its chemical formula.

b.) What happens when bleaching powder reacts with dilute sulphuric acid? Give an equation of the reaction involved.

c.) Give two important uses of washing sods.

d.) What will be the colour of the litmus in an aqueous solution of ammonium chloride salt?

e.) What is meant by hydrates and anhydrous salts? Explain with examples

Chemistry Worksheets Class 10 on Chapter 2 Acids, Bases and Salts - Set 3

Q1. pH scale rangers from

a.) 0 – 7

b.) 7 – 14

c.) 1 – 14

d.) 0 – 14

Q2. The indicator which undergoes change in smell are:

a.) Litmus

b.) universal indicator

c.) olfactory indicator

d.) pH

Q3. Which of the following acid is present in the stomach?

a.) Sulphuric acid

b.) Hydrochloric acid

c.) Nitric acid

d.) Carbonic acid

Q4. Sodium hydroxide can be prepared by which of the following process?

a.) Electrolysis

b.) Chlor-alkali process

c.) Both (a) and (b)

d.) None of the above

Q5. The number of molecules of water of crystallisation present in washing soda crystals is:

a.) 5

b.) 7

c.) 2

d.) 10

Q6. What happens when Nitric acid is added to egg shell?

Q7. What are the general characteristics of acids?

Q8. During summer season, a milkman usually adds a small amount of baking soda to fresh milk. Give reason.

Q9. Name the gas evolved when NaOH reacts with zinc.

Q10. Explain how an antacid works.

Q11. What is a universal indicator? Give its use.

Q12. An aqueous solution of an acid conducts electricity. Give reason.

Q13. A cloth strip dipped in onion juice is used for testing a liquid ‘X. The liquid ‘X changes its odour. Which type of an indicator is onion juice? The liquid ‘X turns blue litmus red. List the observations the liquid ‘X will show on reacting with the following : a.) Zinc granules

b.) Solid sodium carbonate Write the chemical equations for the reactions involved.

Q14. Write the name and the formula of each of the following:

a.) an acidic salt

b.) a basic salt

Q15. A gas X reacts with lime water and form a compound Y which is used as a bleaching agent. Identify X and Y. Give the chemical equation of the reaction involved.

Q16. How will you prove that a given salt is a carbonate of a metal?

Q17. How would you distinguish between baking powder and washing soda?

Q18. Answer the following:

a.) What are alkalis?

b.) Which acid is present in tomato?

c.) How can carbon dioxide gas and hydrogen gas be confirmed?

d.) What will be the effect of dry HCl on litmus paper?

Q19. i.) A substance X used as an antacid reacts with hydrochloric acid to produce a gas Y which is used in extinguishers.

a.) Name the substances X and Y.

b.) Write a balanced equation of the reaction between X and hydrochloric acid.

ii.) What is efflorescence?

Q20. a.) Name a sodium compound used for softening hard water.

b.) Which compound of calcium is used for disinfecting drinking water supply?

c.) Name a strong monobasic acid.

d.) Name the substance obtained by the action of chlorine on solid slaked lime.

10TH CLASS- PHYSICAL SCIENCE

CHAPTER-3- METALS AND NON-METALS

LESSON PLAN

AIMS, CURRICULAR GOALS AND CURRICULAR COMPETENCIES

AIMS OF EDUCATION:

Rational Thought and Autonomy: An individual should have the capacity of rational reasoning and sufficient knowledge to understand the world around them. An individual should be able to make an informed decision. This fundamentally requires knowledge in breadth and depth.

Health and wellbeing:

Democratic participation: This requires appropriate knowledge capacities, values, and dispositions so that an individual may be oriented towards sustaining and improving the democratic functions of Indian society.

Economic participation: Education should work as an enabler for a healthy democracy as well as a healthy economy.

Cultural and social participation: Along with democracy and economy, society, and culture also play an important role in the mode of associated living. An individual should acquire capacities and a disposition to contribute meaningfully to culture.

Nature of Science: Science is an organized system of knowledge that evolves as a result of curiosity followed by inquiry, logical reasoning, experimentation, and the examination of empirical evidence. It enables an understanding of the physical and natural environments and phenomena, the identification of meaningful patterns and relations including causes and effects, and supports the development of models, theories, laws, and principles.

AIMS OF SCIENCE:

1. **Scientific understanding of the natural and physical world:** Scientific understanding develops through scientific observations, questions, experiments, theories, laws, principles and concepts.
2. **Capacities for Scientific enquiry:** The abilities to put forth hypotheses, predictions and analyses, and to test hypotheses, evaluate situations, and draw logical conclusions.
3. **Understanding the evolution of scientific knowledge**: There are crucial historical moments in the development of science of scientific knowledge that could not have occurred without the efforts of various individuals and organisations over thousands of years.
4. **Interdisciplinary understanding between Science and other curricular areas**: Learning in Science involves understanding inter-linkages across disciplines. Concepts, principles, laws and theories cannot be viewed as isolated, but instead they together contribute to a holistic understanding of the world. Students would learn to inquire and learn about the world through such an inter-disciplinary approach.
5. **Understanding of relationship between science, technology and society:** This lesson Engages with issues related to connections between Science and Society and appreciating the role of science in everyday life.
6. **Scientific temper**: Developing the capacities for critical and evidence based thinking and freedom from fear and prejudice is central to the learning of Science.
7. **Creativity:** This lesson aims at Asking good questions, formulating hypotheses and designing creating good experiments to test those hypotheses related to various molecules and their chemical formula of various substances.

CURRICULAR GOALS:

CG-1: Explores the world of matter, its interactions and properties at the atomic level

Competencies:

1. Describe the classification of metals and non-metals based on their properties.
2. Investigate the nature and properties of metals and non-metals and the factors causing corrosion in metals.
3. Describes and represents chemical reactions of metals and non-metals and the various process involved in the extraction of the ore.

CG-2: Explores the physical world around them and understands scientific principles and laws based on observations and analysis

Competencies:

1. Explains the properties of metals and non-metals and relates this to their bonding
2. Manipulates and analyses different changes in metal salt solution during reactions.
3. Defines elements as metals and non-metals based on physical properties.
4. Describe the conditions needed for the extraction of metals.
5. Demonstrates the chemical properties of metals and rusting.

CG-3: Explores the structure and function of the living world at the cellular level.

Competencies:

1. Analyses the colours of flames obtained with different metal salts.

CG-4: Explores interconnection between molecules of matter and environment:

Competencies:

1. Applies the knowledge of properties of metals and non-metals involved in the environmental issues like pollution and green-house effect.

CG-5: Draws linkages between scientific knowledge and knowledge across other curricular areas

Competencies:

1. Applies the law of chemical combination, chemical formulae to explain the phenomenon in other subjects like Physics, Biological and Social Sciences

CG-6: Understands and appreciates the contribution of India through history and the present times to the overall field of science, including the disciplines that constitute it

Competencies:

1. Knows and explains the significant contribution of Indian metallurgical workers in the formation of alloys and their applications.

CG-7: Develops awareness of the most current discoveries, ideas and frontiers in all areas of scientific knowledge in order to appreciate that science is ever evolving, and that there are still many unanswered questions.

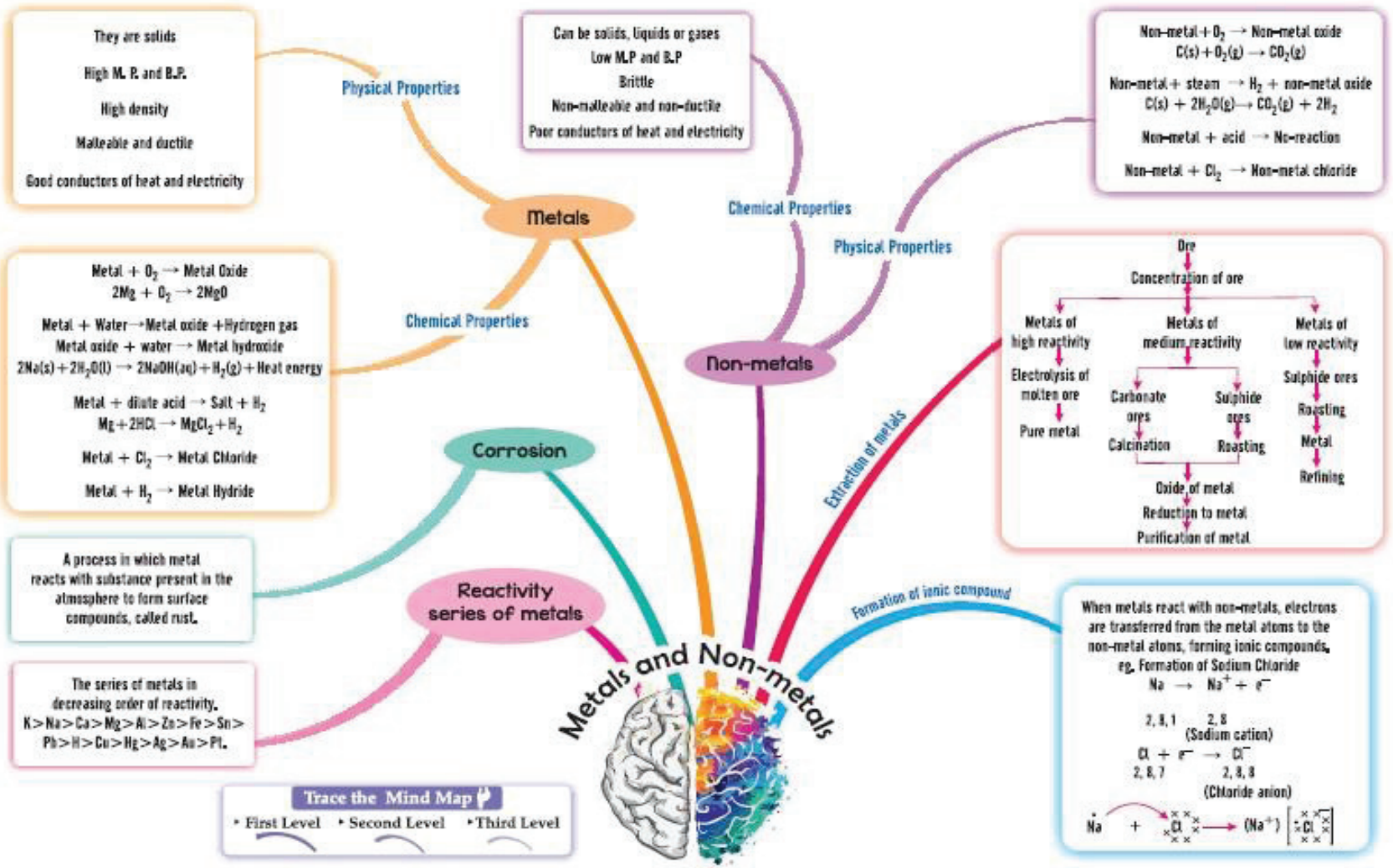
Competencies:

1. States concepts that represent the most current understanding of the matter of metals and alloys and their conceptual understanding to the students.

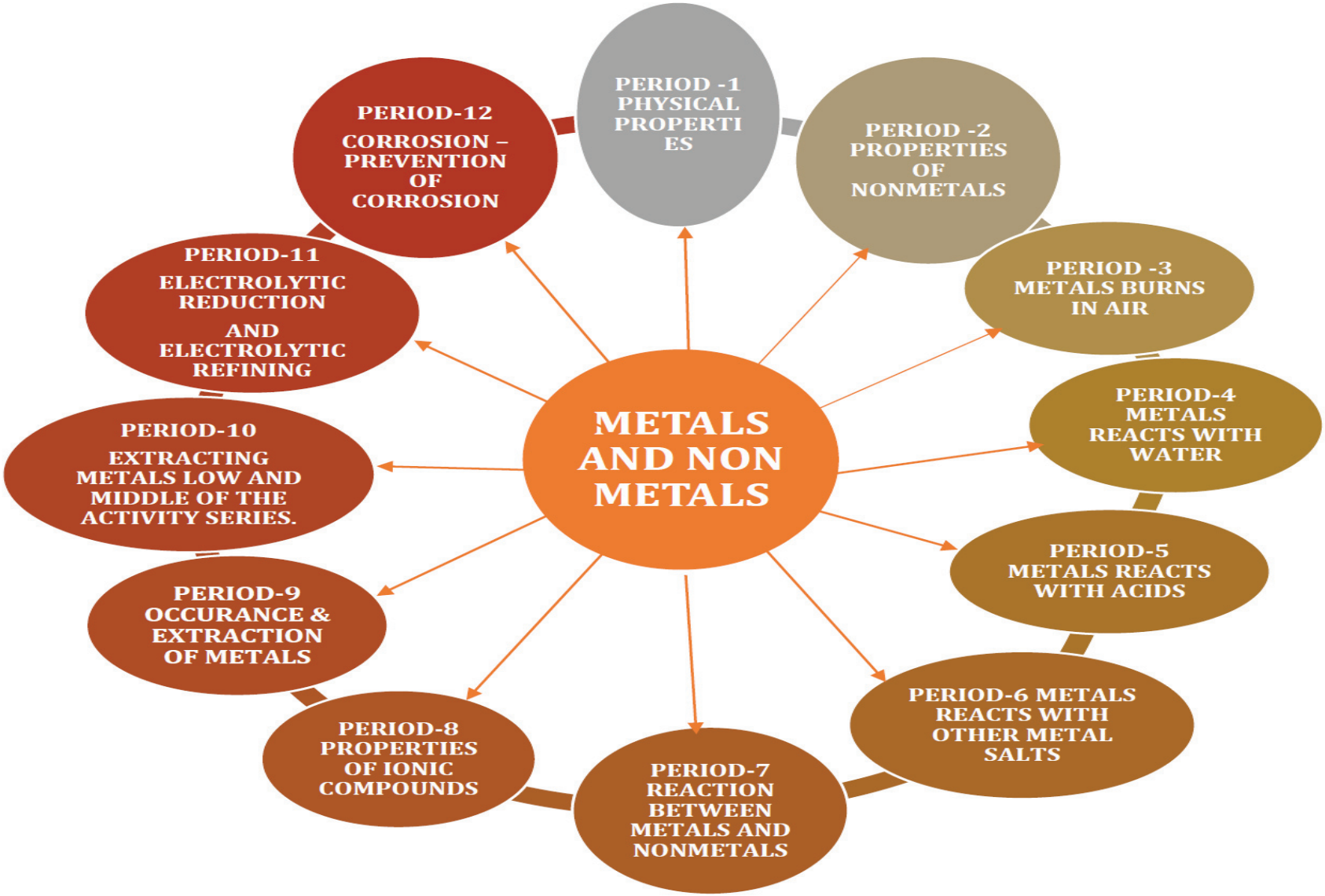
CG-8: Explores the nature of Science by doing Science.

Competencies: 1. Draw flowchart of the various steps involved in the extraction of metals.

FLOW CHART:


Metals and Non-metals
Metals
Physical Properties
They are solids
High M. P. and B.P.
High density
Malleable and ductile
Good conductors of heat and electricity
Chemical Properties
Metal + O_2 → Metal Oxide
$2Mg + O_2 \rightarrow 2MgO$
Metal + Water → Metal oxide + Hydrogen gas
Metal oxide + water → Metal hydroxide
$2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$ + Heat energy
Metal + dilute acid → Salt + H_2
$Mg + 2HCl \rightarrow MgCl_2 + H_2$
Metal + Cl_2 → Metal Chloride
Metal + H_2 → Metal Hydride
Non-metals
Physical Properties
Can be solids, liquids or gases
Low M.P and B.P
Brittle
Non-malleable and non-ductile
Poor conductors of heat and electricity
Chemical Properties
Non-metal + O_2 → Non-metal oxide
$C(s) + O_2(g) \rightarrow CO_2(g)$
Non-metal + steam → H_2 + non-metal oxide
$C(s) + 2H_2O(g) \rightarrow CO_2(g) + 2H_2$
Non-metal + acid → No-reaction
Non-metal + Cl_2 → Non-metal chloride
Extraction of metals
Ore
Concentration of ore
Metals of high reactivity
Electrolysis of molten ore
Pure metal
Metals of medium reactivity
Carbonate ores
Calcination
Sulphide ores
Roasting
Oxide of metal
Reduction to metal
Purification of metal
Metals of low reactivity
Sulphide ores
Roasting
Metal
Refining
Formation of ionic compound
When metals react with non-metals, electrons are transferred from the metal atoms to the non-metal atoms, forming ionic compounds.
eg. Formation of Sodium Chloride
$Na \rightarrow Na^+ + e^-$
2, 8, 1 2, 8
(Sodium cation)
$Cl + e^- \rightarrow Cl^-$
2, 8, 7 2, 8, 8
(Chloride anion)
Corrosion
A process in which metal reacts with substance present in the atmosphere to form surface compounds, called rust.
Reactivity series of metals
The series of metals in decreasing order of reactivity.
K > Na > Ca > Mg > Al > Zn > Fe > Sn > Pb > H > Cu > Hg > Ag > Au > Pt.
Trace the Mind Map
First Level
Second Level
Third Level

PERIOD MAP:


METALS AND NON METALS
PERIOD -1 PHYSICAL PROPERTIES
PERIOD -2 PROPERTIES OF NONMETALS
PERIOD -3 METALS BURNS IN AIR
PERIOD-4 METALS REACTS WITH WATER
PERIOD-5 METALS REACTS WITH ACIDS
PERIOD-6 METALS REACTS WITH OTHER METAL SALTS
PERIOD-7 REACTION BETWEEN METALS AND NONMETALS
PERIOD-8 PROPERTIES OF IONIC COMPOUNDS
PERIOD-9 OCCURANCE & EXTRACTION OF METALS
PERIOD-10 EXTRACTING METALS LOW AND MIDDLE OF THE ACTIVITY SERIES.
PERIOD-11 ELECTROLYTIC REDUCTION AND ELECTROLYTIC REFINING
PERIOD-12 CORROSION – PREVENTION OF CORROSION

Division of Periods:

Teaching Periods: 12

Assessment periods: 2

Remedial Periods: 2

Total periods:16

Key Concepts and Period-wise Learning Outcomes of the Lesson

Period No	Key-Concepts	Learning Outcomes
Period-01	**Physical Properties Of Metals**	1) Investigate the nature and properties of metals. 2) Describe the properties of metals 3) Demonstrate the properties of one metal to another metal 4) Applies the scientific principle to explain the phenomenon in other subjects like physics.
Period-02	**Conductivity In Metals & Properties Of Nonmetals**	1) Investigate the nature and properties of metals. 2) Describe the properties of metals. 3) Demonstrate the properties of one metal to another metal. 4) Applies the scientific principle to explain the phenomenon in other subjects like physics. 5) Differentiate the metal and non-metal based on their properties.

Period-03	**Chemical Properties – Metals Burn In Air**	1) Investigate the chemical properties of metals. 2) Describe and represents the chemical properties of metals by chemical equations. 3) Demonstrate the chemical properties of various metals 4) Manipulates and analyses different characteristics of metals.
Period-04	**Chemical Properties – Reaction Of Metals With Water**	1) Investigate the chemical properties of metals. 2) Describe and represents the chemical properties of metals by chemical equations. 3) Demonstrate the chemical properties of various metals 4) Manipulates and analyses different characteristics of metals.
Period-05	**Reaction Of Metals With Acids**	1) Investigate the chemical properties of metals. 2) Describe and represents the chemical properties of metals by chemical equations. 3) Demonstrate the chemical properties of various metals 4) Compare the reaction of different metals with acids 5) Manipulates and analyses different characteristics of metals.
Period-06	**Reaction Of Metals With Solution Of Other Metal Salts**	1) Investigate the chemical properties of metals. 2) Describe and represents the chemical properties of metals by chemical equations. 3) Demonstrate the reactivity of various metals 4) Compare the reaction of different metals with solution of metals salts 5) Manipulates and analyses different characteristics of metals.

Period-07	**How Do Metals And Non Metals React**	1) Defines ionic bonding between metals and non-metals. 2) Describes and represents chemical interactions between metal and nonmetal 3) Applies and interprets the type of bonding in new ionic compounds. 4) Explains the properties of metals and nonmetals to their bonding between them.
Period-08	**Properties Of Ionic Compounds**	1) Investigate the Physical properties of salts 2) Describe the physical properties of Salts 3) Demonstrate the properties of various ionic compounds 4) Compare the melting points and boiling points ionic compounds used in daily life. 5) Analyses the flame colour of different metal salts and colour changes in the salt when kept in flame.
Period-09	**Occurrence & Extraction Of Metals**	1) Describe the conditions needed for the extraction and reactions taking place during extraction. 2) Explains the extraction of metals according to their position in activity series. 3) Understand the availability of metal as ores based on their reactivity.
Period-10	**Enrichment Of Ores- Extracting Metals Low And Middle Of The Activity Series.**	1) Describe the conditions needed for the extraction and reactions taking place during extraction. 2) Explains the extraction of metals according to their position in activity series. 3) Understand the availability of metal as ores based on their reactivity.

