DEPARTMENT OF SCHOOL EDUCATION

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

STRUCTURED LESSON PLANS FOR CBSE-AFFILIATED SCHOOLS

CHEMISTRY

GRADE - 09

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
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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

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

creating a diverse range of assessments. The workshop enhanced the ability of the teachers to

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.

STRUCTURED PEDAGOGY

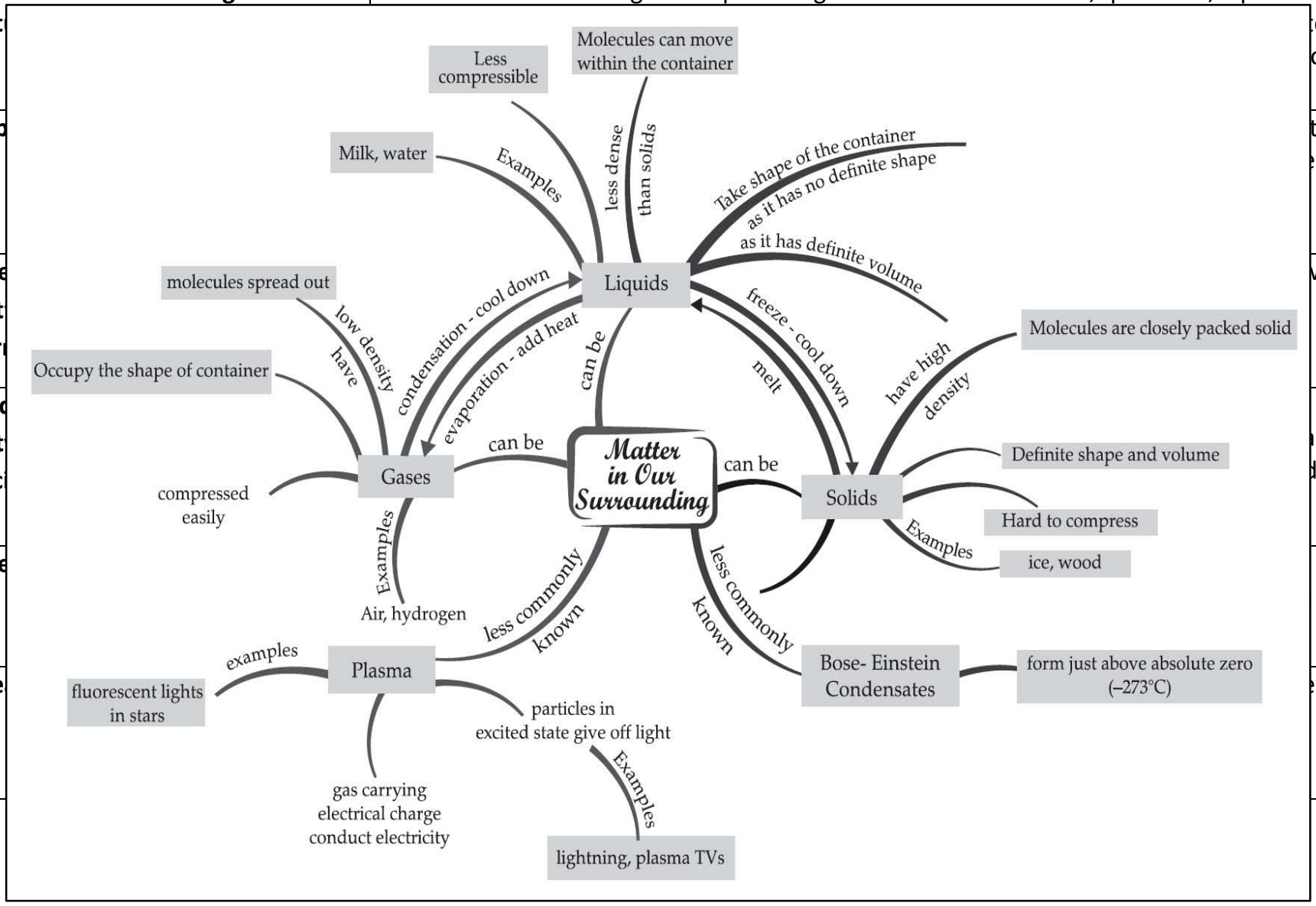
CLASS: IX CHAPTER:01- MATTER IN OUR SURROUNDINGS NO. OF PERIODS: 09

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:	
a. Rational thought and autonomy**.**	Schools should aim to develop independent thinkers who make well-informed decisions based on a grounded understanding of the world around them.
b. Health and well-being**.**	School education should be a wholesome experience for students.students should acquire knowledge, capacities, and dispositions that promote mind-body wellness.
c. Democratic and community participation**.**	School education should aim to develop such knowledge, capacities, and values and dispositions that enable students to participate and contribute to the democratic functioning of india.
d. Economic participation**.**	School education should aim to develop knowledge,capacities, values, and dispositions that enable students to participate and contribute to the economy. Effective participation in the economy has a positive impact both for the individual and for society as a whole.
e. Cultural participation**.**	School education should promote cultural literacy and enable students to acquire knowledge, capacities, and values and dispositions to participate meaningfully and contribute positively to culture.

STRUCTURED PEDAGOGY

AIMS OF SCIENCE

1. **Scientific understanding of the nat**	Scientific understanding develops through scientific observations, questions,experiments, to orld
2. **Cap**	t
3. **Inte bet cur**	vould
4. **Und bet soc**	nce in dents
5. **Scie**	for
6. **Cre**	est a



STRUCTURED PEDAGOGY

CURRICULAR GOALS
CG-1: Explores the world of matter, its interactions and properties at the atomic level:
Competencies:
1. Investigates the particulate nature of matter
2. Describes and represents the interaction of molecules
3. Describes of classification of matter in to different physical states.
CG-2: Explores the physical world around them and understands scientific principles and laws based on observations and analysis:
Competencies:
1. Applies effect of temperature and pressure to explain the change of states of matter.
CG-4: Explores interconnection between molecules of matter and environment:
Competencies:
1. Illustrates the diffusion of particles of matter.
CG-8: Explores the nature of science by doing science
Competencies:
1. Develops pictorial model to represent changes of matter by doing an activity.

PERIOD MAP


Matter in our surroundings
Period-01, Nature & Characteristics of particles of matter
Period-02, Particles are in continuous motion
Period-03, Particles of matter attract each other
Period-04, States of matter(solid state)
Period_05, Liquid & Gaseous state
Period-06, Change of states, effect of temperature
Period-07, Change of states, effect pressure
Period-08, Evoparation & Factors affecting evoparation
Period-09, Evaporation causes cooling

STRUCTURED PEDAGOGY

PERIOD	KEY-CONCEPTS	LEARNING OUTCOMES
1	Physical nature and characteristics of matter.	Discusses the composition of matter Analyses the size of the particles and space between the particles of matter.
2	Particles of matter are continuously moving	Experiments to arrive at and verify the facts of diffusion of matter. Relates processes and phenomena with causes. Communicates the findings and conclusions effectively
3	Particles of matter attract each other	Classifies various substances based on the forces of attraction between theparticles. Explains the phenomenon how forces of attraction between particles affects the strength of the object. Application of scientific concept in everyday life.
4	States of matter, solid state	Distinguishes different states of matter based on properties. Students draw conclusion that solids have definite shape and volume.
5	The liquid and gaseous state	Explain the properties of liquid and gases. Analyze the properties of solids liquids and gases.
6	The change of state, the effect of temperature on change of state, the latent heat of vaporization and fusion	Explains the process of melting. Measures temperature in different scales Differentiate between melting and boiling Demonstrate the effect of temperature on the changes of state Applies this knowledge in day to day life
7	The effect the change of pressure,	Investigates the physical states of the substances based on the change of pressure Analyses similarities and differences involved in various process like condensation sublimation and vaporization
8	Evaporation and factors affecting evaporation.	Describes the process of evaporation. Explains the differences between evaporation and boiling. Analyses the causes of evaporation and explains the factors affecting evaporation.
9	How does evaporation causes cooling.	Applies the concept of evaporation causes cooling seen in day to day life.

PERIOD PLAN-1

CLASS: IX	CHAPTER-01 MATTER IN OUR SURROUNDINGS		
TOTAL NO. OF PERIODS: 9	PERIOD NO.01		
	KEY CONCEPTS:NATURE AND CHARACTERISTICS OF PARTICLES OF MATTER.		
LEARNING OUTCOMES	**TEACHING-LEARNING PROCESS**	**POINTERS FOR FORMATIVE ASSESSMENT-**	**MATERIALS REQUIRED**
1). Able to distinguish the different materials around us based on the physical properties 2). Discusses the composition of matter 3). Analyses the size of the particles and space between the particles of matter.	Teacher give a chalk piece(or any solid material) ,a bottle of water and a closed empty bottle to three groups of children and ask them to discuss about their observation on physical states of these three objects. 1). How do you make lemonade? What are the ingredients? 2). What are their physical states? 3). What changes do you observe when you add lemon juice to water? 4). What change do you observe when you add sugar/ salt to water? 5). Does the taste change why?	1). How the different materials of matter are made up of?	1)salt or sugar, water,beaker,stirrer etc 2). $kmno_4$, crystals, water, beakers, measuring jar etc.

Activity-1.1:

Teacher demonstrates activity1.1 and discusses on following questions.

Fig. 1.1: When we dissolve salt in water, the particles of salt get into the spaces between particles of water.

While doing the activity teacher asks one of the students to mark the level of water before and after adding salt!

1). What is your observation on adding salt?

2). Does the taste change?

3). What is the colour of the water after addition of salt? Why?

2). Classify the following under matter?

1. Chair	2. Air
3. Love	4. Smell
5. Hate	6. Almonds
7. Thought	8. Cold
9. Lemon	10. Water
11. Smell of perfume.	12.

3). Satish is a 9th grade student.he wishes to demonstrate an experiment in the class room to show his scientific temper. He took two 100 ml. Glass beakers and filled it with water completely. In one glass he dropped 5 grams of table salt and in the other he dropped 5 grams of sand. He asked all the students in the class to observe what happened. Before making conclusions of the experiment he asked some of the fellow students to raise few questions regarding the

characteristics particles of matter link:

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characteristics

	4). Does the level of the water change? Why? **Activity-1.2:** Teacher demonstrates activity-1.2 and discuss on the following questions.  *Fig. 1.2: Estimating how small are the particles of matter. With every dilution, though the colour becomes light, it is still visible.* 1). What changes do you observe when potassium permanganate is added to 100 ml of water? 2). What is the colour of water after addition of $kmno_4$? 3). Why $kmno_4$ crystals disappear? 4). How the colour of solution appears on dilution?	experiment? Guess what questions are asked by the students to make activity more intresting? 4) A student adds 5 g sugar in 100 ml water. The student stirs the contents for 2 minutes. After some time, the student notices a clear solution. Why the student was unable to see Sugar particles? (a)they are colorless (b)they settle at the bottom (c)they are too small to be seen (d)they evaporate when added to water 5) A student pours 20 ml flavored water in a glass containing plain water and notices that the taste of the water changes. The students repeat the activity for 10 times and reports That the water still has some flavor. What can be the possible reason for this? (a)the flavor from the water can never be removed by any method.	

	5). What is the reason for appearance of colour again and again after dilution? 6). Where does the $kmno_4$ particles gone when dissolving in water? Teacher concludes from the activity that $kmno_4$crystals dividing themselves in to smaller and smaller, and occupies the space between the molecules of water.	(b)The water is made flavored in such a way that it remains the same until it is consumed. (c) Sieves were not used in the experiment which would have helped to remove flavored particles from the water. (d) The particles of flavored water are very small and are transferred to plain water even when added in very small quantities.	
Teachers' reflections and experiences: **1)**Students distinguish the different materials around us based on the physical properties. **2**)Students analyses the size of the particles and space between the particles of matter.			

PERIOD PLAN-2

CLASS: IX	**CHAPTER: MATTER IN OUR SURROUNDINGS**
TOTAL NO. OF PERIODS: 09	**PERIOD NO.: 02**
KEY CONCEPTS:PARTICLES OF MATTER ARE CONTINUOUSLY MOVING	

LEARNING OUTCOMES	TEACHING-LEARNING PROCESS	POINTERS FOR FORMATIVE ASSESSMENT	MATERIALS REQUIRED
1. Experiments to arrive at and verify the facts of diffusion of matter. 2. Relates processes and phenomena with causes. 3.Communicates the findings and conclusions effectively	1). How matter is classified? 2). What happens when salt or sugar dissolved in water? 3). Tell where we can waive our hand freely i.e. in water or air? 4)Students respond and then we start the topic by raising the question why it is difficult to waive our hand freely in water? 5)How we can waive our hand freely in air? **ACTIVITY 1.3** Put an unlit incense stick at a corner of your classroom. How close you have to go near it to sense its smell? Now light the incense stick. What do you observe ? Do you get the smell sitting at a distance? Record your observations?	1). Give reasons for the following observations. (a)the smell of hot sizzling food reaches you several meters away, but to get the smell of cold food you have to go close. (b). We can get the smell of perfume sitting several meters away.	Incense sticks, matchbox Glasses or beakers,water,blue or red ink, honey

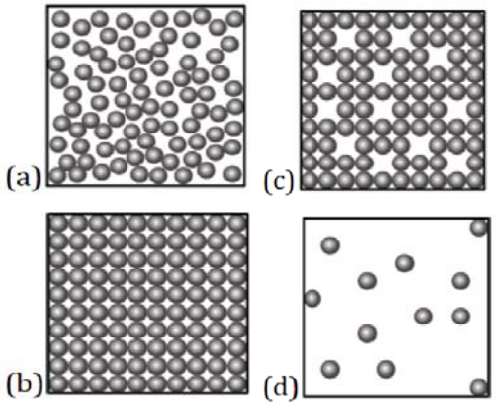
	ACTIVITY 1.4 Take two glass beakers and fill them with water. Put a drop of blue or red ink slowly and carefully along the sides of the first beaker and honey in the same way in the second beaker. Leave them undisturbed at the corner of the classroom. Record your observations. 1). What do you observe immediately after adding a drop of honey? 2). How many seconds or minutes does it take for the ink to spread evenly throughout the water? **ACTIVITY 1.5** Drop a crystal of copper sulphate or potassium permanganate in to a glass of hot water and another container with cold water. Do not stir the solution. Allow the crystals to settle at the bottom. 1). What do you observe just above the solid crystals in the glass?	2). Which of the following spread faster in water? Explain? (a) honey (b)ink (c)lemon juice 3). Why coppersulphate dissolves quickly in hot water than in cold water? 4)Interpret the relation between kinetic energy and temperature? 5) A student adds ink to water. The ink particles spread throughout the water. Which property of water allows other particles to diffuse in it? (a)fixed volume (b)inability to compress (c) intermolecular spaces (d) ability to change shape	Copper sulphate or potassium permanganate, hot & cold water. https://byjus.com/chemistry/matter-particles-characteristics/ https://byjus.com/chemistry/matter-particles-characteristics/

	2). What happens as time passes? 3). What does this suggest about the particles of solid and liquid? 4). Does the rate of mixing change with temperature? Why and how? From the above three activities pupil conclude that particles of matter are continuously moving i.e. They possess kinetic energy. As temperature increases particles move faster. So we can say that increase in temperature raises the kinetic energy of particles. In the above three activities we observe that particles of matter intermix on their own as they have spaces between them. This intermixing of particles of two different types on their own is called diffusion.	6) A student puts one drop of food colour in 100 ml of water. The student notices that the food colour gradually spreads in the water. What is the possible reason for this phenomenon? (a)a close arrangement of the water particles (b)the ability of the water particles to move continuously (c)the ability of the water to stay warm at room temperature (d)less intermolecular space between the water particles	
Teachers' reflections and experiences: **1) Students understands that particles of the matter are continuously moving** **2) Students explains the diffusion of matter.**			

PERIOD PLAN-3

CLASS: IX			
CHAPTER: MATTER IN OUR SURROUNDINGS		**KEY CONCEPTS:PARTICLES OF MATTER ATTRACT EACH OTHER**	
TOTAL NO. OF PERIODS: 10		**PERIOD NO.: 03**	
LEARNING OUTCOMES	**TEACHING-LEARNING PROCESS**	**POINTERS FOR FORMATIVE ASSESSMENT**	**MATERIALS REQUIRED**
1). Differentiates between various objects based on the forces of attraction between the molecules. 2). Explains the phenomenon how forces of attraction between particles affects the strength of the object. 3). Application of scientific concept in everyday life regarding the strength of the particles.	1). What happens when we lit an incense stick kept at the corner of a room? 2). How can we smell the cooked food items from a distance? 3). What happens when water falls on the floor? 4) Can we pass our hand through the book? If not why? **Activity 1.6** Prepare four groups A, B, C &D with the students.  Fig. 1.3 **Group A**: Students hold each other from the back and lock arms tightly and form human chain	1).If we consider each student as a particle of matter then which of the groups are tough to break the human chain? 2).What is the order of strengths among the groups A,B& C.	