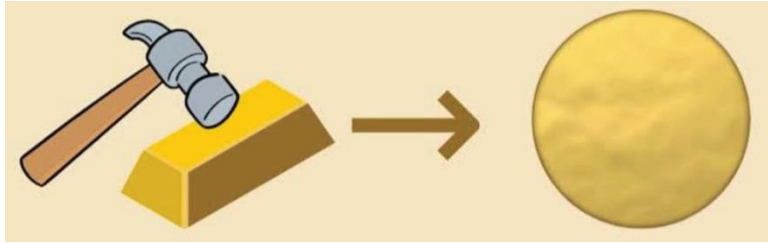
		4) Describe and represents chemical reactions during each step of the enrichment of ore
Period -11	**Extraction Of Metals High In Activity Series – Electrolytic Reduction And Electrolytic Refining**	1) Describe the conditions needed for the extraction 2) Explains the extraction of metals according to their position in activity series. 3) Understand the availability of metal as ores based on their reactivity. 4) Describe and represents chemical reactions during each step of the enrichment of ore.
Period-12	**Corrosion – Prevention Of Corrosion**	1) Investigate the factors causing corrosion in metals 2) Analyses how alloys are used in daily life. 3) Interpret the various methods used to prevent corrosion.

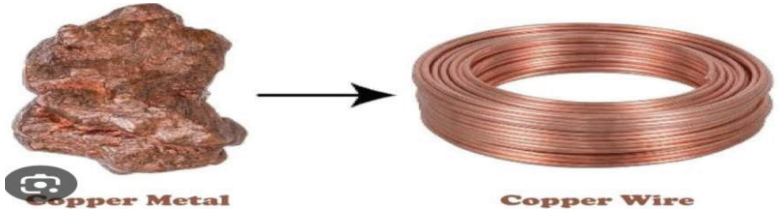
Class: X
Chapter: Metals And Non-Metals
Total No; of periods: 12
Period No: 01
Key concepts: Physical properties of Metals

1064CH03

Learning-Outcomes	Teaching-Learning Process	Pointers for assessment	Materials required
1) Investigate and describe the nature and properties of metals. 2) Distinguish one metal from another metal by their properties. 3) Applies the scientific principles to explain the phenomena in other subjects like physics.	**Motivation & Introduction:** 1) Can you give examples for solids around us? 2) Name the different solid materials used by the students in class. 3) Which of them are metals and which of them are non-metals in student's bench? Why? 4) What are the properties differentiate metal from a non-metal? 5) How are the properties of metals related to the uses of these elements? 6) Why gold and silver are used in making jewelry? 7) Now we will look at some properties of Metals. ***Physical Properties of Metals***: **Activity 3.1:** Perform Activity 3.1 by taking magnesium ribbon.		1)metals like Zinc, Magnesium, copper, Sodium 2) sharp knife 3) watch glass 4)iron hammer 5)sand paper 6)electric wire 7)spatula

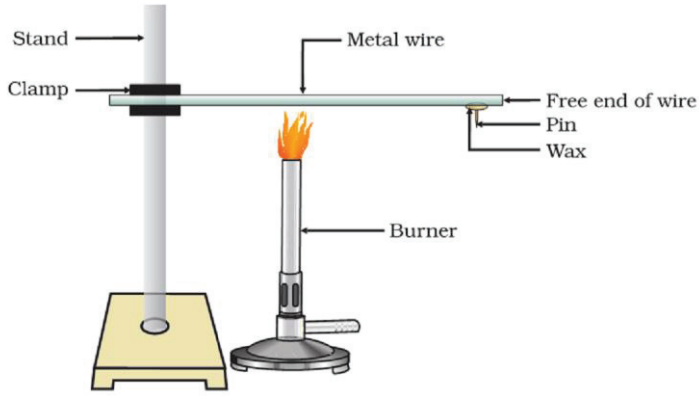
	1) Is the magnesium ribbon shining? Ask a student to rub the magnesium ribbon with a sand paper. 2) Is the Magnesium ribbon shining or not? 3) Why Gold and Silver are used in making jewelry? So Metals in their pure state have a shining surface. This property is called as Metallic Luster. **Activity 3.2:** 1) Is it easy to cut the metals with hand? 2) Which utensils we use to cut the metals in our daily life? Perform this activity by taking available metals and cut them by taking the sharp knife into small pieces. 1) Does all the metals are easily cut into smaller pieces? 2) Can you arrange the metals based on the difficulty in cutting? 3) Do all metals have equal hardness? From this activity we find that metals are generally hard and the hardness varies from metal to metal.		Byju's Tab Content. Video link https://youtu.be/J0v3stz7izA

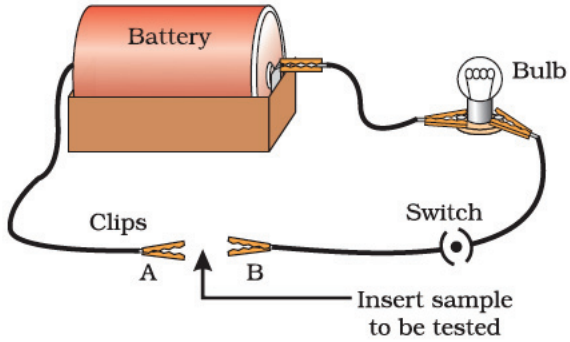
	1) Can you explain why there is the difference between hardness of different metals? **<u>Activity 3.3:</u>** 2) Do you know where metal sheets like Iron, Aluminum are used in daily life? Why? 3) Do you know how the metals are converted into sheets? Perform this activity by taking small zinc, aluminum or copper metal pieces and hit it with metal hammer. 1) Does the shape of the shape of the metal change? 2) What is the shape of the metal after hammering?  From this activity we conclude that some metals can be beaten into thin sheets. This property is called as **Malleability**. 1) Which metals are most malleable in nature?	1).Give an example for a metal which a) is a liquid at room temperature b) can be easily cut with a knife. 2).Name the property of metal by which it is beaten into sheets. 3).Name the property of metal by which it is made into wires. 4).Which one of the following metals can easily be drawn into wires. a) Iron b) Zinc c) Tin d)Copper 5) Name the metal from which 2kms wire can be	

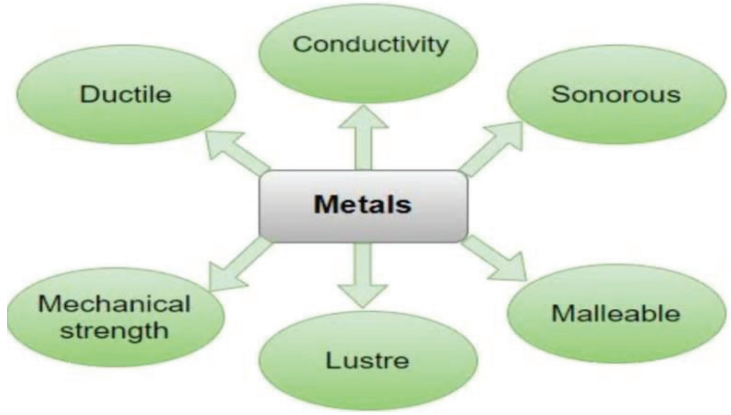
	2) Can you name some metals used for making cooking vessels? **<u>Activity-3.4:</u>** 1) Can you name the instances where the metal wires are used in preparing various objects? 2) Do you know which metal wire is used in the electric wires?  1) Name some metals which can be converted into wires? This ability of metals to be drawn into thin wires is called **Ductility.** 2) Is Ductility same for all metals? 3) Give the reasons why the ductility is different for different metals. 4) Where do we use metal wires in daily life?	drawn from 1gm of substance. 6) Among metals which are most malleable?	
Teachers' reflections and experiences: **1**) Students Explains physical properties of metals. 2) Students Give properties of most used metals.			

Class: X
Chapter: Metals And Non-Metals
Total No. Of Periods:12
Period No: 02
Key Concepts: Conductivity In Metals & Properties Of Non-metals

Learning Outcomes	Teaching-Learning Process	Pointers for assessment	Materials required
• Investigate and describe the nature and properties of metals. • Differentiate the properties of one metal from another metal • Applies the scientific principles to explain the phenomena in other subjects like physics. • Differentiate the metals and non- metals	**Motivation & Introduction:** 1) Why cooking vessels are made with metals? 2) What happens when you touch the metal handle of heated cooking vessel? 3) Can you give any other example where you feel heat when touching any vessel containing hot materials? 4) Can you name the process involved in the above cases? **Activity 3.5:** Perform Activity 3.5 with the help of students.	1)Give an example of a metal which (i). is a liquid at room temperature. (ii). can be easily cut with a knife. (iii). is the best conductor of heat. (iv). is a poor conductor of heat. 2. What is the full form of PVC? 3. Which pair of the metals is/are poor conductors of heat? a)Zn,Au b) Ag,Au c)Cu,Al d) Hg, Pb 4. Which of the following statements is true? A)Metals are good	1)retort stand 2) clamp 3) metal wire 4)burner 5)wax 6)metal pin 7)carbon(coal or graphite) 8) Sulphur 9) iodine 10)battery 11) connection wire 12) bulb 13) switch 14) charts showing properties of metals and nonmetals

based on their properties.	 1. What happened when the metal wire is heated with a burner? 2. Why the metal pin has dropped after heating the metal wire at the other end? 3. Why the wax does melts? **This suggests that metals are good conductors of heat.** 1. Does the metal wire melt after heating? This suggests that metals have high melting point. 2. Which metal is used in making electric wires? 3. Any other metal other than copper is used in making electric wires.	conductors of heat. B) Metals have low melting point. i) only B is true ii) both A and B are true iii) only A is true iv) both A and B are false 5) Sodium: Soft Iron:_____ 6) Drawn into wires→Ductile. Beaten into sheets →_____	Byju's Tab Content. Video link https://youtu.be/J0v3stz7izA

	<u>Activity 3.6:</u> Perform activity 3.6 by taking various metal wires and observe the glowing of bulb.  **The above activity suggests that metals are good conductors of electricity.** 1. Why the copper wires are coated with rubber like material like PVC? 2. What happens when a metal plate fell on the floor? 3. What happens when you hit a bell in a temple or in school? 4. Do they produce sound? **This property of generating sound when a metal is hit with a hard object (hammer) is called <u>Sonority</u>.** To summarize the properties of metals	7)which of the following is a non-metal a) Sodium b) chlorine c) Aluminum d) copper 8) which of the following non-metals is gas at room temperature a) Sulphur b) Bromine c) Iodine d) carbon.	



Activity 3.7:

If you perform the above activities with coal or graphite or sulphur or Iodine, do you get the same results as metals?

No. Such substances which do not show the metallic properties are called Non-metals.

Non-Metals

Carbon

Sulphur

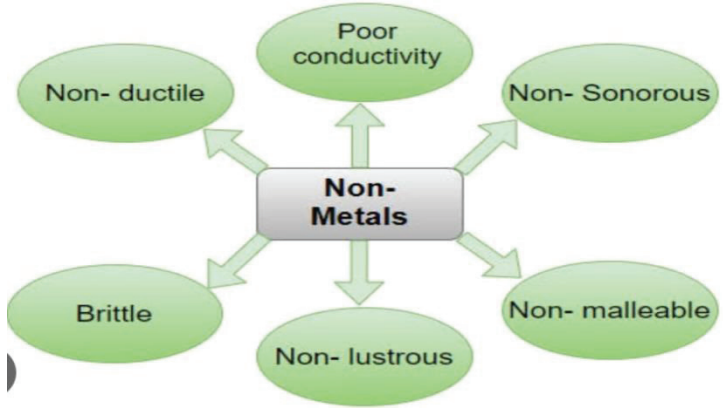
Red Phosphorous

9)Which of the following non-metals is used in the manufacture of fertilizers?

a) Fluorine b) oxygen

c) Chlorine d) Nitrogen

Other examples for non-metals are carbon, nitrogen, oxygen, hydrogen, etc.



The students are asked to fill the table 3.1based on the observations

1. Do the metals and nonmetals have same physical properties?
2. Which metal is liquid at room temperature?
3. Which metals melt in our palm? What is the reason?
4. Iodine is Lustrous. Is it a metal or not?
5. In how many different forms carbon exist in nature?
6. What is allotropy?

10) Tick the correct properties for the following metals and non-metals

Name	Sonority (yes /No)	Malleability(Yes/ No)	Ductility(Yes/ No)	Conductivity (Yes /No)
Copper				
Nitrogen				
Iron				
carbon				

	7. Which allotrope of carbon is a good conductor of electricity? 8. Even though they are metals, sodium or potassium can be cut with knife. Give reason. 9. Do all metals satisfy all the metallic properties? So the elements cannot be classified into metals only based on metallic properties.		

Teachers' reflections and experiences:

1) Students Understands the differences in the properties of metals and non-metals.
2) Students explains the conductivity in metals.

Class: X
Chapter: Metals and Non-Metals
Total no. of periods:12
Period No: 03
Key Concepts: Chemical properties – Metals burn in air

Learning Outcomes	Teaching-Learning Process	Pointers for assessment	Materials required
• Investigate the chemical properties of metals. • Describe and represents the chemical properties of metals by chemical equations. • Demonstrate the chemical properties of various metals • Manipulates and analyses different characteristic	**Motivation and Introduction:** 1. Have you burned crackers during Diwali festival? 2. What do you observe when you burn the crackers? 3. Do you know the reason for the bright sparkles of light from the burning crackers? **Activity 3.8:** Perform 3.8 with Magnesium ribbon and Sulphur powder. 1. What do you observe when Magnesium ribbon burnt in air? 2. Can you name the white ash formed during the above process? 3. Can you write the chemical equation for the above reaction? 4. What will be change in colour when red litmus paper or blue litmus is dipped in the solution	1)Define combustion? 2)Complete the equations a) $2Mg + O_2 \rightarrow$ _____ b) $2Cu + O_2 \rightarrow$ _____ 3)Identify the product when Aluminum reacts with Oxygen. a)AlO b)AlO_2 c)AlO_3 d) Al_2O_3 4) Identify the compound/s formed when metal oxide reacts with water. a) metal sulphate b) metal oxide c) metal hydroxide d) metal carbonate 5)What are the amphoteric oxides? Give two examples.	1.Magnesium ribbon 2.Sulphur powder 3.Litmus paper 4.water 5. burner 6.spatula 7.tongs

s of metals.	of white ash (Magnesium oxide)? 5. What will be the nature of Magnesium oxide? **We conclude that metal oxides are basic in nature.** 1. What do you observe when Sulphur is burnt in air? 2. What is the name of the gas evolved during the burning of Sulphur? 3. How do you collect the gas evolved in the above process? 4. Can you write the chemical equation for the above reaction? 5. How do you check the nature of the gas evolved in the above process? 6. What litmus paper observed a colour change with the solution containing SO_2 gas? 7. What is the nature of the non-metallic oxide SO_2? **We conclude that Non-metal oxides are acidic in nature.** So we can differentiate the metals from non-metals by using their chemical properties. 1. In the above activity with which element the metal or nonmetal is forming new product on burning?	6) What are the precautions to be taken while handling metals and performing activity? 7)$Mg+O_2 \rightarrow A$ $A+ H_2O \rightarrow B$ What are A and B? 8) _____ is a metal which reacts with oxygen gas to form an amphoteric oxide. a)Aluminum b) Potassium c) Sodium d) Copper	8. Byju's tab video link https://youtu.be/YxnN5vLW9F4

2. Can you name the process where substance burns in air?
3. Can you give some examples for combustionreactions in everyday life?

Activity-3.9:

Perform the activity 3.9 by taking the available metals like Aluminum, copper, iron, lead, magnesium, zinc and sodium and fill the following table.

Metal	Metal oxide	Colour of the flame	Solubility in water	reactivity
Aluminum				
copper				
Iron				
Lead				
Magnesium				
Zinc				
sodium				

From the above table.

1. Can you write the chemical reactions for each metal?
2. Can you arrange the metals in decreasing order of their reactivity towards oxygen?
3. Check the nature of the metal oxide by using litmus paper test whether it is basic or not.

9) Complete the following reaction

a) $Al_2O_3 + 6HCl \rightarrow$ ___ + ___

b) $Al_2O_3 + 2NaOH \rightarrow$ ___ + __

	4. Is Aluminum Oxide (Al_2O_3) acidic or basic or both(Amphoteric)? 5. Why metals like Sodium and Potassium are stored in the kerosene oil? 6. Which metals do not react with oxygen even at high temperature?		

Teachers' reflections and experiences:

1) Students Understand the chemical properties of metals.

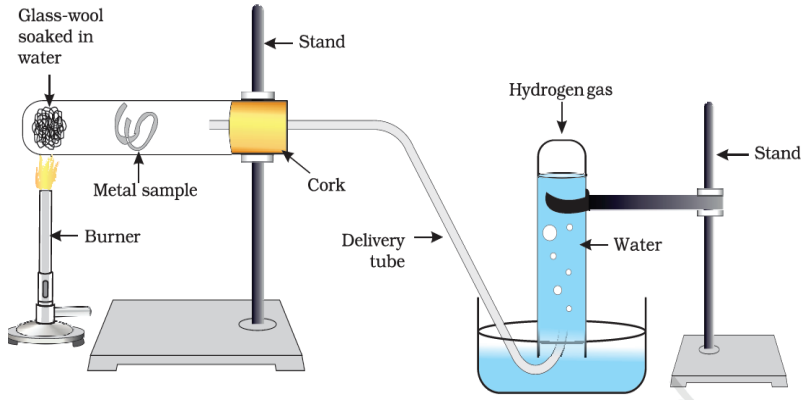
2)Students Perform activities to check the results when metals burn in the air.

Class: X
Chapter: Metals and Non-Metals
Total No. of periods:12
Period No: 04
Key Concepts: Chemical properties – Reaction of Metals with water

Learning Outcomes	Teaching-Learning Process	Pointers for assessment	Materials required
• Investigate the chemical properties of metals. • Describe and represents the chemical properties of metals by chemical equations. • Demonstrate the chemical properties of various metals. • Manipulates and analyses different characteristics of metals.	**Motivation and Introduction:** 1. Do you use stainless steel vessel to store water? 2. Does it react with water or not? 3. If we store water in a copper vessel, does the copper react with water? 4. Do you find any difference in the water as well as the metal after few days in both the above vessels? **Activity 3.10** To know the reactivity of the metals with water we perform Activity 3.10 by taking small pieces of metals like Aluminum, copper, iron, lead , magnesium, zinc and sodium in a beaker of Cold water and then in Hot water and observe the changes. Metal + Water ⟶ Metal oxide + Hydrogen Metal oxide + Water ⟶ Metal hydroxide	1) Do all metals react with water? 2)Name two metals which react violently with cold water? 3) Write the name of the metal which follows exothermic reaction with water.	1.Magnesium ribbon 2.sodium 3.zinc 4.Aluminium 5.copper 6.calcium 7.iron 8.retort stand 9.test tubes 10.beakers 11. hot and cold water 12. cork 13. delivery tube 14. trough 15. burner 16. Glass wool

	1. Name the metals which react with cold water. 2. Why does Sodium metal catch fire on contact with cold water? 3. Is there any increase in temperature of water? 4. Can we call such reactions as exothermic or not? $2K(s) + 2H_2O(l) \rightarrow 2KOH(aq) + H_2(g) + \text{heat energy}$ $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g) + \text{heat energy}$ 1. Name the metals which react with hot water. 2. Why does the Magnesium metal piece float on in hot water? 3. Do you observe any gases evolved in the process? What may be the name of gas? 4. Which metals do not react with both cold and hot water? To know the reactivity of the metals which do not react with cold and hot water the following activity is done where the steam is passed on the metal and	4) Name any two metals which neither react with hot water nor react with cold water. 5) Complete the reaction a) $2Al+3H_2O \rightarrow \_\_\_ +3H_2$ b) $3Fe+4H_2O \rightarrow 4H_2 + \_\_\_$	17. .Byju's tab video link https://youtu.be/YxnN5vLW9F4

collect the gases obtained during the process.



1. Does the metals Aluminum, Zinc and iron react with steam?
2. What are the products formed when these metals react with steam?

$2Al(s) + 3H_2O(g) \rightarrow Al_2O_3(s) + 3H_2(g)$
$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$

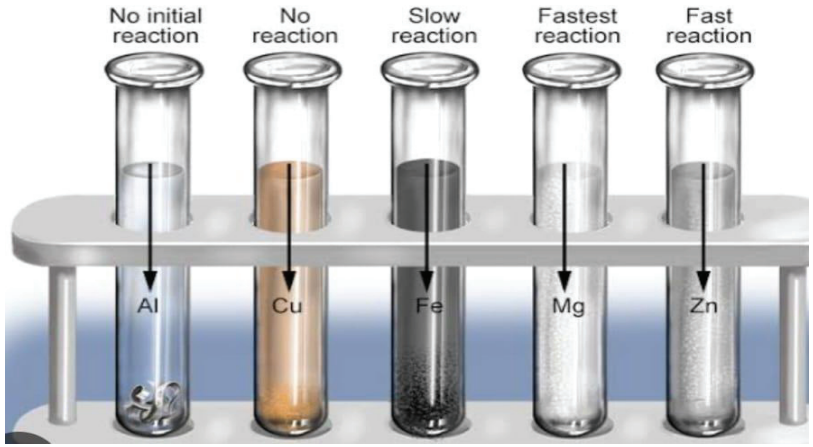
1) Which metals do not react with water at all?
2) Can you give reasons for the non-reactivity of the metals like gold and silver?

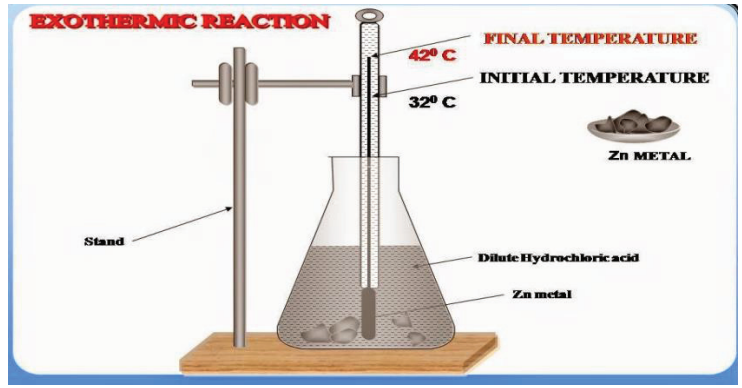
Teachers' reflections and experiences:

1) Understands reaction of metals with water.
2) Differentiates the products formed in the reactions.

Class: X
Chapter: Metals and Non-Metals
Total No. of periods: 12
Period No: 05
Key Concepts: Reaction of Metals with Acids

Learning-Outcomes	Teaching-Learning Process	Pointers for assessment	Materials required
• Investigate the chemical properties of metals. • Describe and represents the chemical properties of metals by chemical equations. • Demonstrate the chemical properties of various metals. • Compare the reactions of different	**Introduction:** 1. What happens with metals react with acid? 2. Do all metals react with acids? **Activity 3.11:** Let us perform the activity 3.11 by taking metals like magnesium, aluminum, copper, zinc and iron. (Care must be taken to avoid sodium and potassium to perform this activity due to their high reactivity.) Try to take the temperatures of the solution before and after reaction?	1) Name one metal which reacts vigorously with dilute HCl? 2)Complete the chemical equations. Mg +2HCl→____+___ Zn + 2HCl→____+___ 2Al + 6HCl →____+___ 3) Does copper reacts with HCl?	1.Magnesium ribbon 2.sodium 3.zinc 4.Aluminium 5.copper 6.calcium 7.iron 8.retort stand 9.test tubes 10.beakers 11. hot and cold water 12. cork 13. delivery tube 14. thermometer 15. burner 16. conical flask

metals with acids. • Manipulates and analyses different characteristics of metals.	 Observe the formation of bubbles in the test tube and 1. Which of the above metals react faster? 2. Write the reactivity order among the metals? 3. What changes do you observe from the above activity? 4. Why the bubbles are evolving from the metal when acid is added? 5. Can you name the gas evolved during the reaction? 6. How do check the Hydrogen gas evolved in	4)Which metals reacts with HNO_3 to liberate H2 gas? a) Manganese b) Magnesium c) Zinc d) All of the above 5) Why Hydrogen gas is not evolved when metals reacts with HNO_3? Give reasons.	17. Byju's tab video link https://youtu.be/YxnN5vLW9F4

	this process? 7. In which of the test tubes the highest temperature is recorded?  1. Write the equations for the above activity with various metals.	6) Identify the correct reactivity order of the following. a) Mg>Al>Zn>Fe b) Al>Zn>Fe>Mg c) Zn>Fe>Mg>Al d) Fe>Mg>Al>Zn	

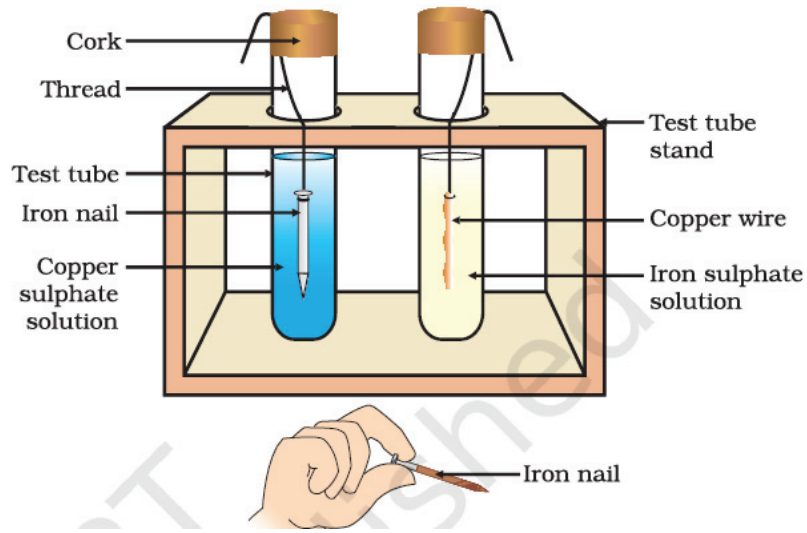
Teachers' reflections and experiences:

1) Students Understands the reactions of acids with metals.

2) Students Differentiates the products formed by the reaction of various metals with different acids.

Class: X
Chapter: Metals and Non-Metals
Total No. of periods:12
Period No: 06
Key concepts: Reaction of Metals with solutions of other Metal salts

Learning Outcomes	Teaching-Learning Process	Pointers for assessment	Materials required
• Investigate the chemical properties of metals. • Describe and represents the chemical properties of metals by chemical equations. • Demonstrate the reactivity of various metals • Compare the reaction of different metals with	**Introduction:** 1. What is the colour and formula of copper sulphate? 2. What is the colour and formula of Iron sulphate? **Activity 3.12:** Let us perform the activity 3.12 by taking metallic objects like copper wire and iron nail.	1) Name two metals which will liberate Hydrogen gas from dilute acid. 2) What would you observe when zinc is added to a solution of Iron (II) Sulphate? Write the chemical reaction. 3) If a metal A on reaction with Iron sulphate gives displacement reaction	1) Test tube stand 2) Test tubes 3) Corks 4) Copper sulphate 5) Iron sulphate 6) Copper wire 7) Iron nail 8) Thread

solution of metals salts • Manipulates and analyses different characteristics of metals.	 **Observe** 1. Which of the above metals react faster? 2. Do you observe any change in the colour of the solutions in the 2 test tubes? 3. Why the colour of copper sulphate solution changes when iron nail is present? Give reason. 4. Why the colour of Iron sulphate solution does not change when copper wire is present? From this activity we conclude that the highly reactive metals can displace less reactive metals from their compounds in solution or molten form.**This is an example for Displacement reaction.**	then, does it react with copper(II) Sulphate? Why? 4) Out of copper, silver, iron and zinc metals which can displace all other metals from their salt solutions. 5) Which one of the following metals would be displaced from that metal saltsolution by the other 3 metals? A)Ag B) Cu C) Zn d) Mg	9) Byju's tab content NCERT e-Link https://youtu.be/FUq8RQ75Lpw

	1. Which metal is more reactive copper or iron in the above activity? General word equation for the above activity is **Metal A + Salt solution of B → Salt solution of A + Metal B** 2. Write the chemical equation for the above activity? Based on the displacement experiments with various metals and their salts the following activity series is developed.	6) Which one of the following pairs will give displacement reaction? a) NaCl solution and Cu metal b) $MgCl_2$ Solution and Al metal c) $FeSO_4$ solution and Ag metal d) $AgNO_3$ solution and Cu metal.	

Teachers' reflections and experiences:

1) Students Understands the reaction of metals with other salt solutions.
2) Students Give examples for highly reactive and less reactive metals.

Class: X
Chapter: Metals and Non-Metals
Total No. of periods: 12
Period No: 07
Key concepts: How do Metals and Non-Metals react

Learning Outcomes	Teaching-Learning Process	Pointers for assessment	Materials required
1) Define, describe and represent chemical interactions between metals and nonmetals. 2) Applies and interpretthe type of bonding in new compounds. 3) Explain the properties of metals and non-metals based on the nature of	**Introduction:** 1. Do you know the differences between metal and nonmetal? 2. Which salt is formed when magnesium is reacting with dil.HCl? 3. Which is a metal and nonmetal in $MgCl_2$ formula? 4. Why metals are reactive in nature? 5. Do you know the difference between electronic configuration of a metal and the nearest inert gas element? 6. Why inert gas elements show little or no reactivity with other elements? We explain the reactivity of elements as a tendency to attain a completely filled valence shell as in inert gas elements. 1. Do you know the formula of Table salt?		Byju's video on this topic in the tab. https://youtu.be/DinMgWWwMUE

reactivity between them.

2. Do you know what is a metal and nonmetal in Sodium Chloride?
3. Can you explain the formation of Sodium chloride?
4.

Observe the electronic configurations of some elements.

Type of element	Element	Atomic number	Number of electrons in shells			
			K	L	M	N
Noble gases	Helium (He)	2	2			
	Neon (Ne)	10	2	8		
	Argon (Ar)	18	2	8	8	
Metals	Sodium (Na)	11	2	8	1	
	Magnesium (Mg)	12	2	8	2	
	Aluminium (Al)	13	2	8	3	
	Potassium (K)	19	2	8	8	1
	Calcium (Ca)	20	2	8	8	2
Non-metals	Nitrogen (N)	7	2	5		
	Oxygen (O)	8	2	6		
	Fluorine (F)	9	2	7		
	Phosphorus (P)	15	2	8	5	
	Sulphur (S)	16	2	8	6	
	Chlorine (Cl)	17	2	8	7	

In the sodium atom ,

1. How many electrons are more than the nearest noble gas Neon?

So to gain stability,

1. What is Valency?
2. What is the valency of (a) Sodium, (b) Neon (c) Magnesium
3. Define ionic bond.
4. Identify the compound has ionic bond in the following
   a)NaCl b)NH_3 c) HCl

	2. How many electrons will it lose to get the Neon configuration? So Na Loses one electron and form Na^+ (Cation). Similarly 3. How many electrons in Chlorine are short of the nearest noble gas Argon? So Chlorine gains one electron to become Cl^- ion.(Anion) If sodium and chlorine were to react, the electron lost by sodium could be taken up by chlorine. So both these elements can have a give-and-take relationship, by that both atoms to get stable octet configuration as follows $Na \rightarrow Na^+ + 1e^-$ 2,8,1 2,8 (Sodium cation) $Cl + 1e^- \rightarrow Cl^-$ 2,8,7 2,8,8 (Chloride anion) 4. Do opposite charges attract or repel? 5. When Na+ and Cl^- approach each other do they have attraction or repulsion between them? The strong electrostatic force of attraction between	5. Explain the formation of Na2O and MgO by the transfer of electrons	

	the Na+ and Cl^- forms NaCl molecule. The compounds formed in this manner by the transfer of electrons from a metal to a non-metal are known as ionic compounds or electrovalent compounds 1. Can you explain the formation of $MgCl_2$ by this method?	6. Identify the cation and anion present in the $MgCl_2$, NaBr and CaF_2	

Teachers' reflections and experiences:

1) Students Differentiates the reactions of metals and non-metals.
2) Students Give examples for both metals and non-metals

Class: X
Chapter: Metals and Non-Metals
Total No; of periods:12
Period No: 08
Key Concepts: Properties of Ionic Compounds

Learning Outcomes	Teaching-Learning Process	Pointers for assessment	Materials required
• Investigate and describe the Physical properties of salts • Demonstrate the properties of various ionic compounds • Compare the melting points and boiling points ionic compounds used in daily life. • Analyses the flame colour	**<u>Introduction:</u>** 1. What is the formula of table salt? 2. What is the type of bond present in NaCl? 3. Can you name some other ionic compounds? 4. What is theirs' physical state? Take a rock salt in hand and try to break it using a stone. 1. What do you observe? The rock salt further broken into pieces when we apply pressure suggests that the Rock salt is an **ionic compound, it is hard and brittle**. 2. Why Ionic compounds are hard? Perform the activity 3.13 by taking the samples of NaCl, KI, $BaCl_2$ or any salt in a metal spatula and heat it as shown in the following figure.	1. Why Ionic compounds are	1)Test tube stand 2)Test tubes 3)burner 4)metal spatula 5)beaker 6)water 7)Iron nail 8)Electrodes 9)Battery 10)Bulb 11)Switch Byju's tab content on the properties of ionic compounds

of different metal salts and colour changes in the salt when kept in flame.

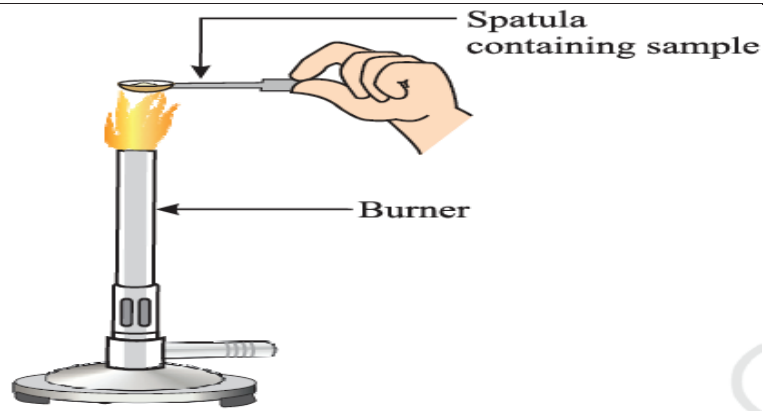


Figure 3.7
Heating a salt sample on a spatula

3. Do you observe any colour when metal salts are kept in flame of Bunsen burner? If so mention them.
4. Why do these salts melt when kept in the flame?

As the ionic compounds have strong inter-ionic attractions, by that they have high Melting points and high Boiling Points.

hard?
2. Mention the colour of the flame when salt is kept in a Bunsen burner flame with metal spatula.

Metal	Colour
NaCl	
KI	
BaCl2	
$CaCl_2$	
$CuSO_4$	
SrCl2	

3. Are Ionic compounds soluble in kerosene?
4. Why do ionic compounds have high melting points?
5. Ionic compounds are good conductors of electricity. Explain

Table 3.4 Melting and boiling points of some ionic compounds

Ionic compound	Melting point (K)	Boiling point (K)
NaCl	1074	1686
LiCl	887	1600
$CaCl_2$	1045	1900
CaO	2850	3120
$MgCl_2$	981	1685

Put the samples of these salts in each of the test tubes containing water, kerosene and petrol, observe the solubility.

1. In which solvents the salts are soluble?

Ionic substances are generally soluble in Water and insoluble in solvents like kerosene and petrol.

As the ionic compounds are soluble in water. Take aqueous solutions of NaCl, KI and $BaCl_2$ and place them one after the other in the apparatus containing the electrodes as shown in the figure.

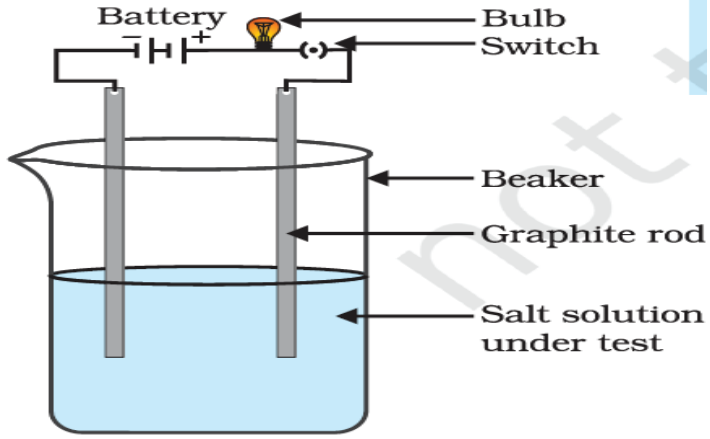


Figure 3.8
Testing the conductivity of a salt solution

2. Does the bulb glows in all the salt solutions?
3. When the bulb glows? Is the circuit closed or open?

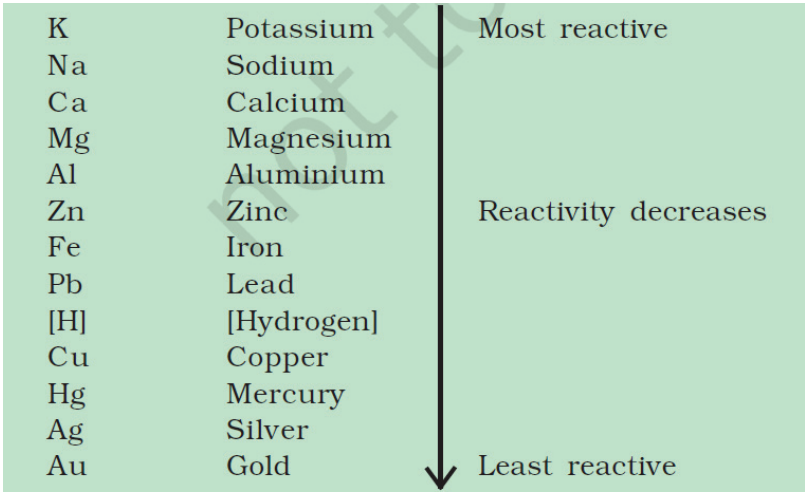
Based on the bulb glowing we conclude that the circuit is completed (closed) by the salt solution. The conduction of electricity through a solution involves the movement of charged particles called ions. The ions are moved to opposite electrodes when electricity is passed. So Ionic Compounds are good conductors of electricity as Aq solutions.

1. Do the ionic compounds conduct electricity in

	Solid State? The ionic compounds do not conduct electricity in solid state due to rigid structure and lack of movement of ions. **The Ionic compounds conduct electricity in both molten state and in solution.**		
Teachers' reflections and experiences: **1) Students Explain the properties of Ionic compounds.** **2) Students Discuss the formation of ionic compounds from its ions.**			

Class: X
Chapter: Metals And Non-Metals
Total No. of Periods: 12
Period No: 09
Key Concepts: Occurrence & Extraction of Metals

Learning Outcomes	Teaching-Learning Process	Pointers for assessment	Materials required
1) Describe the conditions needed for the extraction and reactions taking place during extraction. 2) Explain the extraction of metals according to their position in activity series. 3) Understand the availability of metals as ores or as in native state based on their reactivity.	**<u>Introduction:</u>** 1) Name the metals with which the cooking vessels are prepared? 2) Where do you find the metals on earth? 3) Do they exist in pure form or in combined state? The major source of metals is Earth's Crust. 1) Where do you get Sodium chloride (Table Salt) naturally? 2) Are there any other salts present in Sea water other than NaCl? So the elements or compounds which occur naturally in the earth crust are called minerals. 1) Can you extract metals from all the minerals available in earth crust?	1) Define Mineral 2) Define Ore 3) Write the differences	1) Charts showing reactivity of metals 2) Chart showing ores of various metals 3) Byju's tab content on occurrence of metals.

	Suppose you have 2 minerals A and B of same metal. If A has 50% of metal and B has 30% of metal. 1) From which mineral you can extract more metal? **So minerals which contain very high percentage of metal and can be profitably extracted are called Ores.** We have already discussed the reactivity order of metals in earlier classes  2) Which among the series are least reactive metals? The metals at the top of the activity series	between Ore and Minerals. 4) What is the major source of ores or minerals? 5) Give examples of metals which are available in Free State? 6) Why metals like Na, K, and Ca do not available in free state? 7) Name some ores of Na 8) Why the metals like Zn, Fe, Pb mainly found as oxides in nature.	NCERT Video link https://youtu.be/VVid07QbNxM

	(K, Na, Ca, Mg and Al) are so reactive that they are called as **highly reactive metals**, they never found in free state. The metals in the middle of the activity series (Zn, Fe, Pb, etc.) are **moderately reactive metals**. They are found in the earth'scrust mainly as oxides, sulphides or carbonates. The metals at the bottom of the activity series are **least reactive Metals**. Examples are gold; silver, platinum and copper.They are often found in a free state. 3) Can you classify the metals based on their reactivity?		