4)Explain the effect of forces of attraction on the strength of the objects. 5)Differentiates the objects based on their strength and giving reasons.	 **Group B**: Students hold each other with hands and form human chain. **Group C**: Students hold each other by touching with finger tips and from human chain  **Group D**: students are free and not touching each other. Now students of group D has to run around the three groups and try to break the chain of students in to individual-one. Which human chain is tough to break? Group A human chain is tough to break because in group A the students are held hand tightly using maximum force. Which one is easy to break? Group C the students are held hands loosely with minimum force hence group C is easy to break the human chain.	3).Which among the three particles do you think the particles are held together with greater force? 4) Can you relate the object with groups A,B and C in the **Activity 1.6** 5) Are you able to cut the surface of the water? 6) A diver is able to cut through water in a swimming pool, which property of matter does this observation made?	Iron nail, chalk piece , rubber band Beaker and water.

	ACTIVITY 1.7 Take an iron nail, a cardboard and a rubber band seperately and try to break the substances using hammer, hand or stretching. What do you observe? We observe that the iron nail is difficult to break even with hammer and it is not stretchable. Can we stretch cardboard? Can we break easily rubber band? Why iron nail is difficult to break or unstreachable? the particles in iron nail are held together with maximum force. 	7) Identify various objects in the everyday life and try to differentiate based on their strengths and report as a project. 8) A student learns that the particles of brick are arranged in a manner so that they attract Each other with greater force. Which diagram shows the arrangement of particles in abrick? 	https://byjus.com/chemistry/matter-particles-characteristics/ https://byjus.com/chemistry/matter-particles-characteristics/

	Activity 1.8  Take water in the beaker and try to cut the surface of the water with fingers. What do you observe? Why is it easy to insert your fingure into water? What does the above three activities suggest? Particles of matter have force acting between them. This force keeps the particles together. The force of atrraction between the particles in every matter remain same or different? The strength of this force of attraction varies from one kind of matter to another.	9)A few substances are arranged in the increasing order of 'forces of attraction' between their particles. Which one of the following represents a correct arrangement? (a) Water, air, wind (b) Air, sugar, oil (c) Oxygen, water, sugar (d) Salt, juice, air 10) Fill in the blanks: (a) At room temperature the forces of attraction between the particles of solid substances are———than those which exist in the gaseous state. (b) The arrangement of particles is less ordered in the ——— state. However, there is no order in the ——— state.	
Teachers' reflections and experiences: **1) students understands how forces of attraction between particles affects the strength of the object.** **2) students differentiates the objects based on their strength and giving reasons.**			

PERIOD PLAN-4

<table>
<tr><td colspan="2">CLASS: IX</td><td colspan="2"></td></tr>
<tr><td colspan="2">CHAPTER: MATTER IN OUR SURROUNDINGS</td><td colspan="2">KEY CONCEPTS: STATES OF MATTER, THE SOLID STATE</td></tr>
<tr><td colspan="2">TOTAL NO. OF PERIODS FOR THIS CHAPTER: 09</td><td colspan="2">PERIOD NO:4</td></tr>
<tr><td>LEARNING OUTCOMES</td><td>TEACHING-LEARNING PROCESS</td><td>POINTERS FOR FORMATIVE ASSESSMENT</td><td>MATERIALS REQUIRED</td></tr>
<tr><td>Distinguishes different states of matter based on properties such as shape, volume and states of matter.
Student draws conclusion that solids have definite shape and volume.
Students relates the rigidity of solids to fixed position of atoms/ molecules</td><td>The teacher will start the lesson with a discussion to check for prior knowledge and probing questions
What are different states of matter?
How solids are different from liquids and gases?
Lets do an activity.
Collect the following articles — a pen, a book, a needle and a piece of wooden stick.
• Sketch the shape of the above articles in your notebook by moving a pencil around them.
• Do all these have a definite shape, distinct boundaries and a fixed volume?</td><td>1) Classify the following into different states of matter?
<table><tr><th>Substance</th><th>Solid</th><th>Liquid</th><th>Gas</th></tr><tr><td>Bench</td><td></td><td></td><td></td></tr><tr><td>Book</td><td></td><td></td><td></td></tr><tr><td>Water</td><td></td><td></td><td></td></tr><tr><td>Thought</td><td></td><td></td><td></td></tr><tr><td>Cold</td><td></td><td></td><td></td></tr><tr><td>Hate</td><td></td><td></td><td></td></tr><tr><td>Pen</td><td></td><td></td><td></td></tr><tr><td>Air</td><td></td><td></td><td></td></tr></table></td><td>Bench, book, water, pen
Https://youtu.be/9intojaiytk?Si=k_oq1mpuugnyjdgn</td></tr>
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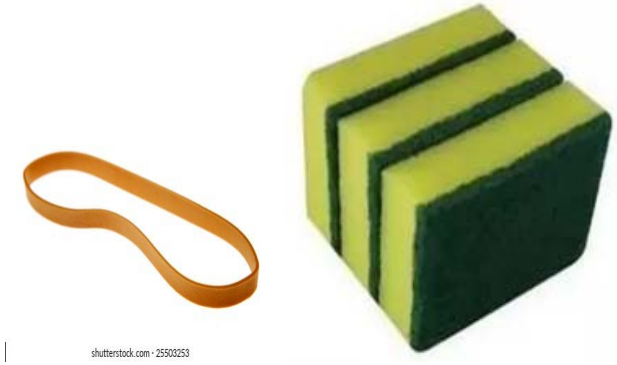
	• What happens if they are hammered, Pulled or dropped? • Are these capable of diffusing into each other? • Try compressing them by applying force. Are you able to compress them? Why solids are rigid? Solids have a tendency to maintain their shape when subjected to outside force. Solids may break under force but it is difficult to change their shape, so they are rigid.  (1) What about a rubber band, can it change its shape on stretching? Is it a solid? (2)A rubber band changes shape under force and regains the same shape when the force is removed? If excessive force is applied, it breaks.	2) Do an activity. Take an ice cube (solid). Press it on its sides. Is it easy or hard to press it? 3) Stretch the given ice cube? 4) Put the ice cubes a side for 10 minutes? 5) What happens to it? 6) Will it have same shape of ice? 7) Do all these have definite shape, distinct boundaries? 8) What happens if they are hammered, pulled or dropped?	

	(3) What about a sponge? (4)It is a solid,yet we are able to compress it. Why? A sponge has minute holes, in which air is trapped, when we press it, the air is expelled out and we are able to compress it.  (c)What about sugar and salt? When kept in different jars these take the shape of the jar. Are they solids? The shape of each individual sugar or salt crystal remains fixed, whether we take it into our hand, put it in a plate or in a jar.	9) Collect the names of different solid substances in your surroundings? 10) Name the state of matter that tends to maintain its shape when subjected to outside force? 11) Why do particles start vibrating in solids?	
Teachers' reflections : 1) Student's draws conclusion that solids have definite shape and volume. 2) Student's relates the rigidity of solids to fixed position of atoms/ molecules.			

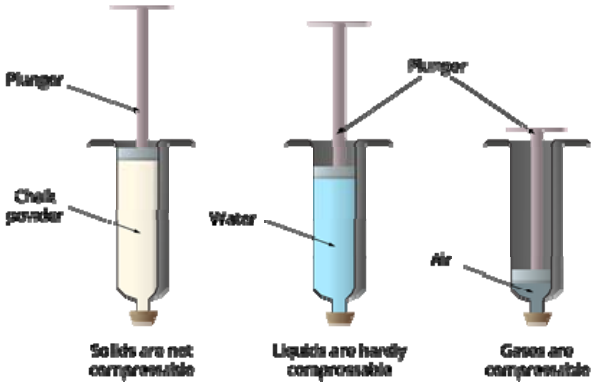
PERIOD PLAN-5

CLASS: IX		CHAPTER: MATTER IN OUR SURROUNDINGS	
TOTAL NO.OF PERIODS: 09		PERIOD NO:5	
KEY CONCEPTS: THE LIQUID AND GASEOUS STATE			
LEARNING OUTCOMES	**TEACHING-LEARNING PROCESS**	**POINTERS FOR FORMATIVE ASSESSMENT**	**MATERIALS REQUIRED**
Explain the properties of liquid and gases Analyze the properties of solids liquids and gases. Indicators: Student draws conclusion that liquids and gases do not have definite shape and volume. Students differentiates the properties of liquids and gases with solids	The teacher will start the lesson with a discussion to check for prior knowledge and Probing questions. Identify the properties of solids? Definite shape Distinct boundaries Fixed volume Negligible compressibility What happens to solids when you apply outside force on them? Solids change their shape? Collect the following: (a) water, cooking oil, milk, juice, a Cold drink. (b) containers of different shapes.	1) Arrange the following in order of increasing density – Air, exhaust from chimneys, honey, water, chalk, cotton and iron. 2) Liquids generally have lower density as compared to solids. But you must have observed that ice floats on water. Find out why?	Bench, book, water, pen Https://youtu.be/9intojaiytk?Si=k_oq1mpuugnyjdgn

	 Put a 50 ml mark on these Containers using a measuring Cylinder from the laboratory. What will happen if these liquids are Spilt on the floor?   • Measure 50 ml of any one liquid and transfer it into different containers One by one. Does the volume remain the same? Does the shape of the liquid remain the same ? When you pour the liquid from one container into another, does it flow	3) Give reasons (a) a gas fills completely the Vessel in which it is kept. (b) a gas exerts pressure on the Walls of the container. (c) a wooden table should be called a solid. (d) we can easily move our hand In air but to do the same through a solid block of wood we need a karate expert. 4) What is LPG? 5) In what form lpg is stored? 6) Give examples for gases which are compressed like LPG? 7) What are the advantages of compressing a gas? 8) We come to know of what is being cooked in the kitchen	

	easily?   We observe that liquids have no fixed shape but have a fixed volume. They take up the shape of the container in which they are kept.   Liquids flow and change shape, so they are not rigid but can be called fluid. How does aquatic life exists? Like humanbeigns aquatic animals or plants need oxygen to respire?	without even entering there, by the smell that reaches our nostrils. How does this smell reach us? 9) Choose the correct statement of the following (a) conversion of solid into vapours without passing through the liquid state is called sublimation. (b) conversion of vapours into solid without passing through the liquid state is called vapourisation.. (c) conversion of vapours into solid without passing through the liquid state is called freezing. (d) conversion of solid into liquid is called sublimation. 10) In which of the following	

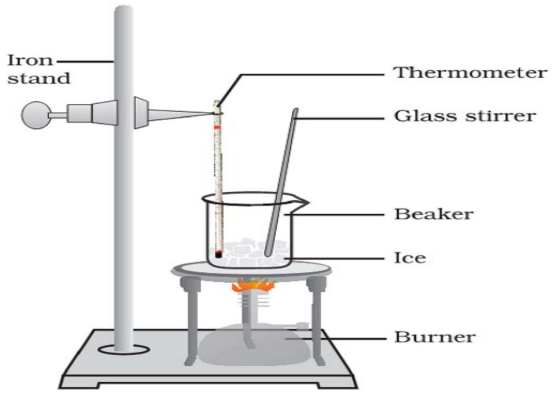
	 All living creatures need to breathe for Survival. The aquatic animals can breathe Under water due to the presence of dissolved Oxygen in water. Does air present in atmosphere dissove in water like salt in water? The gases from the atmosphere diffuse and dissolve in water. These gases,especially oxygen and carbon dioxide, are Essential for the survival of aquatic animals And plants. Among gases,liquids and solids which dissolve in water quickly? What is the name of this dissolution? Why gases have greater diffussion than liquids and solids?	conditions, the distance between the molecules of hydrogen gas would increase? (i) Increasing pressure on hydrogen contained in a closed container (ii) Some hydrogen gas leaking out of the container (iii) Increasing the volume of the container of hydrogen gas (iv) Adding more hydrogen gas to the container without increasing the volume of the container (a) (i) and (iii) (b) (i) and (iv) (c) (ii) and (iii) (d) (ii) and (iv) 11) What is the physical state of water at 25^0C? (a) solid (b) liquid (c) gas (d) none of the above	

	What is the order of diffussion among solids liquids and gases? Have you ever observed a balloon seller filling a large number of balloons from a single cylinder of gas? How many balloons he can fill from the cylinder? Which gas he have in the cylinder?  Take three 100 ml syringes and close Their nozzles by rubber corks. • Remove the pistons from all the syringes. • Leaving one syringe untouched, fill water in the second and pieces of chalk in the third. • Insert the pistons back into the Syringes. You may apply some Vaseline on the pistons before	12) Which of the following form of matter has a fixed volume but not shape? (a) carbon dioxide (b) water vapour (c) kerosene oil (d) none of the above 13) How will you differentiate between a gas and a vapour? 14) Why is liquid classified as a fluid? 15) Why are the particles in liquid held together less firmly as compared to solids?	

	Inserting them into the syringes for Their smooth movement. • Now, try to compress the content by pushing the piston in each syringe What do you observe? In which case was the piston easily pushed in? What do you infer from your observations? Gases are highly compressible as compared to solids and liquids.		
Teachers' reflections: **1**) Student draws conclusion that liquids and gases do not have definite shape and volume. **2**) Students differentiates the properties of liquids and gases with solids			

PERIOD-6

CLASS: IX	CHAPTER: MATTER IN OUR SURROUNDINGS		
TOTAL NO; OF PERIODS: 09	PERIOD NO: 06		
KEY CONCEPTS: CHANGE OF STATE, EFFECT OF TEMPERATURE ON CHANGE OF STATE, LATENT HEAT OF VAPORIZATION AND FUSION.			
LEARNING OUTCOMES	**TEACHING-LEARNING PROCESS**	**POINTERS FOR ASSESSMENT**	**MATERIALS REQUIRED**
a) Students are able to define melting point. b) Students differentiate temperature measurements in different scales. c) Demonstrate the effect of temperature on changes of state. d) Applications to day to day life.	1) What happens when we put liquid water in fridge and see it after 3-4 hrs? Can you identify the change in state in this process? 2) What happens when we held ice cubes in hand for some time? Can you identify the change in state in this process? 3) What happens to the levels of lakes and ponds during summer? Can you identify the change in state in this process? 4) Can you tell me the phenomena behind the above changes? Performing activity -1.12(a)	➢ Conversion of solid state to liquid state is called fusion. What is meant by latent heat of fusion? 1. What are the substances	1)retort stand 2)beakers 3)thermometer 4) ice cubes 5) bunsen burner 6)lighter 7) tripod stand



1. What is the temperature of the ice before melting and after melting?
2. Is the temperature is the same or different?

During the above process, on increasing the temperature of solids , the kinetic energy of the particles increases which overcome the forces of attraction between the particles and a stage is reached when solid melts and is converted to a liquid. This minimum temperature at which a solid melts to become a liquid at the atmospheric pressure is called its **melting point.**

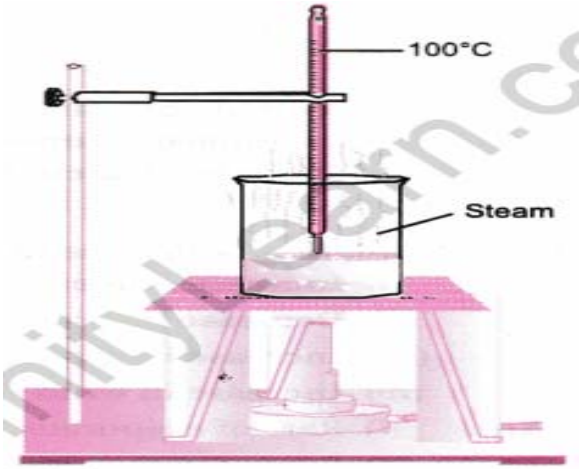
The melting point of ice is 0^0c or 273.15k.

During the change of state from solid to liquid at

that exist in all three states of matter?

2. What happens when ice is heated above 0^0c?
3. How the change of states of matter takes place?
4. Explain the effect of change of temperature on the states of matter.
5. What happens to the particles of matter when heat it?

Change of state	Name of the process	Example
Solid to liquid		
Liquid to gas		
Gas to liquid		
Liquid to solid		
Solid to gas		
Gas to solid		

	0^0c , a certain amount of heat energy is absorbed by ice without any rise in temperature which is called **latent heat.** The amount of heat energy that is required to change 1kg of solid into liquid at atmospheric pressure at its melting point is known as **latent heat of fusion.** Now performing activity 1.12(b)  Activity- 1.1.2(b) 1. What happens to the readings of the thermometer when heating the water gradually? 2. What happens to the water when the	➢ Alka was making tea in a kettle. Suddenly she felt intense heat from the puff of steam gushing out of the spout of the kettle. She wondered whether the temperature of the steam was higher than that of the water boiling in the kettle. Comment. A glass tumbler containing hot water is kept in the freezer compartment of a refrigerator (temperature < 0°C). If you could measure the temperature of the content of the tumbler, which of the following graphs (Fig.1.2) would correctly re present the change in its temperature as a function of time	

reading in the thermometer is 100^0c?

3. Why water is converted to vapour state at 100^0c?

As we supply heat energy to water, at a certain temperature (100^0c) the energy sufficient to break the forces of attraction between each other, the liquid starts changing into gas. **This process is called boiling.**

The temperature at which a liquid starts boiling at atmospheric pressure is known as **boiling point.**

1. What is the boiling point of water?
2. Can you convert 100^0c to kelvin scale?

The steam that is water vapour at 373k has more energy than water at the same temperature. This because particles in steam have observed extra energy in the form of latent heat of vaporization.

Hence we can say that the state of matter can be changed from one state to another state by changing the temperature.