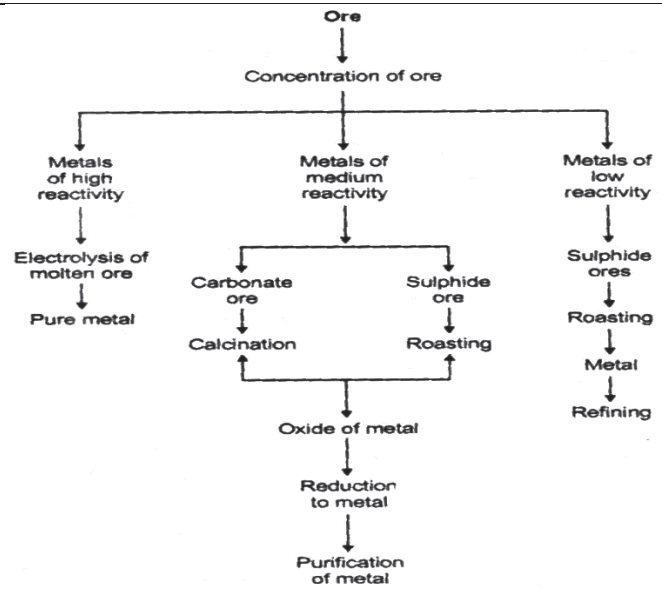
<u>Teachers' reflections and experiences:</u>

1) Understands the extraction of metals.

2) Give various examples ores for different metals.

Class: X
Chapter: Metals and Non-Metals
Total No. of Periods:12
Period No: 10
Key Concepts: Enrichment of ores- Extraction of low and moderate reactive metals in activity series.

Learning Outcomes	Teaching-Learning Process	Pointers for Assessment	Materials required
1) Describe the conditions needed for the extraction and reactions taking place during extraction. 2) Explain the extraction of metals according to their position in activity series. 3) Understand the availability of metal as ores based on their reactivity. 4) Describe and represent chemical reactions during the	**Introduction:** 1. Write the difference between Ore and Minerals. If you have pure metal and impure metal 2. Which one do you choose for preparing various items? 3. Can you prepare iron rod directly from iron ore? So we need to extract pure metal from ores which involves various steps as shown below.		Charts showing name of the ores and formulas Byju's tab content NCERT VIDEO LINK https://youtu.be/VVid07QbNxM

enrichment of ore	 Steps involved in the extraction of metals from ores **Enrichment of Ores:** If any ore is extracted from earth which impurity is associated with it? The impurities such as Soil, Sand etc. associated with it are called Gangue. In order to extract metal from the ore first we have to remove the gangue particles. **This process of removing gangue particles from the ore is called as the concentration or dressing of the ore.** Different processes are used to extract the metals	1) Define ore? 2) Define gangue? 3) Identify less reactive metal of the following. a) Hg b) Na c) Fe d) K 4) Name the ore of mercury? 5) Name the metal not present in the middle of activity series? a)Fe b)Zn c)Pb d)Au 6) Copper is extracted by----- method 7) Heating ore in the absence of air is called -------- 8) Main functions of roasting is	

	based on the activity series. **<u>Extraction of low reactive Metals in the Activity Series:</u>** Metals like mercury, copper are extracted by reducing their oxides by simply heating alone. **For example:** Cinnabar (HgS), which is an ore of mercury and Copper glance (Cu_2S) which is an ore of Cu, can be reduced by heating in air. 1)Extraction of mercury $2HgS(s) + 3O_2(g) \xrightarrow{Heat} 2HgO(s) + 2SO_2(g)$ $2HgO(s) \xrightarrow{Heat} 2Hg(l) + O_2(g)$ 2)Extraction of Copper $2Cu_2S + 3O_2(g) \xrightarrow{Heat} 2Cu_2O(s) + 2SO_2(g)$ $2Cu_2O + Cu_2S \xrightarrow{Heat} 6Cu(s) + SO_2(g)$ 1. What is meant by reduction process? **<u>Extraction of moderate reactive Metals in the middle of the activity series.</u>** The metals in the middle of the activity series such as iron, zinc, lead, copper are moderately reactive. These are usually present as sulphides or carbonates in nature.	a)To remove volatile substance b)Oxidation c)Reduction d)slag 9) Why Aluminum is used along with Fe_2O_3 to join railway tracks? 10) What is the difference between Calcination and Roasting? 11) Name the two metals which are found in free state? 12) What is the chemical process used for obtaining a metal from its oxide?	

	The metal sulphides and carbonates must be converted into metal oxides, and then reduction is easily done to obtain the metal. The sulphide ores are converted into oxides by heating strongly in the presence of excess air. This process is known as Roasting $2ZnS(s) + 3O_2(g) \xrightarrow[\text{Roasting}]{\text{Heat}} 2ZnO(s) + 2SO_2(g)$ The carbonate ores are changed into oxides by heating strongly in limited air. This process is known as Calcination. $ZnCO_{3(s)} \xrightarrow[\text{(Absence of air)}]{\text{Heat}} ZnO_{(s)} + CO_{2(g)}$ Zinc carbonate (Calamine-ore of Zn) When zinc oxide is heated with carbon, it is reduced to metallic zinc. $ZnO(s) + C(s) \rightarrow Zn(s) + CO(g)$ 2. What is the role of Carbon in above reaction? 3. Which type of reaction took place? The highly reactive metals such as sodium, calcium, aluminium, etc., are used as reducing agents because they can displace metals of lower reactivity from theircompounds.		

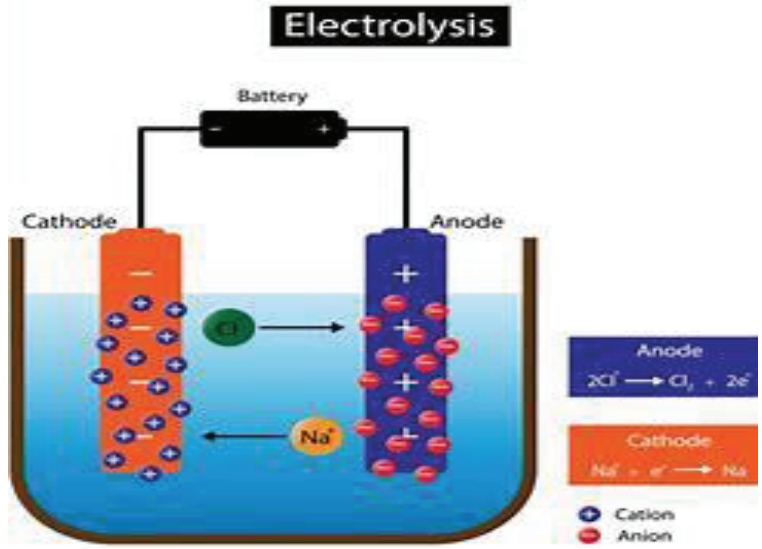
	For Example: When Magnesium dioxide is heated with Aluminium powder, Aluminium displaces the Magnesium in the molten state due to highly exothermic reaction. 1. Is it easy to join the broken rail track which is made of iron? The reaction of iron (III) oxide (Fe_2O_3)with aluminium is used to join railway tracks or cracked machine parts. This reaction is known as the **Thermite reaction.** $Fe_2O_3(s) + 2Al(s) \rightarrow 2Fe(l) + Al_2O_3(s) + Heat$		

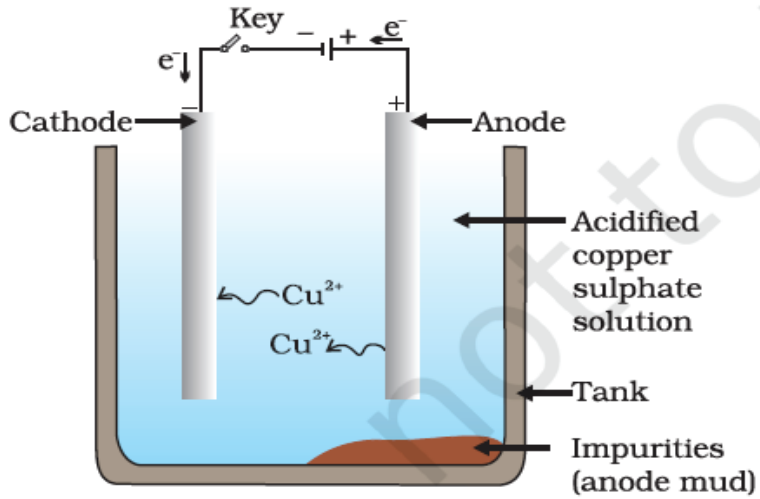
Teachers' reflections and experiences:

1) Students Explain the extraction of metals according to their position in activity series.
2) Students Understand the availability of metal as ores based on their reactivity.

Class: X
Chapter: Metals and Non-Metals
Total No. of periods: 12
Period No: 11
Key Concepts: Extraction of highly reactive metals – electrolytic reduction and electrolytic refining

Learning Outcomes	Teaching-Learning Process	Pointers for assessment	Materials required
1)Describe the conditions needed for the extraction 2) Explain the extraction of metals by different methods based on their position in activity series. 3) Understand the existence of metals as ores based on their reactivity. 4)Describe and represents chemical reactions during the enrichment of ore	**Introduction:** 1. Which type of metals can be extracted by reduction of ore with carbon? 2. Which type of metals can be extracted by roasting of ore? 3. Can the highly reactive metals be extracted from their ores by reduction method? Carbon cannot reduce the oxides of sodium, magnesium, Calcium, Aluminum, etc., to the respective metals. This is because these metals have more affinity for oxygen than carbon. These metals are obtained by electrolytic reduction. By the electrolysis of their molten chlorides as		Charts showing the process of electrolytic reduction Chart showing the electrolytic refining of Copper. NCERT VIDEO LINK https://youtu.be/itzhRmH52IY

	shown in the following figure.  The metals are deposited at the cathode (the negatively charged electrode), Whereas chlorine is liberated at the anode (the positively charged electrode) the following reactions takes place At cathode: **$Na+ + e^- \rightarrow Na$** At Anode: **$2Cl^- \rightarrow Cl_2 + 2e^-$** 1. Can you write the equations of the electrolytic reduction of Aluminum Oxide? 2. Is the metal extracted at the cathode pure or not? For purification of the metals we use Electrolytic refining method.	1) Name some highly reactive metals in metal activity series. 2) Why not Calcination and roasting methods used for the extraction of highly reactive metals? 3) At which electrode the metal is deposited after electrolytic reduction? 4) The type of reaction taking place at cathode is_____ 5) How are the highly reactive metals obtained from their ores? Explain.	Byju's video : electrolytic reduction. https://youtu.be/u8yNUUEjkBA

	The metals like copper, Tin, Nickel, Silver, Gold etc., are refined by electrolysis.  ***Figure 3.12*** *Electrolytic refining of copper. The electrolyte is a solution of acidified copper sulphate. The anode is impure copper, whereas, the cathode is a strip of pure copper. On passing electric current, pure copper is deposited on the cathode.* The impurities which are insoluble deposited at the bottom of the container called as Anode Mud.		

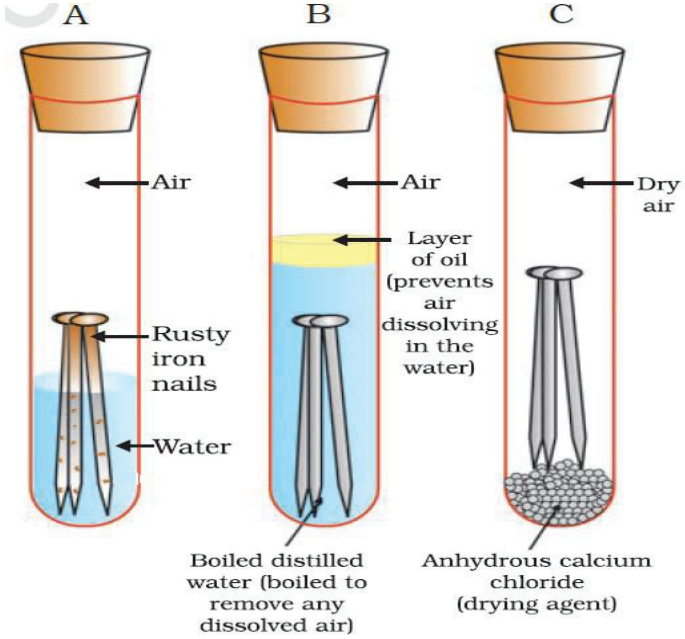
Teachers' reflections and experiences:

1) Students Define electrolytic reduction and electrolytic refining.

2) Students Explain the methods used to extract highly reactive metals.

Class: X
Chapter: Metals and Non-Metals
Total No. of periods: 12
Period No: 12
Key Concepts: Corrosion & prevention of Corrosion

Learning Outcomes	Teaching-Learning Process	Pointers for assessment	Materials required
1) Investigate the factors causing corrosion in metals. 2) Analyses how alloys are used in daily life. 3) Interpret the various methods to prevent rusting.	**Introduction:** 1. Name one hardest and widely used metal for making hammer. 2. What will happen to the iron nail left in open moist air for some days? 3. Why the colour of Silver vessels change left open in air? 4. Which colour is seen on the Copper vessels left open in air for few days? 5. What is the name of the phenomenon in the above changes? In the above 3 cases metals oxidized to metal ions. Ag to Ag+, Cu to Cu^{+2}, Fe to Fe^{+3}.This process is called Corrosion. 1. Is there any other name for the corrosion of iron? Iron when exposed to moist air for a long time acquires a coating of a brown flaky substance called	1. Which metals do not	1. Test tubes 2. Test tube stand 3. Iron nails 4. Water 5. Rubber corks 6. Oil 7. Anhydrous CaCl2 Byju's video link **https://youtu.be/uAcTMVYNbEQ**

	rust. 2. What conditions are necessary for the iron to rust? Let us perform the activity 3.14 by taking iron nails.  ***Figure 3.13*** *Investigating the conditions under which iron rusts. In tube A, both air and water are present. In tube B, there is no air dissolved in the water. In tube C, the air is dry.* After performing activity,	corrode easily? 2. What are alloys? 3. Write the uses of alloys. 4. Which reaction takes place in the corrosion? a) Reduction b) oxidation c) both d) None of the above 5. What is the name of the compound formed by silver when exposed to air? a)AgS b) $AgNO_3$ c) AgCl d) Ag_2O 5) Write the name of the compound formed by Copper when reacts with air. a) Cu_2S b) Cu_2O c)$CuCO_3$ d) $Cu(NO_3)_2$ 6) Which is the method not used to prevent rusting of iron? a)Oiling b) Greasing c) Chrome Plating d) Electrolysis.	

	3. In which test tube, is the Iron nail rusted? 4. Why in test tube B and C the iron nail is not rusted? So we can conclude that for the rusting of iron both Air (Oxygen) and moisture (water) are required. 1. Name some disadvantages of rusting in our surrounding objects made-up of iron. 2. How do we prevent corrosion of such objects? **<u>Prevention of Corrosion :</u>** The rusting of iron can be prevented by painting, oiling, greasing, galvanising, chrome plating, anodising or making alloys. Galvanisation is a method of protecting steel and iron from rusting by coating them with a thin layer of zinc. The galvanised article is protected against rusting even if the zinc coating is broken. 1. What is an alloy? An alloy is a homogeneous mixture of two or more metals or a metal and a non metal. The electrical conductivity and melting point of an alloy is less than that of pure metals. Alloying is a very good method to get the desired properties	7) Write the composition of Stainless steel. 8) Which alloy has low melting point and used in welding. a) Amalgam b) Bronze c) Brass d) Solder	

	examples: 1. Steel–Iron, Carbon (hard, tough and strong) 2. Stainless steel –Iron, Chromium, Nickel(hard, does not rust) 3. Brass–Copper, Zinc (malleable, strong, resistant to corrosion) 4. Bronze–Copper, Tin (very strong, highly resistant to corrosion) 5. Solder –Lead, Tin (low melting point ,used for welding electrical wires together) If one of the metals in an alloy is mercury, it is called an amalgam. 1. Is ornament gold is alloy or not? The iron pillar near the Qutub-Minar in Delhi was built more than 1600 years ago by the iron workers of India is resistant to rusting. *2.* Can you find the reason?		

Teachers' reflections and experiences:

1) Students Investigate the factors causing corrosion in metals
2) Students Analyses how alloys are used in daily life.

WORKSHEET 1

Q1. Which of the following is the correct arrangement of the given metals in ascending order of their reactivity?
Zinc, Iron, Magnesium, Sodium

a.) Zinc > Iron > Magnesium > Sodium
b.) Sodium > Magnesium > Iron > Zinc
c.) Sodium > Zinc > Magnesium > Iron
d.) Sodium > Magnesium > Zinc > Iron

Q2. Which of the following metals forms a protective layer on oxidation?

a.) Mg
b.) Na
c.) Al
d.) Fe

Q3. Solder is an alloy of:

a.) lead and tin
b.) copper and tin
c.) zinc and lead
d.) mercury and other metals

Q4. Which of the following non-metal is a good conductor of electricity?

a.) Chlorine
b.) Graphite

c.) Sulphur
d.) Phosphorus

Q5. Which of the following gases burns with a pop sound?

a.) Oxygen
b.) Carbon dioxide
c.) Hydrogen
d.) All of the above

Q6. What type of oxides are formed when non-metals combine with oxygen?
Q7. What is aqua regia? Name two special metals which are insoluble in common reagents but dissolve in aqua regia?

Q8. Which gas is liberated when a metal reacts with an acid? How will you test the presence of this gas?

Q9. What is a thermite reaction?

Q10. What is meant by the concentration of ore?

Q11. A metal M doesn't liberate hydrogen from acids but reacts with oxygen to give a black colour product. Identify M and the black-coloured product and also explain the reaction of M with oxygen.

Q12. Name the metals which have been placed:
a.) at the bottom of the reactivity series. b.) at the top of the reactivity series.
c.) just below copper in the reactivity series

Q13. Give three uses of metals and three uses of non-metals.

Q14. How ionic compounds are formed? State any three general properties of ionic compounds.

Q15. Give reasons:
a.) The oxides of metals like Na, Mg and Ca cannot be reduced by carbon. b.) Aluminium contains are used to transport nitric acid.

Q16. An ore on heating in air produces sulphur dioxide. Which process would you suggest for its concentration? Describe briefly any two steps involved in the conversion of this concentrated ore into related metal.

Q17. Explain the process of electro-refining of metals.

Q18. a.) Write the balanced chemical equations for the extraction of copper metal from its ore. What is the reducing agent used?
b.) Which reducing agent can be used in the extraction of metals placed at the top of the reactivity series? Give the name of the process also.
c.) What is the chemical substance formed as a green coating when the copper reacts with atmospheric gases in moist conditions?

Q19. Differentiate between metals and non-metals.

Q20. Give equations for the conversion of:
a.) Cinnabar to mercury. b.) Zinc carbonate to zinc.
c.) Manganese dioxide to manganese d.) Zinc sulphide to zinc

WORKSHEET-2

Q1. Which of the following alloys contains mercury as one of the constituents?
a.) stainless steel
b.) solder
c.) duralium
d.) zinc amalgam

Q2. A basic oxide will be formed by which of the following element?
a.) K
b.) S
c.) P
d.) Kr

Q3. Which of the following metal exists in liquid state?
a.) Na
b.) Ag
c.) Cr
d.) Hg

Q4. Which of the following is the most reactive metal?
a.) Aluminium
b.) Copper
c.) Tin
d.) Calcium

Q5. Which of the following is not a property of a metal?
a.) Malleable
b.) Ductile
c.) Non-lustrous
d.) Conductor

Q6. Define the activity series of metals.

Q7. What are amphoteric oxides? Give two examples of amphoteric oxides.

Q8. An element X is soft and can be cut with a knife easily. This is very reactive with air and cannit be kept open with air, it reacts vigorously with water. Name the element X.

Q9. Fill in the blanks.
a.) Metals can form positive ions by_.
b.) Electrical wires have a coating of an insulating material____. c.) The liquid non-metal is____.

Q10. a.) Explain why metals usually do not liberate hydrogen gas with dilute nitric acid.
b.) Name two metals which can however liberate hydrogen gas on reacting with dilute nitric acid.

Q11. How does the method used for extracting a metal from its ore depend on the metal's position in the reactivity series? Explain with examples.

Q12. Explain any three methods used for preventing corrosion of metals.

Q13. A solution of $CuSO_4$ is kept in an iron pot. After a few days the iron pot was found to have a number of holes in it. Explain the reason in terms of reactivity. Write the equation of the reaction involved.

Q14. Give the steps involved in the extraction of metals of low and medium reactivity from their respective sulphide ores.