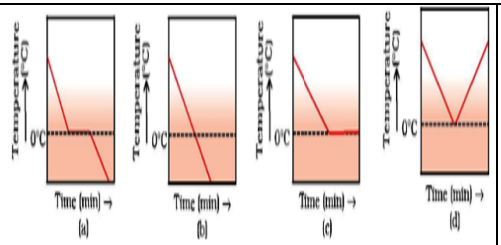


fig 1.2

- The boiling points of diethyl ether, acetone and n-butyl alcohol are 35°C,56°C and 118°C respectively. Which one of the following correctly represents their boiling points in kelvin scale?

(a) 306 K, 329 K, 391 K
(b) 308 K, 329 K, 392 K
(c) 308 K, 329 K, 391 K
(d) 329 K, 392 K, 308 K

- On converting 25°C, 38°C and 66°C to kelvin scale, the correct sequence of temperature will be

(a) 298 K, 311 K and 339 K
(b) 298 K, 300 K and 338 K

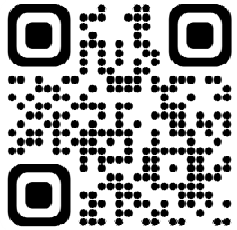
		(c) 273 K, 278 K and 543 K (d) 298 K, 310 K and 338 K	

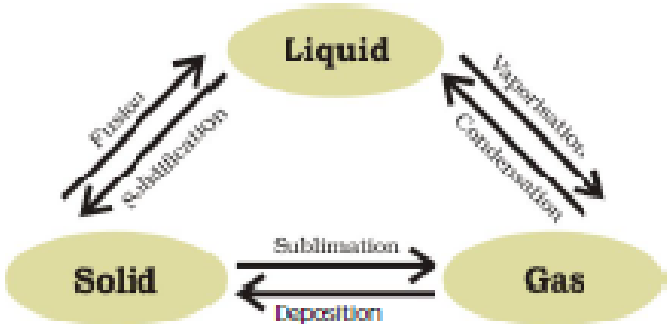
Teachers' reflections and experiences:

1) Students can appreciate the role of temperature in changing the physical states of matter.
2) Confuse about the concepts of melting and boiling temperatures and accordingly the matter behavior.
3) Did not understand the concept of kinetic energy at micro level.
4) Enthusiastic to conduct lab activity and observe the differences
5) Try to note the readings.

PERIOD-7

CLASS: IX	**CHAPTER: MATTER IN OUR SURROUNDINGS**		
TOTAL NO. OF PERIODS: 09	**PERIOD NO: 07**		
KEY CONCEPTS: EFFECT OF CHANGE OF PRESSURE			
LEARNING OUTCOMES	**TEACHING-LEARNING PROCESS**	**POINTERS FOR ASSESSMENT**	**MATERIALS REQUIRED**
1) Demonstrate the physical states of matter based on the change of pressure. 2) Analyses similarities and differences involved in	**Introduction:** 1. How are the particles arranged in solids, liquids and gases? 2. Do the particles change their state by changing temperature (heating or cooling)? 3. What is the effect of change of pressure on the state of gas particles?	1) What happen when high pressure is applied to the gas in the cylinder? 2) What is the phenomenon involved in storage of CNG	1) Cylinder With piston 2) Iodine gas 3) Dry ice Byju's video link https://youtu.be/gowru3depea

various processes like condensation, sublimation, vaporization etc.	Let us take a gas in a cylinder with a piston and start applying pressure with piston. 1. What will happen when we start applying pressure? 2. Do you think that increasing or decreasing the pressure can change the state of matter? The gas particles in the cylinder come closer to each other and if we continue apply pressure, then the compression of gas takes place in a cylinder and converts into liquid state. **This process is called condensation.** Generally solid co_2 gas is stored under high pressure. But when the pressure is decreased and equal to 1atm then the solid co_2 is converted into gaseous state directly without going into liquid state. **This process is called sublimation.**	gas? 3) What is the phenomenon involved in disappearance of camphor? A)condensation B) sublimation C)vapourisation D)deposition 4) What will happen when we increase pressure on CO_2 gas in a cylinder? 5) What is dry ice? 6) At what temperature, is dry ice converted into gas? 7) Conversion of solid to vapour is called sublimation. Name the term used to denote the	

	 Finally, we say that pressure determines the states of matter. I.e., matter is solid or liquid or gas.	conversion of vapour to solid? 8) Cooking gas is known as LPG (liquid petroleum gas). How can a gas to be liquefied? A) when pressure is applied to the gas B) when temperature of the gas is increased. C) when gas is mixed with a liquid substance. D) when the force of attraction between particles is reduced.	

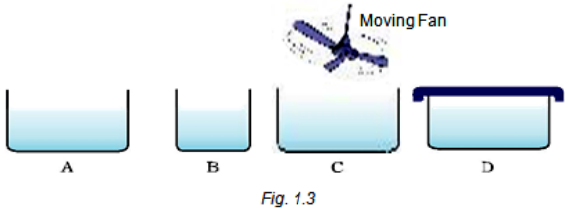
Teachers' reflections and experiences:

6) Students understand the effect of pressure on the states of matter.
7) Students can appreciate the role of pressure in the change of physical states of matter.
8) Students understand the process of condensation and sublimation
9) Students distinguish the various processes involved in the change of physical states of matter.

PERIOD PLAN-8

CLASS: IX		**CHAPTER: MATTER IN OUR SURROUNDINGS**	
TOTAL NO. OF PERIODS:09		**PERIOD.NO.08**	
KEY CONCEPTS: EVAPORATION AND FACTORS AFFECTING EVAPORATION			
LEARNING OUTCOMES	**TEACHING-LEARNING PROCESS**	**POINTERS FOR FORMATIVE ASSESSMENT**	**MATERIALS REQUIRED**
1). Describes the process of evaporation. 2). Exemplifies evaporation. 3). Explains the differences between evaporation and boiling. 4). Analyses the causes of evaporation. 5). Explains how factors affecting evaporation. 6). Relates the factors of evaporation to everyday life.	1) Do we always need to heat or change pressure for changing the state of matter? 2) Why does the level of water decreases in ponds, lakes, rivers in summer? 3) What happens to water when wet clothes dry? 4) How does common salt recovered from sea water? To know the answer for the above questions we will discuss the concept. i.e., evaporation. 5)Explain the definition of evaporation? 6)Explain the mechanism involved in the process of evaporation? 7). Why wet clothes dry faster in summer than that of in winter?	➢ You want to wear your favourite shirt to a party, but the problem is that it is still wet after a wash. ➢ What steps would you take to dry it faster? 1). Write the differences between evaporation and boiling. **2). Project:** Collect the information about the examples of evaporation and its applications in daily life. 3. Which of the following factor/s is not responsible for faster evaporation?	

	8). Why some people prefer to sip tea in saucer rather than in cup? To understand the effect of factors on evaporation we perform an activity. **Acitivity-1.14:** 1. Take 5 ml of water in a test tube and keep it under a fan. 2. Take 5 ml of water in an open china dish and keep it under a fan. 3. Take 5 ml of water in an open china dish and keep it inside a cupboard in the class. Students can record the time taken for evaporation in all the cases. Teacher will suggest the students to do the above activity in rainy day and record the observations (assignment). Now teacher makes the class in to 4 groups and ask them to discuss how the following factors affect the rate of evaporation. • Group-A: Discuss how evaporation increases with increase of surface area. (e.g. In our daily life, we spread out the washed clothes while	(a) increase in surface area (b) increase in humidity (c) increase in wind speed (d) Increase in temperature. 4) Why are we prefer to sip hot tea or milk in a saucer rather than in a cup? 5) During summer, water kept in an earthen pot becomes cool because of the phenomenon of (a) diffusion (b) transpiration (c) osmosis (d) evaporation 6)Which condition out of the following will increase the evaporation of water? (a) Increase in temperature of water (b) Decrease in temperature of water (c) Less exposed surface area of water (d) Adding common salt to water 7)Look at figure 1.3 and suggest in which of the vessels A,B, C or D the rate of evaporation will be the highest?	Test tubes, china dishes and water. Or Refer byju's content or ifp. Evaporation-link: https://youtu.be/rxqmsp2ddfu

	drying). • Group-B: Discuss how evaporation increases with increase of temperature (e.g., clothes dry quickly on a sunny day) • Group-C: Discuss how evaporation increases with a decrease in humidity (e.g. Clothes dry faster under low humidity in air) • Group-D: Discuss how evaporation increases with an increase in wind speed.(e.g. Clothes dry faster on a windy day). From this activity we conclude that temperature, surface area, humidity and wind speed affect the rate of evaporation.	Explain?  *Fig. 1.3* Comment on the following statements: (a) Evaporation produces cooling. (b) Rate of evaporation of an aqueous solution decreases with increase in humidity.	
Teachers' reflections and experiences: 1)Students explains the differences between evaporation and boiling. 2) Students give examples of evaporation to everyday life			

CLASS: IX		**CHAPTER: MATTER IN OUR SURROUNDINGS**	
TOTAL NO. OF PERIODS : 09		**PERIOD NO: 09**	
KEY CONCEPTS: EVAPORATION, HOW DOES EVAPORATION CAUSES COOLING?			
LEARNING OUTCOMES	**TEACHING-LEARNING PROCESS**	**POINTERS FOR ASSESSMENT**	**MATERIALS REQUIRED**
1. Applies the concept of evaporation cause cooling seen in everyday life. 2. Understand the processes like drying of clothes, cooling of surfaces are due to evaporation of liquid. 3. Gives examples for evaporation causes--→ cooling.	**Introduction:** 1) What kinds of clothes keep us cool? 2) Why do wet clothes make us feel cool? 3) How does sweating help in keeping our body temperature under control on a hot day? 4) Why does our palm become cool when pour acetone/sanitizer? 5) Why do people sprinkle water on the roof or open ground after a hot sunny day? 6) Write some examples for evaporation in everyday life (water is in earthen pot gets cool due to evaporation, why pigs toil in mud water, --- etc.). **Activity:** Demonstrate the process of	1) Perform a group activity; ask the students to list out examples of evaporation causes cooling. 2) Why does a desert cooler give better cooling on a hot dry day? 3) Why do we prefer to sip hot tea or milk in a saucer rather than in a cup? 4) What type of clothes	https://diksha.gov.in/play/collection/do_3130736097782251521200 6?contentid=do_31280561677543014415323 https://diksha.gov.in/pl

	evaporation by taking one/two drops of alcohol or acetone on the palm of the hand. The palm feels cool. Explain perspiration or sweating help in keeps our body cool on a hot day?	should we wear in summer? 5) Which of the following process/es absorb heat? (1) condensation (2) evaporation (3) freezing (4) melting. 6) Why do dogs panting on hot summer days? Give reasons.	ay/collection/do_3130736097782251521200 6?contentid=do_31312827743128780811803  Alcohol sanitizer, acetone

Teachers' reflections and experiences:

1) **Students understand the phenomenon of evaporation causes cooling.**
2) **Students give examples for the evaporation in everyday life.**

WORKSHEET-1

Q1. Which of the following does not impact the evaporation rate?

(a) Insoluble heavy impurities

(b) Wind speed

(c)Surface area

(d) None of the above

Q2. The kinetic energy of the molecule is directly proportional to the

(a) Atmospheric pressure

(b) Temperature

(c) both (a) and (b)

(d) None of the above

Q3. The phenomenon in which solid directly converts to the vapour state is known as

(a) sublimation

(b) solidification

(c) vaporisation

(d) none of the above

Q4. Which of the following is the correct interpretation of dry ice?

(a) it is water in a solid-state

(b) it is water in the vapour state

(c) it is carbon dioxide in a vapour state

(d) it is carbon dioxide in a solid-state

Q5. What is the boiling point of water at sea level?

(a) 0 k

(b) 100 k

(c) 373 k

(d) none of the above

Q6. What was the basic classification of elements in ancient times? Name them.

Q7. Fill in the blanks and give a suitable reason for your answer.

(i) As the temperature rises, particles move _____.
(ii) With an increase in temperature, the kinetic energy of the particles also _____.

Q8. We can break a piece of chalk into small particles on hammering, but it is impossible to break a piece of iron in the same fashion. Why?

Q9. Find the density of a handful of sand with a mass of 208 g displacing a volume of 80 ml of water.

Q10. Why is liquid classified as a fluid?

Q11. Why does solid ice float on water?

Q12. By which physical process does the fragrance of burning an incense stick spread all around?

Q13. Name the physical process responsible for drying wet clothes. Why does the spreading of clothes increase the rate of drying?

Q14. Which property of gases helps us in detecting the leakage of lpg gas?

Q15. Convert the following temperature to the kelvin scale.

(i) 65 ° c
(ii) 300 ° c

Q16. Is dry ice same as the normal ice? If no, then differentiate between dry and ordinary ice.

Q17. Why are the particles in liquid held together less firmly as compared to solids?

Q18. How will you differentiate between a gas and a vapour?

Q19. What are the necessary conditions of a substance to be classified as a matter?

Q20. A student spilt a bottle of ammonia in one corner of the laboratory. Soon the laboratory was filled with a pungent irritating smell. The students immediately opened the windows and doors and switched on the exhaust fans. After some time, students got relief. What did happen? Explain

WORKSHEET-2

Q1. BEC is the abbreviation of the _____.

(a) Bose-Einstein Condensate

(b) Bose-Einstein Coolant

(c) Bose-Einstein Condenser

(d) None of the above

Q2. What is the chemical formula of dry ice?

(a) CO_2

(b) H_2O

(c) H_2O_2

(d) None of the above

Q3. Which of the following phenomenon is responsible for cooling water kept in the earthen pot?

(a) evaporation

(b) diffusion

(c) transpiration

(d) none of the above

Q4. Which of the following form of matter has a fixed volume but not shape?

(a) carbon dioxide

(b) water vapour

(c) kerosene oil

(d) none of the above

Q5. Which of the following compound undergo sublimation?

(a) ice cube

(b) sodium chloride

(c) naphthalene

(d) none of the above

Q6. Fill in the blanks and give a suitable reason for your answer.

(i) The diffusion rate of liquids is _____ than that of solids.
(ii) Naphthalene undergoes the process of _____.

Q7. What is vaporisation?

Q8. Why do particles start vibrating in solids?

Q9. Convert the temperature of 70° c to the kelvin scale.

Q10. What is the value of latent heat of fusion of ice?

Q11. Why are burns caused by steam much more severe than by boiling water?

Q12. How can gas be liquefied?

Q13. What is the primary factor that determines the state of matter?

Q14. Which gas will diffuse rapidly among chlorine, carbon dioxide, methane and nitrogen? Give a suitable reason for your answer.

Q15. Why is plasma found in the stars?

Q16. Why does a solid have the strongest intermolecular forces of attraction?

Q17. What do you mean by the statement that the melting point of ice is 273.16 k?

Q18. Give some examples of the plasma state?

Q19. Which phenomenon of gases enables us to catch LPG gas leakage?

Q20. How will you differentiate between solid, liquid and gas?

WORKSHEET-3

Q1. Which of the following has the highest kinetic energy?

(a) steam particles at 100 °c

(b) steam particles at 0 °c

(c) water particles at 100 °c

(d) water particles at 0 °c

Q2. What is the physical state of water at 25^0C?

(a) solid

(b) liquid

(c) gas

(d) none of the above

Q3. Arrange the following substances in increasing order of forces of attraction between the particles: water, sugar, and oxygen.

(a) water < sugar < oxygen

(b) oxygen < water < sugar

(c) water < oxygen < sugar

(d) oxygen < sugar < water

Q4. Which of the following is preferred in the summer?

(a) cotton

(b) polyester

(c) nylon

(d) none of the above

Q5. BEC is the abbreviation for Bose-Einstein Condensate, which has

(a) shallow kinetic energy

(b) shallow potential energy

(c) both (a) and (b)

(d) none of the above

Q6. What is the SI unit of pressure? Give its value in the atmospheric unit.

q7. Name the chemical compound present in the nail polish remover.

q8. Which state of matter is responsible for the glow of the sun and the stars?

Q9. Fill in the blanks and give a suitable reason for your answer.

(i) Higher the melting point of a substance _____ will be the force of attraction between its particles.
(ii) Particles from the bulk of the liquid gain energy to change into the _____ state.

Q10. Write the full form of BEC.

Q11. Name the state of matter that tends to maintain its shape when subjected to outside force.

Q12. The blue colour spreads when a drop of blue ink is put in water, and the whole solution becomes blue. Name the phenomenon due to which this happens.

Q13. Why is dry air heavier than wet air?

q14. What is humidity? What is the effect of humidity on the evaporation rate?

q15. What is the plasma state of matter? Give examples in which matter is present in the plasma state.

Q16. Convert 273 k and 373 k into temperatures on the celsius scale. What is the physical state of water at these temperatures?

Q17. When ice at - 10°c is slowly heated, ice temperature gradually increases to o°c. The system's temperature remains constant when the ice changes into water and then rises further. Explain the observation.

Q18. What do you mean by the term evaporation? What are the various factors that affect the evaporation rate?

Q19. How will you differentiate between evaporation and boiling?