Q15. a.) Silver and copper lose their shine when they are exposed to air. Name the substance formed on their surface in each case.
b.) Tarnished copper vessels are cleaned with tamarind juice.
c.) Aluminium is more reactive than iron yet there is less corrosion of aluminium as compared to iron when both are

exposed to air.

Q16. Write one example of each of the following:

a.) The most malleable metal and most ductile metal.

b.) The best conductor of heat and the poorest conductor of heat.

c.) A metal with the highest melting point and metal with the lowest melting point.

Q17. The atomic numbers of elements A, B and C are 11, 17 and 6 respectively. a.) Which of these elements is a metal that forms a mono-positive ion?

b.) Which of the two elements combine through ionic valency. c.) What is the formula of the compounds C and B.

Q18. a.) When calcium metal is added to water, the gas evolved does not catch fire but the gas evolved on adding potassium metal to water catches fire. Explain why?

b.) Name a metal for each case:

i.) It displaces hydrogen gas from tantric acid.

ii.) It does not react with any physical state of water.

iii.) It does not react with cold as well as hot water but reacts with steam.

Q19. Give reasons:

a.) Carbon cannot reduce the oxides of Na or Mg.

b.) NaCl is not a conductor of electricity in a solid state.

c.) Metals like Na, K, Ca and Mg are never found in their free state in nature.

d.) Iron articles are galvanized.

Q20. Answer the following:

a.) What is an alloy? How is an alloy made?

b.) What elements are present in steel? How are the properties of steel different from those of pure iron?

c.) Give the constituents and one use of brass.

d.) Name an alloy of copper. State its chemical composition and one use.

WORKSHEET-3

Q1. Which of the following metal will react with dilute nitric acid to produce hydrogen gas.

a.) Mg
b.) Zn
c.) Al
d.) Sn

Q2. Which of the following metal does not react with dilute HCl-

a.) Al
b.) Cu
c.) Zn
d.) Fe

Q3. The atomic number of an element X is 19. The number of electrons in its ion X^+ will be: a.) 18
b.) 19
c.) 20
d.) 21

Q4. Which of the following is an iron ore?

a.) Cinnabar
b.) Calamine
c.) Haematite
d.) Rock salt

Q5. Which of the following four metals would be displaced from the solution of its salt by the other three metals?

a.) Zn
b.) Ag
c.) Cu
d.) Mg

Q6. Name two elements that are stored in kerosene. Explain why?
Q7. Explain galvanisation.

Q8. Why copper is used to making hot water tanks but not steel?

Q9. Name two metals which occur in nature in free state as well as in combined state.

Q10. How is the method of extraction of metals high up in the reactivity series different from that for metals in the middle? Why the same process cannot be applied for them? Explain giving extraction of sodium.

Q11. A substance X which is an oxide of a metal is used intensively in the cement industry. This substance is present in bones also. On treatment with water, it forms a solution which turns red litmus blue. Identify X and also write the chemical reactions involved.

Q12. Differentiate between roasting and calcination.

Q13. Show the formation of Na_2O and MgO by the transfer of electrons.

Q14. a.) Carbon cannot be used as reducing agent to obtain Mg from MgO. Why?
b.) How is sodium obtained from molten sodium chloride? Give equation of the reactions. c.) How is copper obtained from its sulphide ore? Give equations of the reactions.

Q15. Explain the following by giving examples. a.) How do metal oxides react with acids?
b.) How do non-metal oxides react with the base?

Q16. Compound X and aluminium are used to join railway tracks. a.) Identify the compound X.

b.) Name the reaction
c.) Write the equation of the reaction.

Q17. a.) Give a brief explanation of the electrolytic refining of impure copper with a labelled diagram.
b.) Name two alloys prepared from copper and write their uses.

Q18. Give reasons:
a.) White phosphorus is kept immersed in water.
b.) School bells are made up of metals.
c.) Electric wires are made up of copper.
d.) Calcium metal after reacting with water starts floating on its surface.

Q19. Define the following terms:
a.) Mineral
b.) Ores
c.) Gangue
d.) Refining of metals

Q20. Answer the following:
a.) Hydrogen is not a metal but still has been assigned a place in the reactivity series of metals. Why?
b.) Name the gas in the air that tarnishes silver articles slowly.
c.) Why do gold ornaments look new even after several years of use?
d.) How many carats are in pure gold? Why is pure gold not suitable for making ornaments.

LESSON PLAN
Chapter-4

1064CH04

Class: 10th

Subject: Chemistry

Name of the lesson: Carbon and Its compounds

Total number of Periods: 12 (11+1)

Key concepts: Covalent bond in Carbon, Allotropy of carbon, Versatile nature of carbon,Saturated & Unsaturated compounds of carbon and theirs nature, Chains, Branches and ring compounds of Hydrocarbon, Homologous series of Hydrocarbons, Nomenclature of carbon compounds, Chemical reactions: Combustions and Oxidation reactions, Chemical properties: Addition and Substitution reactions, Ethanol and properties, Ethanoic acid and properties, Soaps and detergents

Aims of Education:

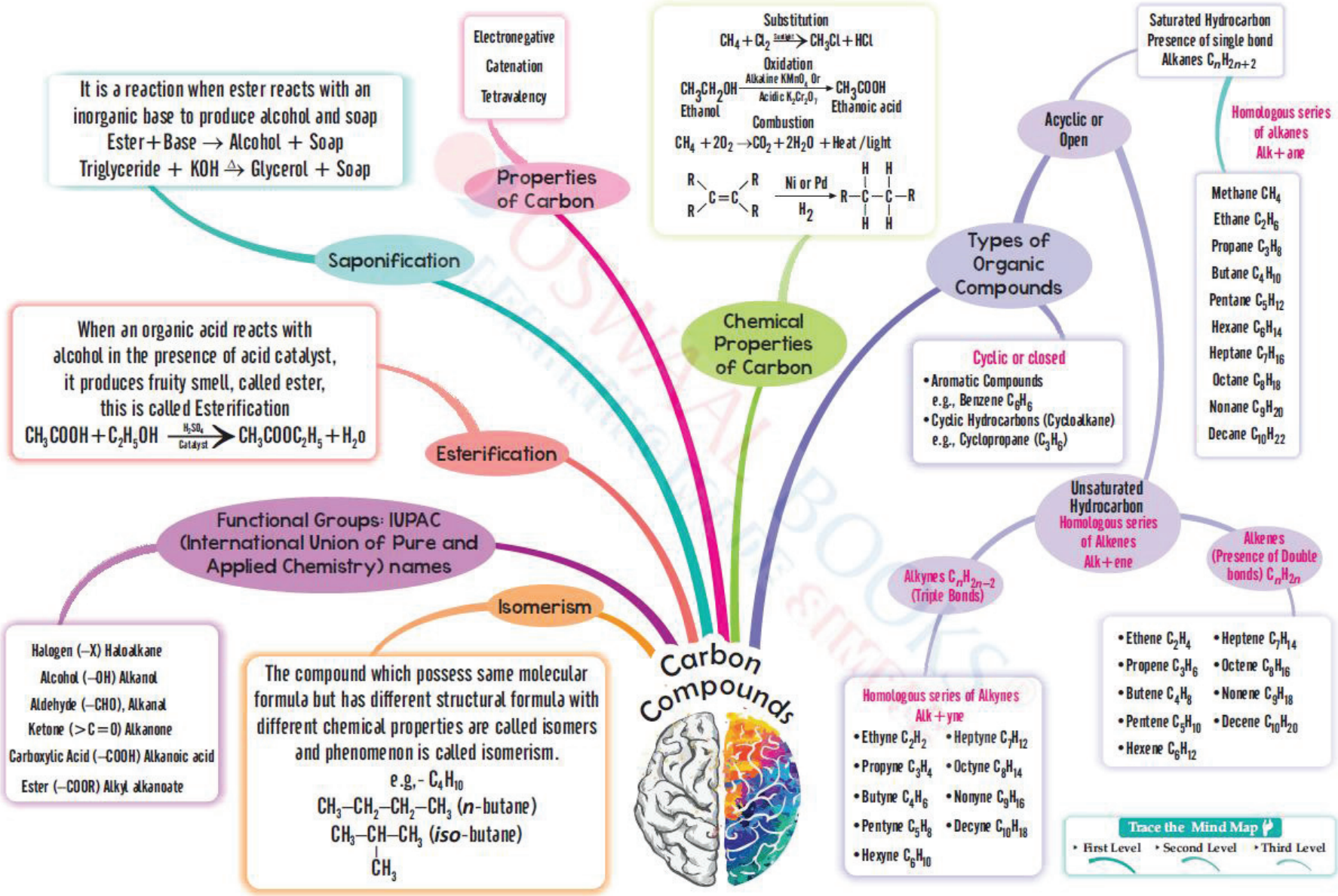
1. **Rational Thought and Autonomy:** An individual should have the capacity of rational reasoning and sufficient knowledge to understand the world around them. An individual should be able to make an informed decision. This fundamentally requires knowledge in breadth and depth.
2. **Health and wellbeing**
3. **Democratic participation:** This requires appropriate knowledge capacities, values, and dispositions so that an individual may be oriented towards sustaining and improving the democratic functions of Indian society.
4. **Economic participation:** Education should work as an enabler for a healthy democracy as well as a healthy economy.

5. **Cultural and social participation:** Along with democracy and economy, society, and culture also play an important role in the mode of associated living. An individual should acquire capacities and a disposition to contribute meaningfully to culture.

Aims of Science:

1. **Scientific understanding of the natural and physical world:** Scientific understanding develops through scientific observations, questions, experiments, theories, laws, principles and concepts. An adequate knowledge of these is essential to build a systematic and verifiable understanding of the way the natural and physical world functions.
2. **Capacities for Scientific enquiry:** The abilities to put forth hypotheses, arguments, predictions and analyses, and to test hypotheses, evaluate situations, and draw logical conclusions, are fundamental to the learning of science. Science education must does build these skills in students systematically over the stage in school.
3. **Interdisciplinary understanding between Science and other curricular areas:** Learning in science involves understanding interlinkages across disciplines. Students would learn to inquire and learn about the world through such an indisciplinary approach.
4. **Understanding of relationship between science, technology and society:** Engaging with issues related to connections between Science, Technology and Society including the ethical aspects and implications, and appreciating the role of science place in addressing the challenges and the world is undergoing, will add to the breadth of students learning.
5. **Scientific temper:** Students will imbibe scientific values and dispositions such as honesty, integrity, scepticism, objectivity, tenacity, preservance, collaboration and cooperation, concern for life, and preservation of the environment.
6. **Creativity:** Asking good questions, formulating hypotheses and designing good experiments to test those hypotheses often require artistry and creativity. Developing such creativity and a sense of aesthetic in the pursuit of scientific understanding and exploration is very important.

Mind Mapping:



Curricular Goals:

CG-1: Explores the world of matter, its interactions, and properties at the atomic level:

Competencies:

1. Describes the nature of bonding and classification of hydrocarbons & homologous series
2. Investigates the nature and properties of different carbon compounds based on their chemical & physical activity.
3. Describes and represents chemical interactions and changes using symbols and chemical equations.

CG-2: Explores the physical world around them and understands scientific principles and laws based on observations and analysis:

Competencies:

1. Applies the concept of nomenclature to name the carbon compounds
2. Manipulates and analyses different characteristics of hydrocarbons and other functional group compounds.

CG-4: Explores interconnection between molecules of matter and environment:

Competencies:

1. Applies the concept of soaps, detergents and cleaning actions of soaps & detergents in daily life and observe the uses of different carbon compounds (Ethanol & Ethanoic acid, etc….) in daily life.
2. Analyses the causes for the differences in chemical properties of saturated and unsaturated carbon compounds.

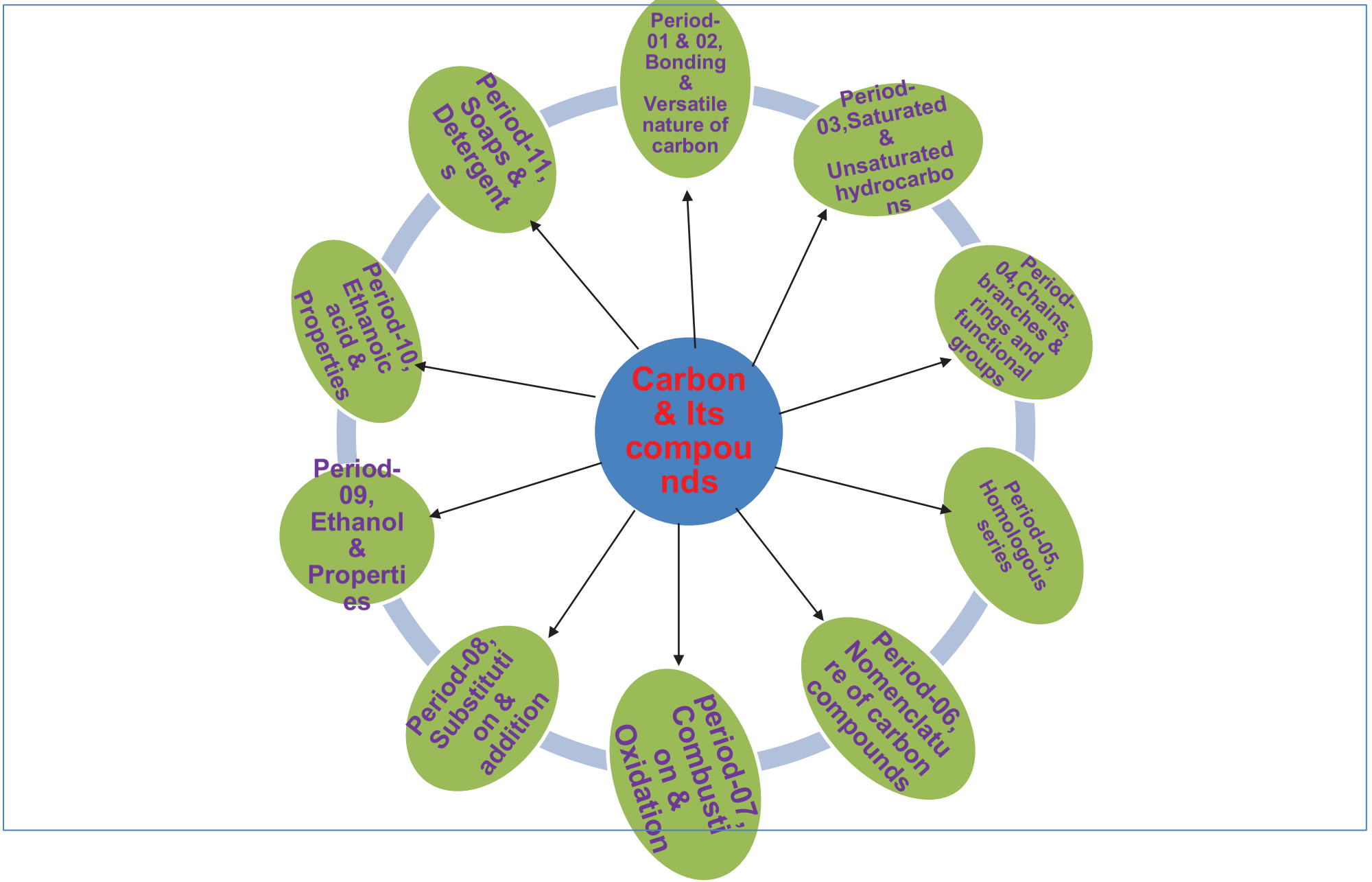
CG-5: Draws linkages between scientific knowledge and knowledge across other curricular areas

Competencies:

1. Explores the literature of nomenclature of organic compounds.

CG-8: Explores the nature of science by doing science

Competencies: Develops accurate and appropriate molecular structures of carbon compounds.


Carbon & Its compou nds
Period-01 & 02, Bonding & Versatile nature of carbon
Period-03,Saturated & Unsaturated hydrocarbo ns
Period-04,Chains, branches & rings and functional groups
Period-05, Homologous series
Period-06, Nomenclatu re of carbon compounds
period-07, Combusti on & Oxidation
Period-08, Substituti on & addition
Period-09, Ethanol & Properti es
Period-10, Ethanoic acid & Properties
Period-11, Soaps & Detergent s

Period No	Key-Concept	Learning outcomes
Period-01 & 02	Covalent bond in Carbon, Allotropy of carbon, Versatile nature of carbon	1) Describe the versatile nature of carbon in forming large number of compounds. 2) Investigates the reason behind the covalent bonding in Carbon compounds but not ionic bond. 3) Draws the different electronic dot structures of carbon compounds
Period-03	Saturated & Unsaturated compounds of carbon and theirs nature	1) Describe the nature and bonding of saturated and unsaturated hydrocarbon compounds. 2) Differentiates saturated and unsaturated compounds of carbon 3) Classifies unsaturated hydrocarbons
Period-04	Chains, Branches and ring compounds of Hydrocarbon	1) Describe and define structural isomers of Alkanes and cyclic hydrocarbons 2) Draw and represents the electron dot structures of different hydrocarbons 3) Classifies the hydrocarbons into Chain Branched & Cyclic hydrocarbons 4) Identify and classify the different functional groups among the carbon compound based on their structures.
Period-05	Homologous series of Hydrocarbons	1) Describe and define homologous series of carbon compounds 2) Identify and classify the members of homologous series of different functional groups. 3) Analyses the structural and mass differences among the homologous series , relates their properties.
Period-06	Nomenclature of carbon compounds	1) Analyses patterns of various homologous series in order to name them 2) Explore the literature of various carbon compounds to get

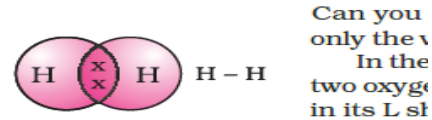
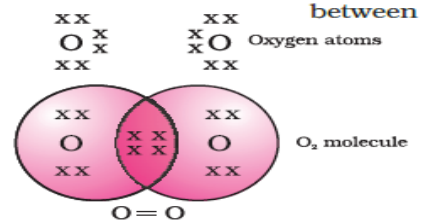
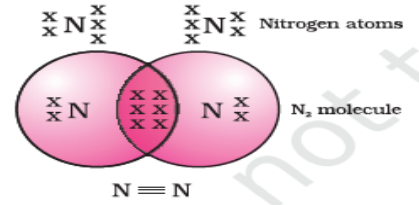
		awareness on the nomenclature 3) Draws accurate and appropriate molecule structure based on their nomenclature
Period-07	Chemical reactions: Combustions and Oxidation reactions	1) Studies the commonly used carbon compounds, their properties and uses 2) Validates the properties of commonly used carbon compounds by observing their uses
Period-08	Chemical properties: Addition and Substitution reactions	1) Studies the commonly used carbon compounds, their properties and uses 2) Validates the properties of commonly used carbon compounds by observing their uses
Period-09	Ethanol and properties	1. Describes how compounds are used in various industries. 2. Investigates the nature and properties of ethanol. 3. Demonstrates the reaction of metals with alcohol. 4. Applies this knowledge of Properties of alcohol in daily life .
Period-10	Ethanoic acid and properties	1. Describes how compounds are used in various industries. 2. Investigates the nature and properties of ethanoic acid. 3. Demonstrates the reaction of alcohols with acids. 4. Applies this knowledge of Properties of Ethanoic acid and ethyl acetate in daily life .
Period-11	Soaps and detergents	1. Describes the classification of various types of water 2. Investigate the nature the water with soap water. 3. Explains the relationship between the hardness of water and formation of lather with soap. 4. Demonstrates the hardness of water by simple experiments. 5. Applies the knowledge of soaps and detergents in their daily life.

Period Plan-1&2

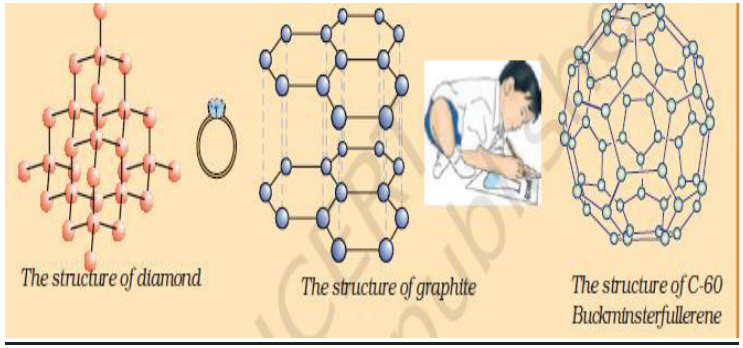
Class: 10TH CLASS
Chapter: Carbon & Its Compounds
Total no. of periods: 12
Period number: 01& 02
Key concepts: Covalent bond in Carbon, Allotropy of carbon, Versatile nature of carbon

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Describe the versatile nature of carbon in forming large number of compounds. 2). Investigates the reason behind the covalent bonding in Carbon compounds but not ionic bond. 3) Draws the different electronic dot structures of carbon compounds	1). Name the common element present in the coal, cotton, wood and other nutrients like vitamins, carbohydrates, etc..... 2). Name the forms of carbon present in the atmosphere. 3). What is the form of carbon present in the earth crust? 4). Is carbon present in living organisms? 5). Write the percentage amount of the carbon present in atmosphere and earth crust. 6). Is the percentage of carbon less or higher in amount?	1). Write the name of the carbon compounds that are present in living things (plants & Animals. 2). Which carbon compounds exempted from the branch of Organic Chemistry? 3). Is this true about the carbon compounds? Explain. (a). They are good conductors of electricity. (b). The carbon compounds have low	Chapter's link: https://youtu.be/j71-My1XH0k https://diksha.gov.in/play/collection/do

	7). How many compounds can formed by carbon with least percentage of abundance? By discussion of the above questions and answers, teacher introduces the concept of "Carbon & Its compounds". **4.1-Bonding in Carbon-The covalent bond:** Teacher discusses and introduces the bonding nature, valence, types of bonds and covalent bonding of carbon in its compound by probing the following questions. 1). Write the atomic number and configuration of Carbon. 2). Write the valence of Carbon? 3). How carbon form bonds with other elements? 4). What type bond formed by Carbon in its compounds? 5). Why can't Carbon forms ionic bond? 6). What is a covalent bond? Give examples.	boiling points than ionic compounds. 4).Why carbon forms only covalent bonds but not ionic bonds? Give reasons. 5). Draw the electronic dot structures of the following compounds (a) Methane (CH_4), (b). Carbon dioxide (CO_2), (c). Ethene(C_2H_4), (d). Ethyne(C_2H_2). 6). List out the properties of carbon compounds.	3130736097956741211937?contentId=do_3131246969405767681 44 https://diksha.gov.in/play/collection/do_3130736097956741211937?contentId=do_3131246972095365121 51

	7). How many types of covalent bonds formed by Carbon? Give examples for each type of bond.  H – H **Figure 4.2** *Single bond between two hydrogen atoms* Can you only the v In the two oxyg in its L sh more elec electrons Fig. 4.3. two shar between t  Oxygen atoms O_2 molecule O = O **Figure 4.3** *Double bond between two oxygen atoms*  Nitrogen atoms N_2 molecule N ≡ N **Figure 4.4** *Triple bond between two nitrogen atoms* Such between molecule	1). Write the allotropic form of carbon which is (a). Grayish black opaque substance, (b). Colorless transparent having extraordinary brilliance. 2). Match the following	**Bucky ball link:** https://diksha.gov.in/play/collection/do_3130736097956741211937?contentId=do_313693903475064832149 Types of

	8). Can we call all these carbon compounds as covalent compounds? 9). Are the melting and boiling points of carbon compounds less or higher? 10). Do carbon compounds conduct electricity? By discussing the above questions and answers, teacher summarizes the concept of covalent bonding of carbon compounds and theirs properties. **2nd period** **Allotropes of Carbon(More to know)** By showing the piece of Coal, pencil lid, Lamp black, coconut charcoal, electrode(graphite) of the battery cell, asks the students 1). Are the above shown substances contain carbon or not? Will they contain other elements?	**Column-A** **Column-B** (i). Diamond (a) Geodesic dome (ii). Graphite (b). Tetrahedral (iii). Fullerenes (c). Hexagonal array 3). List out the uses of (a). Diamond (b). Graphite (c). Fullerenes 4). What are the two peculiar properties of carbon which lead to the huge number of carbon compounds we see around us? 5). Whether the statement is true or false	Bond, watch the below video link: https://youtu.be/DinMgWWwMUE For more information on Carbon allotropes, watch the below video https://youtu.be/4E8ShsaWssA

	2). Can you give other forms of carbon existing in nature? 3). Name the hardest form of carbon? 4). Name the conductivity form of carbon? By discussing the above questions and answers, teacher makes the learners to perceive the concept of different physical forms(allotropy) of carbon and theirs properties.  **4.2-Versatile nature of Carbon:** 1). Can name some compounds of carbon?	(a). Carbon small size is disadvantage to form long bonds. (b). The nucleus of carbon holds the shared pair of electrons very strongly.	

	2). How many Carbon compounds existing in nature? 3). Do other elements also can form these many compounds? 4). Why Carbon only can form millions of compounds than other elements? By discussing the above questions and answers, teacher introduces and explains “the versatile nature of Carbon”. **<u>Versatile properties of Carbon</u>** 1). What are number of valence electrons in Carbon? 2). Why Carbon is tetravalent? 3). Can carbon atom forms bonds with other carbon atoms? 4). Do you know the property of self-linking nature of Carbon? 5). Are there any other elements that show		Coal, pencil lid, lamp black, coconut charcoal, graphite rod,

	catenation? 7). Is the extent of catenation same for all elements? By discussion the above questions, answers and showing the structural models (Ball & Stick models) of Diamond, Graphite, Sulphur and Phosphorous, teacher summarizes the Concept of “Catenation and tetra valence of Carbon”.		Balls& Sticks-model
Teacher’s reflections and experiences: 1) Students describe the versatile nature of carbon. 2)Students investigates the reason behind the covalent bonding in Carbon compounds but not ionic bond			

Period Plan-3

Class: 10thCLASS
Chapter: Carbon & Its Compounds
Total no. of periods: 12
Period number:03
Key concepts: Saturated & Unsaturated compounds of carbon and theirs nature

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Describe the nature and bonding of saturated and unsaturated hydrocarbon compounds. 2). Differentiates saturated and unsaturated compounds of carbon 3). Classifies unsaturated hydrocarbons 4) Draws the	1). Name the compound present in CNG or LPG? 2). Which compound is used in ripening of fruits? 3). Write the type of bonding in between carbon atoms in the above compounds. 4). Does carbon form multiple bonds with other carbon atoms? 5). What is the name of the carbon compounds formed by only Hydrogen & Carbon? 6). Are all hydrocarbons have same structure and properties?	1). Draw the electron dot structures of the (a). Ethane, (b). Ethene, (c). Ethyne 2). Write the number of covalent bonds present in Propane. 3). Classify the following compounds	Chapter's link: https://youtu.be/j71-My1XH0k Byju's content and e-patasala https://diksha.gov.in/play/collection/do

<table>
<tr>
<td>different electronic dot structures of carbon compounds</td>
<td>By discussing the above questions and answers, teacher introduces and explains the concept of- “4.2.1-Saturated and Unsaturated Carbon compounds”.

Activity:
Teacher makes the class into 3 groups, distributed clay balls and broom sticks of equal length to each group. And asks them to prepare the models of the following

(a). Group-A: Methane (CH_4) & Ethane (C_2H_6).

(b). Group-B: Ethene (C_2H_4) & Propene (C_3H_6)

(c). Group-C: Ethyne (C_2H_2) & Propyne (C_3H4).

By discussing the observations of the above activity, teacher summarizes that the classification of hydro carbons into Alkanes, Alkenes & Alkynes with theirs general formulae.

Assignment:
Complete the following table with first 4 members to each group i.e. Alkanes, Alkenes and Alkynes.</td>
<td>as Alkanes, Alkenes and Alkynes.
(i). C_2H_6, (ii). C_3H_4, (iii). C_4H_8, (iv). C_2H_2

4). Find the odd one

(A). C_2H_4, C_3H_6, C_4H_{10}, C_4H_8

(B). C_2H_6, C_3H_6, C_3H_8, C_4H_{10}

(C). C_3H_6, C_2H_2,C_3H_4,C_4H_6

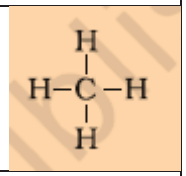
5) Why are one carbon Alkenes & Alkynes not possible?

6). Complete the following table

<table>
<tr><td>Compound</td><td>General formula</td><td>Example</td></tr>
<tr><td>Alkanes</td><td></td><td></td></tr>
<tr><td></td><td>C_nH_{2n}</td><td></td></tr>
<tr><td>Alkynes</td><td></td><td></td></tr>
</table>
</td>
<td>31307360979567411211937?contentId=do_3131246973719101441143

For more information on Saturated and Unsaturated Carbon Compoundshttps://youtu.be/x_urclNMoPs</td>
</tr>
</table>

			Clay balls and Broom sticks Coal, pencil lid, lamp black, coconut charcoal, graphite rod, Balls & Sticks-model

Name	Formula	Number of carbons	Structure
Methane	CH_4	1	

Teacher's reflections and experiences:

1) Students describe the nature and bonding in saturated and unsaturated hydrocarbon compounds.

2)Students differentiates saturated and unsaturated compounds of carbon.

Period Plan-4

Class: 10 th CLASS
Chapter: Carbon & Its Compounds
Total no. of periods: 12
Period number:04
Key concepts: Chains, Branches and ring compounds of Hydrocarbon

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1). Describe and define structural isomers of Alkanes and cyclic hydrocarbons 2). Draw and represents the electron dot structures of different hydrocarbons 3). Classifies the hydrocarbons into Chain Branched & Cyclic hydrocarbons	1). Write the structure of Butane. 2). Can you show the carbon linkage between carbon atoms in Butane? 3). Are all the carbon atoms in Butane linked in straight manner? 4). Can we call these types of linear linkage compounds as straight chain hydrocarbons? 5). Is any alternative way of linkage of these carbons in Butane? **Activity** By providing clay balls as carbons & hydrogens and equal length broom sticks as bonds to fix,	1). How many structural isomers	Chapter's link: https://youtu.be/j71-My1XH0k Clay balls & Sticks For more information on Functional

<table>
<tr>
<td>4). Identify and classify the different functional groups among the carbon compound based on their structures.

5) Draws the different electronic dot structures of carbon compounds</td>
<td>asks the students of four groups to rearrange C-C linkages in butane and form different structures.

After correcting the models from each group, teacher asks one of the students from each group to draw those structures on the black board.

1). Is there any difference between structures of four groups?

2). Do these compounds have difference in formula or C-C linkages?

Again teacher asks a student from one group to rearrange the carbons in closed ring form and draw the structure and formula of the cyclic ring.

3). Compare the molecular formulae of the normal Butane & Cyclic butane. Explain</td>
<td>possible for N-Hexane? Draw the structures.

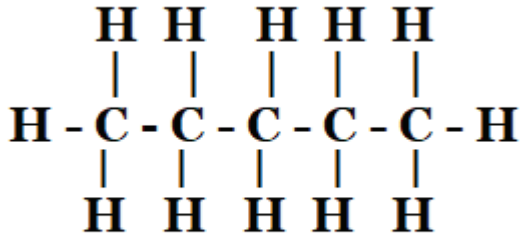
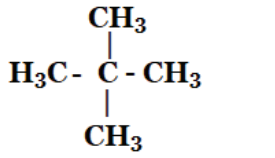
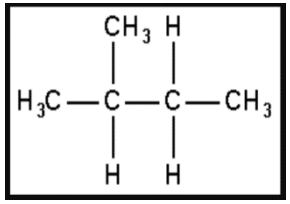
2). Complete the following table

<table>
<tr><th>Hetero atom</th><th>Class of compounds</th><th>Formula of functional group</th></tr>
<tr><td>Cl/Br</td><td></td><td>-Cl, -Br(Substitutes for hydrogen atoms</td></tr>
<tr><td>Oxygen</td><td>1.----------</td><td>-OH</td></tr>
<tr><td></td><td>2.Aldehyde</td><td>----------</td></tr>
<tr><td></td><td>3.----------</td><td>>C=O</td></tr>
<tr><td></td><td>4. Carboxylic acid</td><td>----------</td></tr>
</table>

3). Draw the structures of Benzene & Cyclo-hexane, write their formulae.

4). Draw the structures for the following compounds.
(i) Ethanoic acid (ii) Bromopentane</td>
<td>Groups and Types of Formulae, watch the below video:

https://youtu.be/vOb5HK_4EzE</td>
</tr>
</table>

	By discussing the observations from the above activity, teacher explains branched chain hydrocarbons, cyclic hydrocarbons and gives more examples for structural isomers. 1. Structural isomers of n-Pentane  **n-pentane**  2,2 dimethylpropane  2-Methyl Butane	(iii) Butanone (iv). Hexanal. 5). What will be the formula and electron dot structure of cyclo-pentane? 6). Butanone is a four-carbon compound with the functional group (a) carboxylic acid (b) aldehyde (c) ketone (d) alcohol	
Teacher's reflections and experiences: 1) Students describe and define structural isomers of Alkanes and cyclic hydrocarbons **2)**Students draw and represents the electron dot structures of different hydrocarbons			

Period Plan-5

Class: 10th CLASS
Chapter: Carbon & Its Compounds
Total no. of periods: 11
Period number:05
Key concepts:Homologous series of Hydrocarbons

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1).Describe and define homologous series of carbon compounds 2). Identify and classify the members of homologous series of different functional groups. 3). Analyses the structural and mass differences among the homologous series , relates their properties.	Methane→CH_4 Ethane→C_2H_6 Propane→C_3H_8 Butane→C_4H_{10} By showing the above structures of Alkanes, teacher asks the following questions. 1). Write the structures of the above organic compounds. 2). What is the difference between the chemical formulae of		Chapter's link: https://youtu.be/j71-My1XH0k Charts of the respective topics

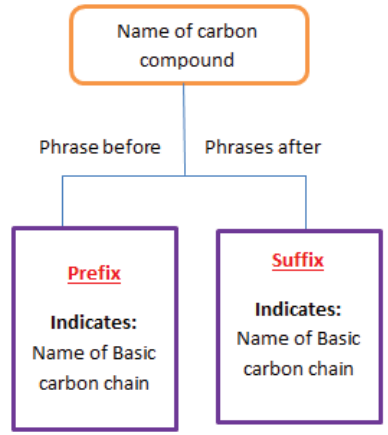
4). Draw and represents the electron dot structures of different hydrocarbons	(i). Methane (CH_4) & Ethane (C_2H_6) (ii). Ethane (C_2H_6) & Propane (C3H8) (iii). Propane (C3H8) & Butane (C4H10). . And also write the mass difference in each pair. Similarly take the group of Alkenes Ethene→C_2H_4 Propene→C_3H_6 Butene→C_4H_8 Pentene→C5H10 3). Do these Alkenes also differ by $-CH_2$ unit? And they have mass difference by 14 units among successive members? By discussing answers of the above questions, teacher introduces the concept of Homologous series and defines it.	1). write the next homologue member for the following compounds? (a)CH_3OH (b)HCOOH (C)C_3H_4 (d)CH_3CHO 2). Name the first member of the following homologous series. a)Alkanes b)Alkenes c)Alkynes d)Alcohols e)Aldehydes f) Carboxylic acid 3). Write the names of the compounds of homologous series for the following functional groups up to four carbons atoms. a) -OH b) -COOH c) -CHO d) -X	

	Activity-4.2: By showing the chart of series of alcohols, teacher asks the students to follow the instructions and note down the observations. →Arrange these Alcohols in the increasing carbon atoms. →Find out the functional group present in the given alcohols. →Write the structural difference of successive alcohols and also note down the mass difference. →Can you call these alcohols as a homologous series? →Do all these alcohols have same properties or different properties? →Write the general formula of Alcohols. By the above discussion, teacher summarizes the concept of Homologous series and its properties.	4). Why the compounds of the same homologous series have same chemical properties but different physical properties? Explain. 5). Identify the missed ones in the following (i). CH_4, ---------, C_3H_8, C_4H_{10}, ---------- Q)Which of these series can be classified as homologous series? (a) CHCl3, C2H5OH, C3H7OH (b) CH3OH, C2H5OH, C3H7OH (c) CHCl3, C4H9OH, CH3COOH (d) CH3COOH, C4H9OH, C2H5OH	

Teacher's reflections and experiences:1) Students describe and define homologous series of carbon compounds

2)Students Identify and classify the members of homologous series of different functional groups.

CLASS: 10 **CHAPTER: CARBON AND ITS COMPOUNDS** **TOTAL NUMBER OF PERIODS FOR THIS LESSON: 11** **NUMBER OF LESSON PLAN:6** **KEY CONCEPTS**: Nomenclature of Carbon compounds			
Learning Outcomes	**Teaching learning process**	**Pointers for assessment**	**T-L Material required**

❖ Analyses patterns of various homologous series in order to name them ❖ Explore the literature of various carbon compounds to get awareness of nomenclature ❖ Draws accurate and appropriate molecule structures based their nomenclature	Interaction with students to know their previous knowledge regarding to the Concept of the topic Q)How many bonds formed by carbon atoms? Q) Why carbon forms only covalent bonds with other atoms? Q) What is a homologous series of carbon compounds? Q) What is the necessary for naming carbon compounds? **Nomenclature of Carbon Compounds** The name of the of a carbon compound contains mainly three basic parts: **Prefixes - parent/Root - suffix**  	Q)With the molecular formula C_2H_6 has (a) 6 covalent bonds. (b) 7 covalent bonds. (c) 8 covalent bonds. (d) 9 covalent bonds.	IFP black Board https://app.byjus.com/video_share_1260?referrer=NDc2NjgyOTI%3D%0A&course_name=10th%20Grade&course=16

To give name to an organic compound we have to modify prefix and suffix according to the number carbon atoms and nature of the functional group respectively

Naming of carbon compounds can be done by method:

1. Identify the number of carbon atoms in the compound.

The words roots used for the number of carbon atoms in basic carbon chain as follows

Chain length	Root word	Chain length	Root word
C_1	Meth	C_{11}	Undec
C_2	Eth	C_{12}	Dodec
C_3	Prop	C_{13}	Tridec
C_4	But	C_{14}	Tetradec
C_5	Pent	C_{20}	Eicos
C_6	Hex	C_{30}	Triacont
C_7	Hept	C_{40}	Tetracont
C_8	Oct	C_{50}	Pentacont
C_9	Non	C_{60}	Hexacon
C_{10}	Dec	-	-

Q)What is the prefix as well suffixes

for the following

a) –CHO

b)- OH

c) =

d) x

Q) Fill the following table

S.NO	Chain length	Root word
1	C_1	
2		Dec

https://app.byjus.com/video_share_1259?referrer=NDc2NjgyOTI%3D%0A&course_name=10th%20Grade&course=16

https://www.youtube.com/watch?v=N0o2T7DKTw8

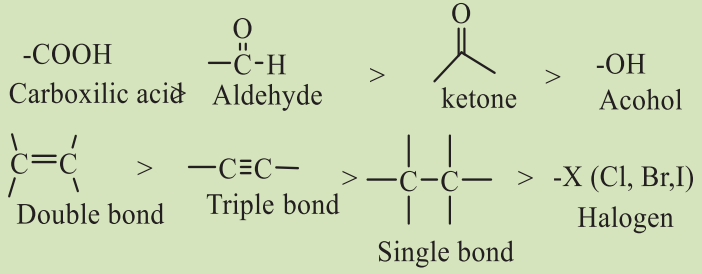
Example: A compound having **three**carbon atoms would have the name of word root **prop**.

Q) What is the word root of a compound having 8carbon atoms?

2. In case a functional group is present, it is indicated in the name of the compound with either a prefix or a suffix (as given in Table 4.4) according to their priority order

NOTE:
Ina Carbon Compound If more one functional group present then **low priority functional groups** become **prefixes** and **High priority fictional group** becomes as **suffix** while naming that compound.

The priority order of the functional groups



3	C_{14}		
4		Eicos	
5	C_{60}		
6		Triacont	

Q) Butanone is a four-carbon compound with the functional group

(a) Carboxylic acid.

(b) Aldehyde.

(c) Ketone.

(d) Alcohol.

Example: In a carbon compoundcontaining aldehyde and alcohol functional groups The alcohol comes under prefix and aldehyde comes under suffix.

Q) What are prefix and suffixes when a carbon compound containing Carboxylic acid functional group and Chlorine atom?

NOTE:
Ina Carbon Compound contains Single bond or double bond or triple bond their suffix has to give as follows

Type of bond	Name suffix
—	-ane
=	-ene
≡	-yne

If carbon chain contains double bond or triple bond then it is considered as unsaturated one

3. If the name of the functional group is to be given as a suffix, and the suffix of the functional group begins with a vowel a, e, i, o, u, then the name of the carbon chain is modified by deleting the final 'e' and adding the appropriate suffix.

Q)Matchthe following

A Name of the functional group	B Formula of the functional group
A)Carboxylic acid B) Halogen	i) -CHO ii) –X iii) –COOH

For example
A three-carbon chain with a ketone group would be named in the following manner – Propane – 'e' = propan + 'one' = propanone.