Q20. Neha, by mistake, spilt a glass of water on the floor. Her mother suggested switching on the fan, and after a few minutes, she found that all water had disappeared. She asked her mother how this happened and where all water had disappeared. Based on this, answer the following questions:

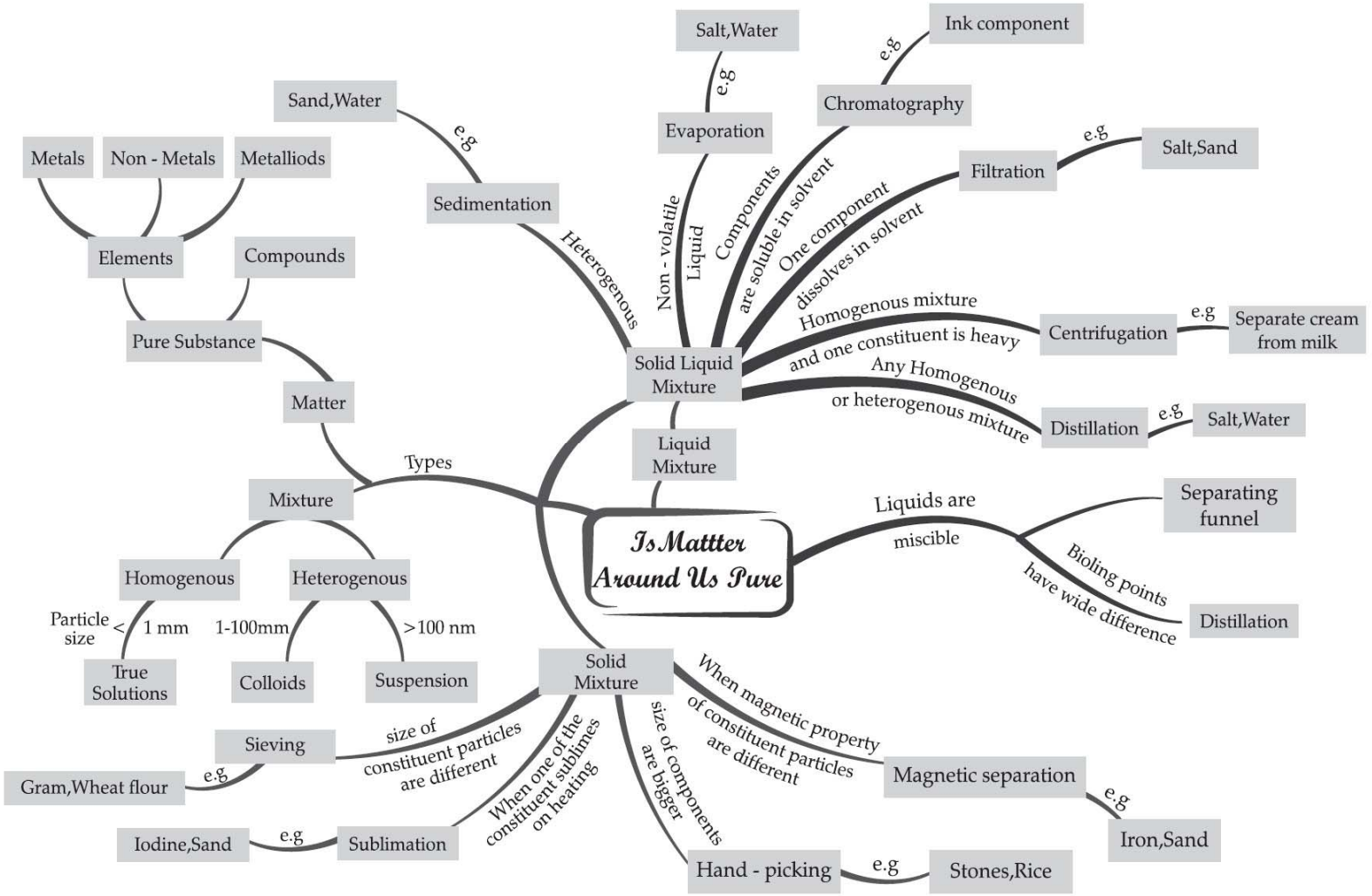
(i) What was the phenomenon associated with the disappearance of water?
(ii) Why does her mother suggest neha switch on the fan?
(iii) What are the values associated with her mother?

CLASS: IX **CHAPTER:02- IS MATTER AROUND US PURE?** **NO. OF PERIODS: 09**

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:	
a. Rational Thought and Autonomy.	Schools should aim to develop independent thinkers who make well-informed decisions based on a grounded understanding of the world around them.
b. Health and Well-being.	School education should be a wholesome experience for students.Students should acquire Knowledge, Capacities, and Dispositions that promote mind-body wellness.
c. Democratic and Community Participation.	School education should aim to develop such Knowledge, Capacities, and Values and Dispositions that enable students to participate and contribute to the democratic functioning of India.
d. Economic Participation.	School education should aim to develop Knowledge,Capacities, Values, and Dispositions that enable students to participate and contribute to the economy. Effective participation in the economy has a positive impact both for the individual and for society as a whole.
e. Cultural Participation.	School education should promote cultural literacy and enable students to acquire knowledge, capacities, and values and dispositions to participate meaningfully and contribute positively to culture.

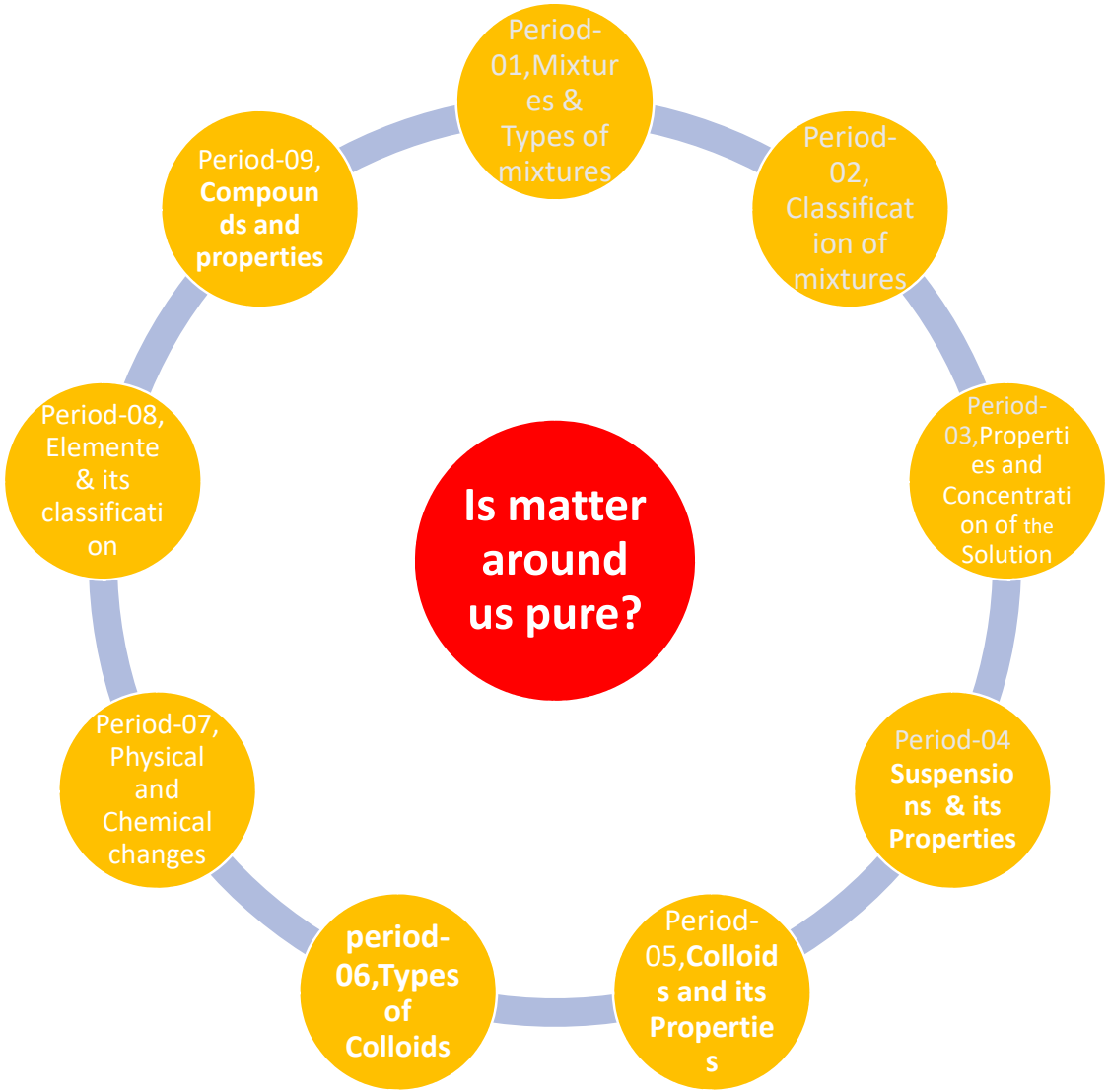
AIMS OF SCIENCE	
1. **Scientific understanding of the natural and physical world:**	Scientific understanding develops through scientific observations, questions,experiments, theories, laws, principles and concepts. An adequate knowledge of these is essential to build a systematic and verifiable understanding 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	COMPETENCIES
CG-1 Explores the world of matter its interactions and properties at the atomic level.	Investigates the nature and properties of matter (types and properties of mixtures solutions colloids and suspensions)based on its chemical composition.
	Explains the importance of measurement and calculate the concentration of the solutions.
	Describes physical and chemical changes of matter
CG-2 Explores the physical world around them and understands scientific principles and laws based on observations and analysis,	Applies effect of temperature and explain the change of states of matter.
	Describes the properties of elements and compounds based on their reactivity.
	Manipulates and analyses different characteristics of mixtures based on tyndal effect filtration and stability.
CG-4 Explores interconnection between molecules of matter and environment,	Illustrates the different types and examples of colloids present in environment.
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,	State questions related to matters in the curriculum for which current scientific understanding is well recognised to be inadequate.
CG-8 Explores the nature of science by doing science,	Implements a plan for scientific enquiry based on experiments.