Q) Write the name of carbon compound congaing triple bond and Carboxylic functional groups?

4. In naming straight line carbon compounds / structure we have to add "n"to the prefix on the other hand while naming rite **ring like carbon compound / structures we have to add "cyclo" to the prefix**

Impartment terminology for modification prefixes
n - Normal chain
Iso – Branched chain
neo – Quaternary Carbon (Carbon attachéd to 4 carbon atoms)
Cyclo - Ring like structure

For example:

C) Alcohol	iv)-OH
D) aldehyde	

Q) Draw the structures for the following compounds.

(i) Ethanoic acid

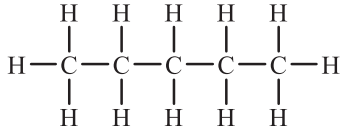
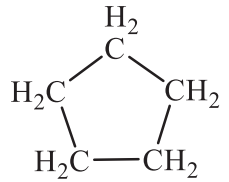
(ii) Bromopentane

(iii) Butanone

(iv) Hexanal

(V) n- butane

(VI) Cyclo butane

	 n-pantane  cyclopentane	(v) neo pentane	

Teacher's reflections and experiences:

1)Students analyses patterns of various homologous series in order to name them

2)Students Explore the literature of various carbon compounds to get awareness on the nomenclature

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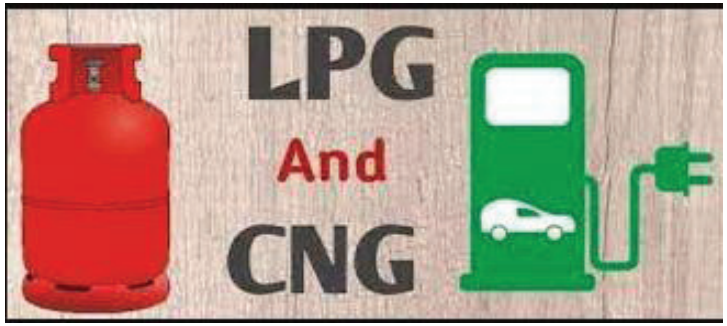
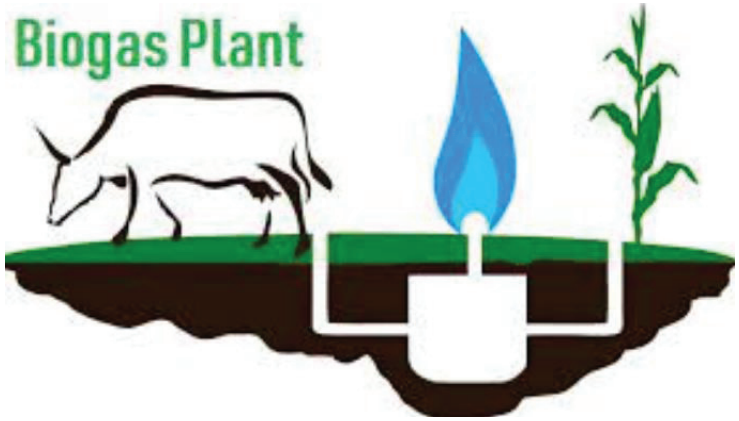
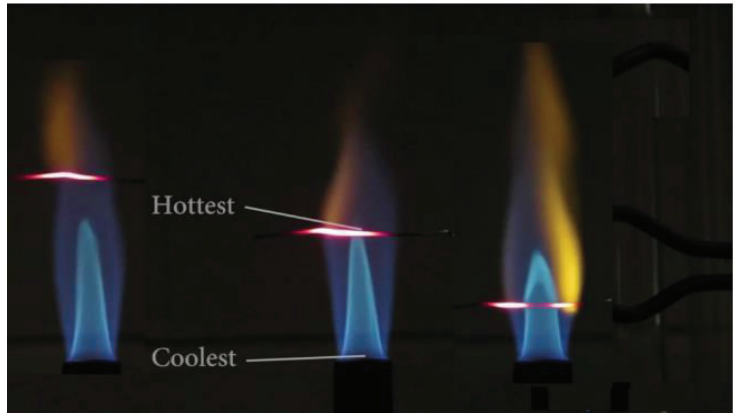
PERIOD PLAN-7

CLASS: 10
CHAPTER: CARBON AND ITS COMPOUNDS
TOTAL NUMBER OF PERIODS FOR THIS LESSON: 11
NUMBER OF PERIOD PLAN:7
KEY CONCEPTS: Chemical Properties: Combustion and oxidation

Learning out comes	Teaching learning process	Pointers for assessment	T-L Material required
❖ Studies the commonly used carbon compounds, their properties and uses ❖ Validate the properties of commonly used carbon compounds by observing their uses	Interaction with students to know their previous knowledge regarding to the Concept of the topic Q) Observe the following picture and answers the questions  Q) What is chemical substance present in	Q) What are the differences and similarities between LPG and CNG ?	

	cylinders which are used in cooking our food? Q) What is chemical substance present in cylinders which are used automobiles? Q) What is chemical present in the bio gas / goober gas?  Q) What arethe similarities among the above three types of gases Q) Why are we using hydrocarbons or carbon compounds for our energy needs? Q) Carbon compounds produce energy? **Combustion:** Carbon, in all its allotropic forms, burns in	Q) Why gobar gas is called as Biogas ? Q) Why alkaline $KMnO_4$called oxidising agent?	https://app.byjus.com/video_share_1261?referrer=NDc2NjgyOTI%3D%0A&course_name=10th%20Grade&course=16

	oxygen to give carbon dioxide along with the release of heat and light This called combustion reactions. **For examples:** $C + O_2 \longrightarrow CO +$ Heat aand light $CH4 + 2O_2 \longrightarrow CO_2 + 2H_2O +$ Heat aand light $CH_3CH_2OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O +$ Heat aand light These are examples of oxidation reactions **Activity4.3:** Q)What do you observewhen some camphor on spatula and burn them(Any carbon compounds examples: Naphthalene, alcohol etc)  Q)Observe the nature of the flame and whether	Q) What indicates sooty flame while burning carbon compounds? Q)While cooking, if the bottom of the vessel is getting blackened on the outside, it means that (a) the food is not cooked completely. (b) the fuel is not burning completely. (c) the fuel is wet. (d) the fuel is burning completely.	https://www.youtube.com/watch?v=K1Q-UvmMdxs

	smoke is produced or not? Q) Place a metal plate above the flame. Is there any deposition on the plate ? **Activity 4.4** Q)Light a Bunsen burner and adjust the air hole at the base to get different types of flames/presence of smoke?  Q)When do you get a yellow, sooty flame? Q)When do you get a blue flame? From the above two activities we understand that Saturated hydrocarbons will generally give a clean flame while unsaturated carbon compounds will give a yellow flame with lots of black smoke. This results in a sooty deposit on the metal plate in Activity 4.3. However, limiting the supply of air results in incomplete	Q)How many different types flames observed when we light Bunsen burner?	https://www.youtube.com/watch?v=JeF-Br4HBy4

	combustion **NOTE** Fuels such as coal and petroleum have some amount of nitrogen and sulphur in them. Their combustion results in the formation of oxides of sulphur and nitrogen which are major pollutants in the environment. **Oxidation:** **Activity 4.5 :** Q) What do you observe when 5% alkaline Potassium permanganate drop by drop to the test tube contains 3ml of ethanol?  Q)Does the colour of potassium permanganate persist when it is added initially?	Q) A mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne and air is not used? Q) Why is the conversion of ethanol to ethanoic acid an oxidation reaction?	https://www.youtub

	Q) Why does the colour of potassium permanganate not disappear when excess is added $CH_3CH_2OH \xrightarrow[\text{OR Acidified } K_2CrO_7 + \text{Heat}]{\text{Alkaline } KMnO_4 + \text{Heat}} CH_3COOH$ From this activity we understood that this oxidation reaction in this ethanol converted it carboxylic acid. Some substances are capable of adding oxygen to others. These substances are known as oxidising agents Ex: Alkaline $KMnO_4$ and Acidified $K_2Cr_2O_7$	Q) Write structures of the ethanol and ethanoic acid? Q) Arrange the following Carbon compounds according to their decreasing order of their acidicstrength a)Ethanol b)Ethanoic acid c) Ethanal Q)A student conducts an activity where he burns methane in the presence of oxygen. What islikely to form? (a) Water (b) carbon dioxide (c) dioxide and water	e.com/watch?v=12p90HJ-m3U

		(d) carbon dioxide and oxygen	

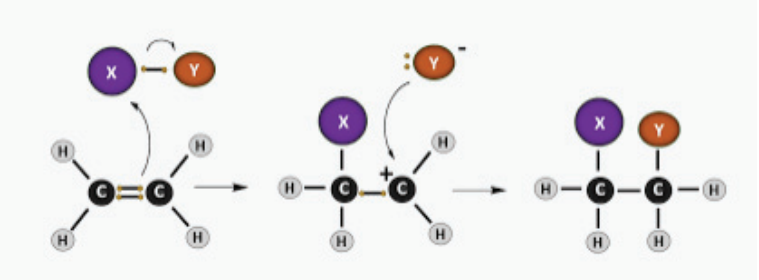
Teacher's reflections and experiences:

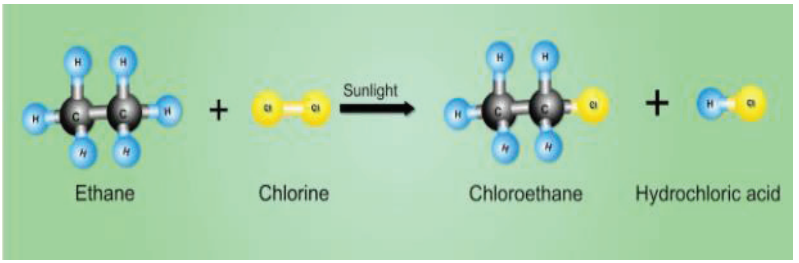
1)Studies the commonly used carbon compounds, their properties and uses

2)Validates the properties of commonly used carbon compounds by observing their uses

PERIOD PLAN-8

CLASS: 10
CHAPTER: CARBON AND ITS COMPOUNDS
TOTAL NUMBER OF PERIODS FOR THIS LESSON: 11
PERIOD NO.8
KEY CONCEPTS: Chemical Properties:Addition and Substitution reaction

Learning out comes	Teaching learning process	Pointers for assessment	T-LMaterial required
❖ Studies the commonly used carbon compounds, their properties and uses ❖ Validate the properties of commonly used carbon compounds by observing their uses	Interaction with students to know their precious knowledge regarding to the Concept of the topic Q) What are unsaturated hydrocarbon compounds? Q) What are saturated hydrocarbon compounds? Q) Describechemical reactions(a) and (b)given below  (a)	Q)Identify the unsaturated compounds from the following (i) Propane (ii) Propene (iii) Propyne (iv) Chloropropane (a) (i) and (ii) (b) (ii) and (iv) (c) (iii) and (iv)	



(b)

ADDITION REACTIONS

Q) What type of hydro carbons can participate in addition reactions?

Q) How In addition reactions unsaturated hydrocarbons converted in to saturated hydrocarbon compounds

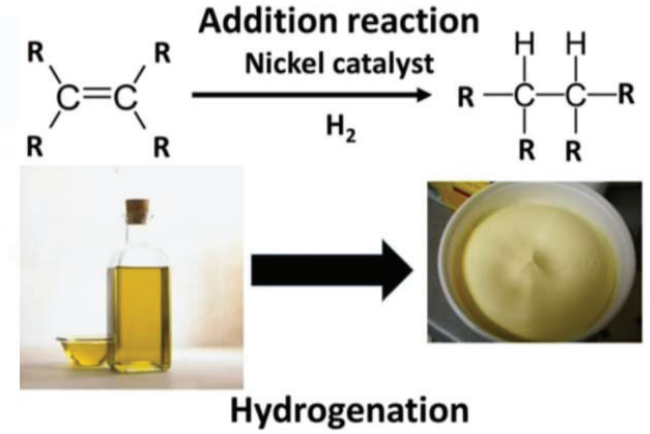
Hydrocarbon compounds having double or triple bond can exhibit addition reactions

Example:

Hydrogenation Of Vegetable Oils

(d) (ii) and (iii)

Q)Unsaturated hydrocarbons contain multiple bonds between the two C-atoms and show addition reactions. Give the test to distinguish ethane from ethane?

	Q) What do you observe from the bellow picture?  Hydrogenation of vegetable oils using a nickel catalyst. Vegetable oils generally have long unsaturated carbon chains while animal fats have saturated carbon chains. **NOTE** **Catalysts** are substances that cause a reaction to occur or proceed at a different rate **without the reaction itself being affected.** **SUBSTITUTION REACTIONS**	Q) Oils on treating with hydrogen in the presence of palladium or nickel catalyst form fats. This is an example of (a) Addition reaction (b) Substitution reaction (c)Displacement reaction (d) Oxidation reaction Q) Chlorine reacts with saturated hydrocarbons at room temperature in the (a) absence of sunlight (b) presence of sunlight (c) presence of water	https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DSntuwgNNtDE&psig=AOvVaw3eq-M5juOGMhT0KN7IiDh9&ust=1701167677541000&source=images&cd=vfe&opi=89978449&ved=0CAUQjB1qFwoTCKCeg8v944IDFQAAAAAdAAAAABAD

Q) Which type of hydrocarbons participate in substitution reactions

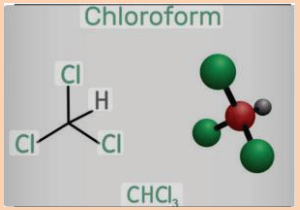
Hydrocarbon compounds having single bonds can exhibit substitution reactions

Example:

Reaction Of Chlorine with Hydrocarbons (Ex: Methane, Ethane…) in presence of sunlight

NOTE

Tri ChloroMethane($CHCl_3$):



It is also known as chloroformwhich is a substitution product of methane and chlorine. It is Powerful anaestheticand also a good solvent used as an extraction solvent for fats, oils, greases, rubber, waxes, gutta-percha, resins, lacquers, floor polishes, artificial silk manufacture, gums and adhesives

(d) presence of hydrochloric acid

Q) The chemical reaction shows the addition of chlorine gas to hydrocarbon in the presence ofsunlight.

How does chlorine react to a hydrocarbon compound in the presence of sunlight?

(a) it adds hydrogen into the compound

(b) it adds an oxygen atom into the compound

(c) it substitutes hydrogen atom from the compound

(d) it breaks double and triple bonds into a single bond

https://youtu.be/t6fTDStG35c?si=22EOklK-4ueGEEEY

		Q) The chemical reaction shows the addition of chlorine to methane in the presence of sunlight. What is likely to be the product of the reaction represented by "X"? (a) CH_4+ H_2SO_4 (b) CH_3Cl + HCl (c) $CHCl_3$ + HCl (d) CH_3Cl + H_2SO_4	

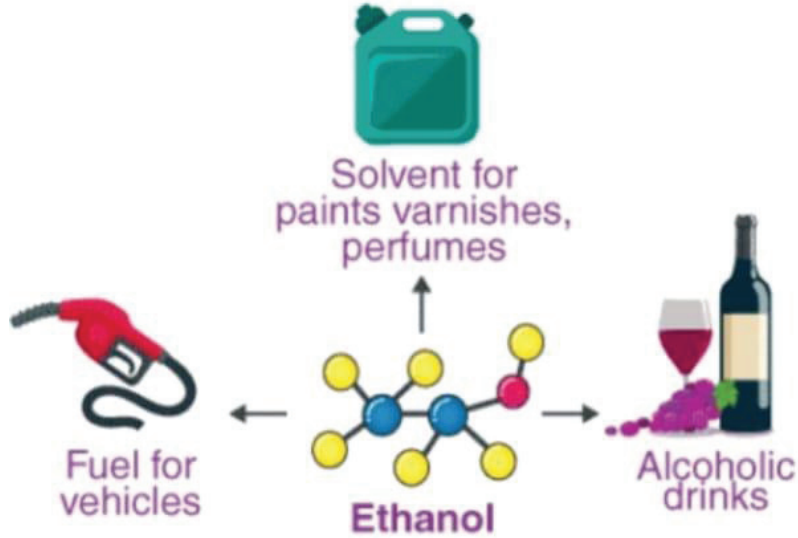
Teacher's reflections and experiences:

1)Student Studies the commonly used carbon compounds, their properties and uses

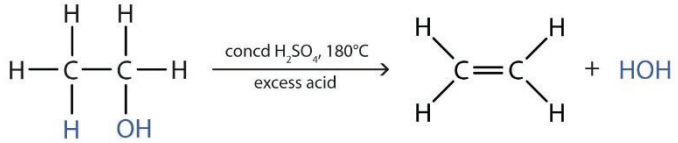
2)Students Validates the properties of commonly used carbon compounds by observing their uses.

Class: X Chapter: Carbon and its Compounds Total No. of Periods:11 Period No: 09 Key Concepts: Ethanol & its properties			
Learning Outcomes	**Teaching-Learning Process**	**Pointers for assessment**	**Materials required**

1. Describe how compounds are used in various industries. 2. Demonstrate the nature and properties of alcohol. 3. Applies this knowledge of Properties of Alcohol in daily life.	**Motivation and introduction:** 1. What is the main component of Sanitizers? 2. What is the solvent present in spirit and tincture of iodine? 3. Which chemical is added to petrol now-a-days to decrease the pollution of vehicles? 4. Do you know the active ingredient of all alcoholic drinks? Ethanol is commonly called as alcohol which is the active ingredient in alcoholic drinks, sanitizers, perfumes, cough syrups etc. i) Ethanol, C_2H_5OH is a colourless liquid having a pleasant smell. (ii) It boils at 351K. (iii) It is miscible with water in all proportions. (iv) It is a non-conductor of electricity (v) It is neutral to litmus. I. Why ethanol is bad conductor of electricity? 2. Even though Ethanol has Hydrogen, why it is not an acid? **Uses:** 1) It is a good solvent; it is also used in medicines such as tincture of iodine, cough syrups, and in the manufacture of paints, dyes, soaps and synthetic rubber. 2) Some countries now use alcohol as an additive in	1. What is the chemical formula of ethanol? 2. Why ethyl alcohol used in cough syrups? 3. Which alcohol is present in all alcoholic beverages? 4. What is the common name of ethanol? 5. What is the physical state of ethanol at room temperature? 6. What is the boiling point of ethanol? A)351K B)251K C)321K D)156K	Beaker, Ethanol, Sodium Metal, Burning splinter Thermometer Litmus papers Byju's link; https://youtu.be/A2hGFrrS2-s Ethanol - Definition, Formula, Uses & Properties of Ethanol with FAQs (byjus.com)

	petrol since it is a cleaner fuel which gives rise to only carbon dioxide and water on burning. 3) In cold countries alcohol is used as an anti-freeze in radiators of vehicles.  1. Give the chemical equation involved in the burning of Alcohol? **<u>Disadvantages:</u>** • Consumption of small quantities of dilute ethanol causes drunkenness. • Even though this practice is condemned, it is a socially widespread practice.	7. How do you test the presence of alcohol? 8. Which alcohol even in small quantities leads to death? 9. What disease caused due to the regular intake of alcohol? 10. What compound damages the optic	

	• However, intake of even a small quantity of pure ethanol (called absolute alcohol) can be lethal. • Also, long-term consumption of alcohol leads to many health problems like liver damage, blindness, depression, weekness of central nervous system leads to mental confusion, lack of coordination, sense of judgment, etc. 2. What is denatured alcohol? 3. How do you prevent the misuse of alcohol in industries? 4. How can we control the bad practice of consuming alcohol among the people? 5. What happens when Sodium metal reacts with water? As discussed in Metals and Non-metals lesson? 1. Do you guess the same thing happens when sodium metal reacts with ethanol? **<u>Activity 4.6:</u>** Let us perform activity 4.6 by placing a small piece of Sodium into the small conical flask containing Ethanol. 1. What do you observe during the reaction? 2. Is there any increase in the temperature of the reaction mixture? 3. How will you test the gas evolved? Ethanol reacts with Sodium to give Sodium Ethoxide	nerve causing permanent blindness in person? 11. Which gas evolved when sodium metal reacts with ethanol? 12. What is the product formed by dehydration of	

	and releases H_2 Gas.  1. What is the nature of the Sodium Ethoxide? 2. If a strong acid like H_2SO_4 is spilled on the hand then what happens to our hand? 3. Why the skin burns with Conc.H_2SO_4 If we heat Ethanol with Conc. H_2SO_4 at 443K, then dehydration reaction takes place to form Ethene.   1. How do you prepare Ethanol from sugarcane? 2. What type of reaction is dehydration?	ethanol?	

Teachers' reflections and experiences:

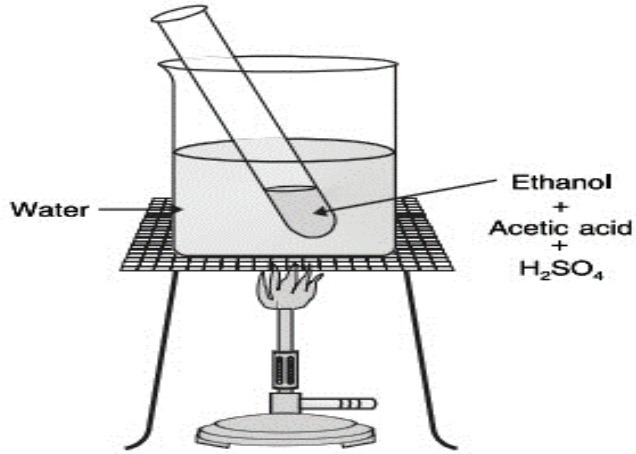
1) Describes how compounds are used in various industries.
2) Investigates the nature and properties of ethanol.

Class: X Chapter: Carbon and its Compounds Total No; of periods:11 Period No: 10 Key Concepts: Ethanoic acid & its Properties			
Learning Outcomes	**Teaching-Learning Process**	**Pointers for assessment**	**Materials**

			required
1. Describe usage of compounds in various industries. 2. Demonstrate the reaction of alcohols with acids. 3. Applies this knowledge of Properties of Ethanoic acid and ethyl acetate in daily life .	1. Why do we get pain when honey bee or an ant bites us? 2. Can you name the compounds responsible for irritation which present in honey bee or ants? 3. What is the name of chemical present in vinegar which is used in the preservation of pickles? In the all above instances compounds with carboxylic acid functional group are present. **<u>Ethanoic Acid (CH_3COOH):</u>** Ethanoic acid is commonly called acetic acid belongs to a group of acids called carboxylic acids The melting point of pure Ethanoic acid is 290 K. It often freezes during winter, and therefore, it is named as glacial acetic acid. Ethanoic acid has acidic nature because of the presence of -COOH Group. 1. Is Ethanoic acid has same acidic nature as that of the Mineral acids like HCl? Let us perform the activity 4.7 by taking dilute acetic acid and dilute hydrochloric acid using litmus paper	1) What is the common name of Ethanoic acid? 2) What is the melting point of acetic acid? 3) What is the functional group present in Ethanoic acid? 4) How to differentiate	• Ethanol • Ethanoic acid • Test tubes • Beaker • Water • Conc. H_2SO_4 • NaOH • Na metal • Na_2CO_3 • $NaHCO_3$ • Lime water Ncert video link: <u>https://youtu.be/di4pMJciJ_Y</u>

	and universal indicator. 2. Which solution is more acidic? 3. Why the acetic acid solution is less acidic than hydrochloric acid solution? We conclude that unlike mineral acids like HCl which are completely ionised, carboxylic acids are not ionized completely, so that carboxylic acids are weak acids. To know the chemical properties of Ethanoic acid let us perform the Activity 4.8 as shown in the following figure taking ethanol and acetic acid.	acetic acid and HCl? 5) Do you observe any smell when carboxylic acid reacts with alcohol?	https://youtu.be/8exe3cMICV0

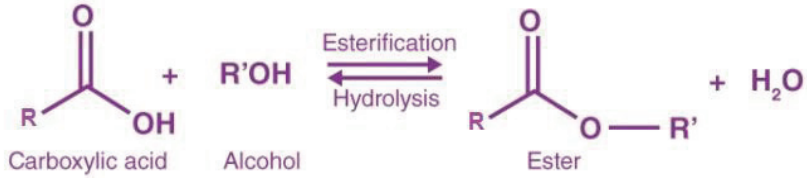
$$CH_3COOH + C_2H_5OH \xrightarrow{\text{Conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$$



1. What is the smell of the above mixture when poured into the water in a beaker?

The sweet-smell liquid obtained in the process is called Ethyl acetate, which is an ester.

When a carboxylic acid is refluxed with alcohol in the presence of a small quantity of conc.H_2SO_4, an ester is formed; this reaction is known as Esterification.



6) Write the chemical equation for Esterification?

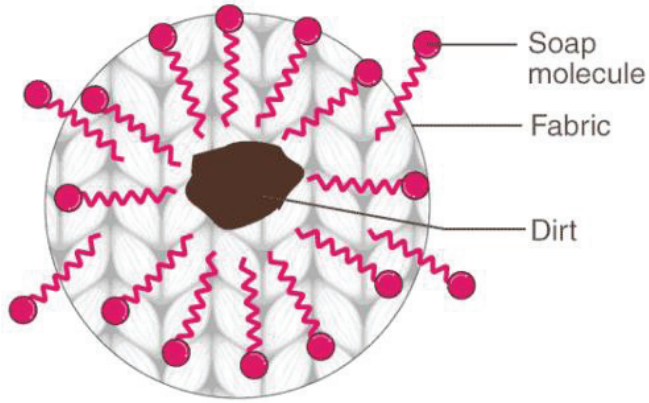
7) What is the other name of frozen Ethanoic acid?
8) How would you distinguish experimentally

	Generally, esters are sweet-smell in nature. These are used in making perfumes and as flavoring agents. **<u>Hydrolysis of ester:</u>** When ester is treated with alkali like NaOH, the ester is converted back to alcohol and the sodium salt of carboxylic acid. This reaction is called **Saponification.**  This Saponification is used in the preparation of soaps. **Soaps are sodium or potassium salts of long chain fatty (carboxylic) acids.** **<u>Reaction with Metals:</u>** Ethanoic acid (Acetic acid) reacts with metals like sodium, zinc and magnesium to liberate hydrogen gas. $2CH_3COOH+2Na \rightarrow 2CH_3COONa+H_2(\uparrow)$ **<u>Reaction with Base:</u>** It reacts with a solution of sodium hydroxide to form sodium ethanoate and water. $CH_3COOH+NaOH \rightarrow CH_3COONa+H_2O$	between an alcohol and a carboxylic acid? 9) What are soaps? 10) What is Saponification? 11) Can you give an example for long chain carboxylic acid used in the preparation of soap?	

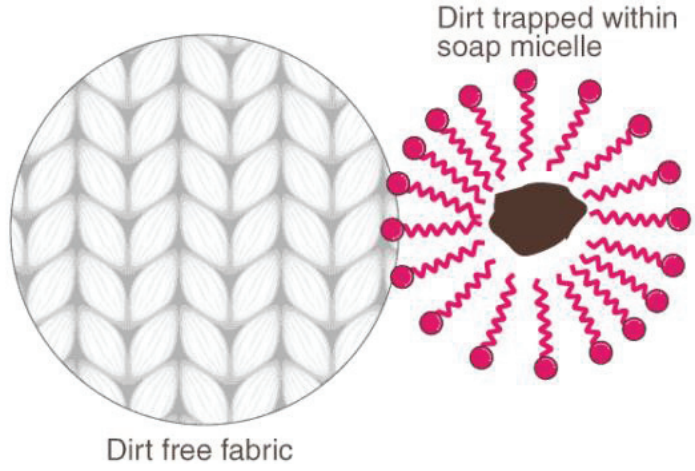
	2. How Ethanoic acid does reacts with carbonates and hydrogen carbonates? Perform the Activity 4.9 by taking Ethanoic acid, Na_2CO_3 and $NaHCO_3$. 3. What do you observe? 4. what change do you observe, when you pass the gas evolved through freshly prepared lime water? 5. Can you write the reaction involved in this Change of colour of lime water? **<u>Reaction of Ethanoic Acid with Carbonates and Bicarbonates:</u>** Carboxylic acids react with carbonates and bicarbonates with the evolution of CO2 gas. **For example,** when Ethanoic acid (acetic acid) reacts with sodium carbonate and sodium bicarbonate, CO_2 gas is evolved. $2CH_3COOH+Na_2CO_3 \rightarrow 2CH_3COONa+H_2O+CO_2$ $CH_3COOH+NaHCO_3 \rightarrow CH_3COONa+H_2O+CO_2$		
<u>Teachers' reflections and experiences:</u> 1) Students describe how compounds are used in various industries. 2) Students Investigate the nature and properties of Ethanoic acid.			

Class: X
Chapter: Carbon and its Compounds
Total No; of periods: 11
Period No: 11
Key Concepts: Soaps and Detergents

Learning Outcomes	Teaching-Learning Process	Pointers for assessment	Materials required
I) Describe the types of hardness of water. 2) Explain the relationship between the hardness of water and formation of lather with soap. 3) Demonstrates the hardness of water by simple experiments. 4) Applies the knowledge of soaps and detergents in the daily life.	**<u>Motivation and introduction:</u>** 1. What are soaps? 2. Which process is used in the preparation of soaps? 3. Write some uses of soaps. 4. Do you know the cleaning action of soap? Perform activity 4.10 and observe the changes in the two test tubes. 1. In which test tube the oil layer is separated? 2. Why in the test tube B the oil layer is not separated? When soap is added to water, the soap molecules uniquely orient themselves to form spherical shape micelles.	1) How soap is different from Detergent? 2) Why micelle formation does take place when soap is added to water?	• Test tubes • Test tube stand • Oil • Soap solution • Distilled water • Rain water • Well water • Detergent solution Chart showing micelle formation Ncert video link



The non-polar hydrophobic part or tail of the soap molecules attracts the dirt or oil part of the fabric, while the polar hydrophilic part or head,(−COO−Na+, remains attracted to water molecules.



The agitation or scrubbing of the fabric helps the

3) Will micelle be formed in other solvents like ethanol?

4) Explain the formation of white curdy precipitate when soap is added to hard water.

https://youtu.be/8exe3cMICV0

Byju's video Link https://youtu.be/NPvWSo0Us9A

	micelles to carry the oil or dirt particles and de-attach them from the fibers of the fabric. 1. Does soap remove the stains of oil and dirt from the fabric? 2. Have you ever noticed the formation of different foam from place to place when you use the detergent for washing the fabrics? 3. Have you ever noticed that the foam formed with difficulty while bathing? Let us perform activity 4.11 to explain the difference between different types of water.  1. In which test tube do you get more foam? 2. In which test tube do you observe a white curdy	5) Explain the formation of scum when hard water is treated with soap. 6) What change will you observe when you test soap with litmus paper?	

	precipitate? Hard water contains salts of calcium and magnesium, principally as bicarbonates, chlorides, and sulphates. When soap is added to hard water, calcium and magnesium ions of hard water react with soap forming insoluble curdy white precipitates of calcium and magnesium salts of fatty acids. $2C_{17}H_{35}COONa+MgCl_2 \rightarrow (C_{17}H_{35}COO)_2Mg+2NaCl$ $2C_{17}H_{35}COONa+CaCl_2 \rightarrow (C_{17}H_{35}COO)_2Ca+2NaCl$ These precipitates stick to the fabric being washed and hence, interfere with the cleaning ability of the soap. Therefore, a lot of soap is wasted if the water is hard. 1. Is there any remedy to overcome this problem? 2. Is there any alternative to the soap used in washing clothes? This problem is overcome by using another class of compounds called detergents as cleansing agents. Detergents are generally sodium salts of sulphonic acids or ammonium salts with chlorides or bromides ions. Perform the activity 4.12 by taking hard	7) Would you be able to check if water is hard by using a detergent? 8) Compare the cleansing action with soaps and detergents with soft and hard waters.	

	water in two test tubes A & B, add soap to A and detergent to B and shake vigorously. 1. Do both test tubes have the same amount of foam? 2. In which test tube is a curdy solid formed? So we can conclude that the detergents are effective even with hard water.		

Teachers' reflections and experiences:

1) Students Describes the classification of various types of water
2) Students Investigate the nature the water with soap water.

CBSE Class 10 -Chapter 4 Carbon and Its Compounds

WORKSHEET - 1

Q1) The electronic configuration of an element is found to be 2, 4. How many bonds can one carbon atom form in a compound?

(a) 1 (b) 2

(c) 4 (d) 6

Q2) The following chemical reaction shows the addition of chlorine to methane in the presence of sunlight:

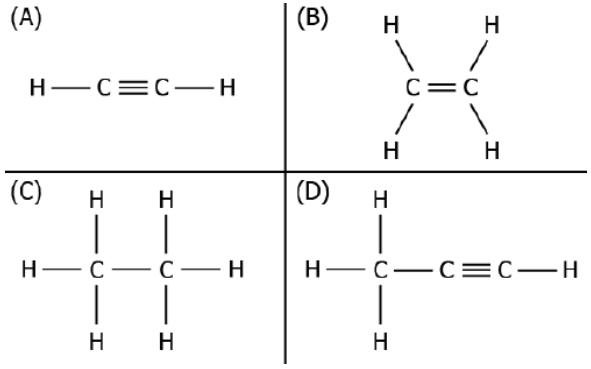
$CH_4 + Cl_4 \rightarrow X$

What is likely to be the product of the reaction represented by "X"?

(a) $CH_4 + H_2SO_4$ (b) $CH_3Cl + HCl$

(c) $CHCl_3 + HCl$ (d) $CH_3Cl + H_2SO_4$

Q3) The image represents the structure of a few hydrocarbon compounds.

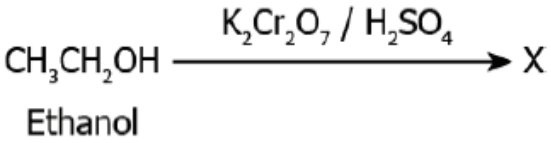


Which of these compounds can be classified as alkynes?

(a) Only (A) (b) Only (B)

(c) Both (A) and (D) (d) Both (B) and (C)

Q4) The below image represents a chemical reaction where ethanol is oxidised using potassium dichromate and sulphuric acid.

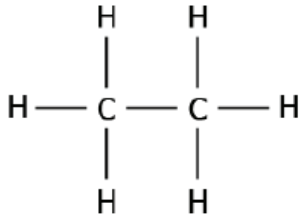


Which of the following option represents the product "X"?

(a) CH_2O (b) CH_3CH

(c) CH_3H_2O (d) CH_3COOH

Q5) The given image represents the structure of a carbon compound known as ethane.



Which of the following option explains the naming of ethane?

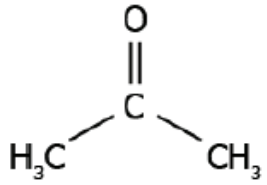
(a) The presence of a functional group connected with a single bond

(b) As it contains two carbon atoms, and a single bond connects the carbon atoms

(c) Carbon compound with a total number of eight atoms is named ethane

(d) As it contains six hydrogen atoms, and a single bond connects the carbon and hydrogen atom

Q6) The following image represents a carbon compound.



Which functional group is present in the compound?

(a) Alcohol (b) Aldehyde

(c) Carboxylic acid (d) Ketone

Q7) A carbon compound contains two atoms of carbon. Which name should the carbon compound bear?

(a) Butane (b) Ethane

(c) Methane (d) Propane

Q8) The following chemical reaction shows the addition of chlorine gas to hydrocarbon in the presence of sunlight.

$CHCl_3 + Cl_2 \rightarrow CCl_4 + HCl$

How does chlorine react to a hydrocarbon compound in the presence of sunlight?

(a) It adds hydrogen to the compound

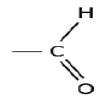
(b) It adds an oxygen atom to the compound

(c) It substitutes hydrogen atom from the compound

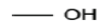
(d) It breaks double and triple bonds into a single bond

Q9) Which of these functional groups can combine with carbon to produce alcohol?

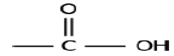
(a)



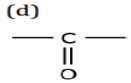
(b)



(c)



(d)



Q10) A student studies that vinegar, which is a diluted form of ethanoic acid, freezes during winter. What does this suggest about the physical properties of pure ethanoic acid?

(a) It has a low boiling point

(b) It has a low melting point

(c) It has a very high boiling point

(d) It has a very high melting point

Q11) Which of the following is the molecular formula of cyclobutane?

a) C_4H_{10} b) C_4H_6

c) C_4H_8 d) C_4H_4

Q12) A student studies that a soap molecule has two ends, one of which is an ionic end, and the other is the carbonic chain. Which option explains the interaction of a soap molecule with oil?

(a) Ionic end of the soap interacts with the oil

(b) The closest end of the soap interacts with the oil

(c) Carbonic chain end of the soap interacts with the oil

(d) Ends of the soap randomly interact with the oil

Q13) Methane, ethane and propane are said to form a homologous series because all are:

(a) Hydrocarbons (b) Saturated compounds

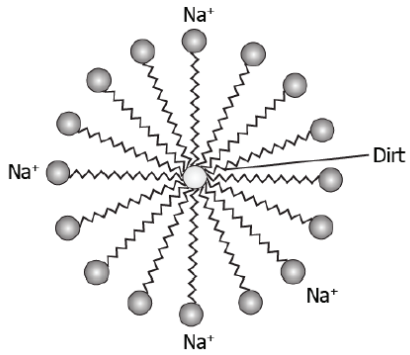
(c) Aliphatic compounds (d) Differ from each other by a CH_2 group

Q14) Which of the following belongs to a homologous series of alkynes?

(a) C_6H_6 (b) C_2H_6

(c) C_2H_4 (d) C_3H_4

Q15) A student studies that soap solution results in micelle formation, which helps to remove dirt. It has a unique orientation which helps in keeping the dirt out of the water, as shown in the image.



What helps the dirt to rise away?

(a) Suspension of the dirt in the micelles

(b) A collection of water molecules in the centre of the micelle

(c) The attraction between the ionic end and the dirt to remove it

(d) Mixing of the soap molecules along with the dirt to make it heavier

Q16) Choose the correct statement.

(a) The ethene molecule is made up of 2 carbon atoms and 4 hydrogen atoms

(b) Each carbon atom shares three electrons with three hydrogen atoms to form three carbon-hydrogen single covalent bonds

(c) In ethane, the two carbon atoms share one pair of electrons among themselves to form one carbon-carbon single covalent bond

(d) All of the above

Q17) Which of the following is the property of ionic compounds?

(a) They have high melting and boiling points

(b) They conduct electricity in solution or in a molten state

(c) Both (a) and (b)

(d) None of the above

Q18) Which of the following is not a characteristic of fullerenes?

(a) Of all the fullerene, the C60 allotrope is the most stable

(b) Its shape is similar to that of a soccer ball

(c) It contains only fused six-membered carbon-carbon rings

(d) Its hardness is lower than that of a diamond

Q19) How many single bonds are present in methane?

(a) Four (b) Five

(c) Six (d) Three

Q20) A hydrocarbon should have a minimum of _____ carbon atoms to show isomerism.

(a) Three (b) Four

(c) Five (d) Six

Class: X Chapter – 4 Carbon and its Compounds

Work Sheet-2

1. Ethane, with the molecular formula C2H6, has ____ covalent bonds.

A. six B. seven

C. eight D. nine

2. Choose the correct option based on the statements given:

Statement 1: Carbon shares electrons to form covalent bond with other elements.

Statement 2: C4+ and C4−ions are highly unstable.

A. Both statements are correct but statement 2 is not the correct explanation for statement 1.

B. Both statements are correct and statement 2 is the correct explanation for statement 1.

C. Statement 1 is wrong but statement 2 is correct.

D. Statement 1 is correct but statement 2 is wrong.

3. Silicon is tetravalent. But why can't it form long chain compounds like carbon?

A. Silicon is a metalloid and cannot bond with other atoms.

B. Silicon is larger in size than carbon, and cannot hold the shared electron pair(s) strongly.

C. Silicon is smaller in size than carbon, and cannot hold the shared electron pair(s) strongly.

D. Silicon compounds are unreactive.

4. Select the option that will complete the homologous series given below.

C2H4, C3H6, _____, C5H10, C6H12

A. C4H6 B. C4H10

C. C4H4 D. C4H8

5. The general formula for alkynes is:

A. CnH2n+2 B. CnHn

C. CnH2n−2 D. CnH2n

6. Which amongst the following is not an allotrope of carbon?

A. Carbon dioxide B. Fullerene

C. Diamond D. Graphite

7. Diamond has a _____ structure while that of graphite is _____.

A. hexagonal layered, octahedron

B. tetrahedral, hexagonal layered

C. tetrahedral, square pyramidal

D. pentagonal, hexagonal layered

8. The maximum number of covalent bonds that can be formed between two carbon atoms is _____.

A. two B. five

C. three D. four

9. The ability of atoms of an element to combine among themselves to form long chains is called _____.

A. catenation

B. allotropy

C. tetravalency

D. isomerism

10. Which of the following pairs does not contain unsaturated hydrocarbons?

A. C4H8, C3H4

B. C10H22, C6H14

C. C2H4, C6H12

D. C4H6, C6H10

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