PERIOD MAP:


Is matter around us pure?
Period-01,Mixtures & Types of mixtures
Period-02, Classification of mixtures
Period-03,Properties and Concentration of the Solution
Period-04 Suspensions & its Properties
Period-05,Colloids and its Properties
period-06,Types of Colloids
Period-07, Physical and Chemical changes
Period-08, Elemente & its classification
Period-09, Compounds and properties

Period. No	Key-concept	Learning outcomes
Period-01	What is Mixture, Types Of Mixtures	1).Understand what is a Mixture and its composition. 2).Understand most of the substances around us are also mixtures. 3). Distinguishes different types of mixtures.
Period-02	Classification of mixtures into Solutions, Suspensions and Colloids, definition of Solution	1). Investigate the properties of solution, suspension and colloid. 2). Understand The Concept Of components of a solution. 3). Able to give daily life examples for solutions. 4). Classifies the solutions into gaseous, liquid and solid solutions. 5). Define alloys and their uses.
Period-03	Properties and Concentration of the Solution	1). Understands the properties and concentration of a solution. 2). Differentiates saturated and un- saturated solutions. 3). Relates the property of solubility of different substances in a given solvent at given temperature. 4). Calculates the concentration of a solution by using mass by mass % method or volume by volume method.
Period-04,05 & 06	(4). Suspensions and properties of suspensions ;(5). Colloids and Properties of colloids and (6). Types of Colloids	1). Differentiates true solutions and suspensions based on characteristics. 2)Classify dispersed phase and dispersion medium 3). Plans and conducts experiment to verify Tyndall effect in lab and naturally.

Period-07	Physical and Chemical changes	1). Distinguish between Physical and Chemical changes. 2). Applies the knowledge of physical and chemical changes in natural processes to understand the environment.
Period-08	Elements, metals, non-metals & metalloids, malleability, ductility, sonority &lustrous	1). Understand and give examples for elements. 2). Classify the Elements as metals, non-metals and metalloids. 3). Understand the peculiar properties of metals and Non-metals. 4). Recollecting the real-life benefits of metals, non-metals and metalloids.
Period-09	Compounds and properties of compounds	1). Understands the concept –"Compounds". 2). Compare the properties of Mixtures and compounds. 3) Differentiate Mixtures and Compounds.

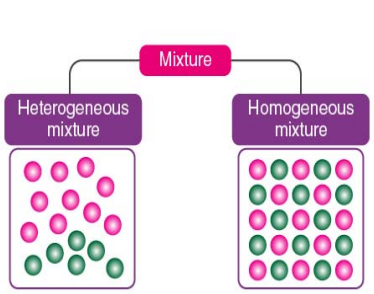
PERIOD PLAN-1

Period time:40 mins

Class: IX
Chapter: Is matter around us pure?
Total no. of periods:9
Period No: 01
Key concepts:What is Mixture ? Types Of Mixtures

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materials required
1)Understand what is a Mixture and its composition 2)Understand the concept of mixture and give examples for mixtures. 3)Distinguishes different types of mixtures.	1.What is Matter? 2. How matter is made? 3. How can we classify the matter?  *Fig. 2.1: Some consumable items*	1). How does a mixture is different from Pure substance?	

	By showing the above pictures asks the following questions. And try to get the answers or answered by the teacher. 4). Answer the label of each packet shown. 5). Does the pure milk is really pure substance? By introducing the concept of Mixtures and pure substances, teacher demonstrates the activity. **<u>Demonstration and activity</u>** **Activity 2.1 : Demonstrate with suitable examples** Providing the following examples make the learner to learn easily about "what are homogeneous and heterogeneous mixtures".	2). Classify the following as homogeneous and heterogeneous mixtures. (a). Soil, (b). Sea water, (c). Air, (d). Coal,(e) Soda water 3). What is the name of the matter----------which contains one type of particles? 4). What are the differences between Homogeneous and Heterogeneous mixtures?	https://byjus.com/chemistry/mixtures/ Beaker, copper sulphate , Common salt, Potassium permanganate, water



Examples:

1). $CuSO_4$ & water→Groups-A & B

2). Mixture of $CuSO_4$& $KMnO_4$→Groups-C & D

Questions to Groups-A & B:

1). Does the mixture have uniform colour and texture?

2). Does $CuSO_4$ completely miscible in water?

3). Is there boundary of separation between $CuSO_4$ and Water?

4). Can you separate $CuSO_4$ and water by filtration?

5).Complete the following table

mixture	**composition**	**Phase separation**
Homogeneous		
Heterogeneous		

6). Classify the following as homogeneous and heterogeneous mixtures.
(a) salt in water
(b) Sugar in water
(c) Iron fillings & NaCl
(d) Oil in water
(e) Salt & Sulphur

	Questions to Groups-C & D: 1). Does the mixture have uniform colour and texture? 2). Are $CuSO_4$ and $KMnO_4$ completely mix with each other? 3). Can you pick $CuSO_4$ or $KMnO_4$ crystals from the mixture? 4). How do you separate $CuSO_4$ and $KMnO_4$ from the mixture? 5). Are both the mixtures of (i) Sand +water and (ii). $CuSO_4$+ $KMnO_4$ same? 6). Is there any boundary of separation in the above mixtures between the components?	7) Which of the following can be classified as a mixture? (a)a clear white salt solution (b)a rusted iron nail (c)a piece of paper cut into different shapes (d)a bowl of water with floating ice cubes	

Teacher reflections& Experiences:

1) **Students understand the difference between Mixture and its composition**
2) **Students give examples for different mixtures.**
3) **Students understand most of the substances around us are mixtures.**

PERIOD PLAN-2

Period time: 40 mins

Class: IXName of the teacher:G Nagaraju & V Nagamani **Chapter: Is matter around us pure?** **Total no. of periods for this chapter:9** **Period No: 02** **Key concepts:Classification of mixtures into Solutions, Suspensions and Colloids, definition of Solution**			
Learning Outcomes	**Teaching-Learning Process**	**Pointers for formative assessment**	**Materials required**
1). Investigate the properties of solution, suspension and colloid. 2). Understand The Concept Of components of a solution. 3). Able to give daily life examples for solutions. 4). Classifies the	1. What is meant by a pure substance? 2. What is a Mixture? 3. What are the differences between Pure substance and mixture? 4. What is a homogeneous mixture? 5. What is a heterogeneous mixture? 6. Are all heterogeneous mixtures have same texture and properties?		Chalk powder or

solutions into gaseous,liquid and solid solutions. 5). Define alloys and their uses.	**<u>Demonstration and activity</u>** **Activity 2.2** Teacher divides the class into A,B,C and D groups, and asksthe students to perform the activity with the given mixtures. Then instruct them to note down the observations in the following table.	Q). Classify the following as solutions, suspensions and colloids (a). Pond water, (b). Vinegar, (c). Fog, (d). Glucose + water, (e). Paint, (f). Oil & water. 1. Is Solution treated as a homogeneous mixture or a heterogeneous mixture? 2. Name the solute and solvent present in the following	Wheat flour, Milk or Ink,Copper sulphate, Water, 4 beakers , torch light Types of mixtures link: https://diksha.gov.in/play/collection/do_3130736097780531201194 6?contentId=do_3130875189279784961316 2

		Name of the mixture	**Tyndall effect**	**Filtration**	**Stability**	solutions (a). Soda water,(b). Tincture of Iodine,(c), brass,(d). Aqueous Coppersulphate solution
		CuSO4 + Water				
		Chalk powder + Water				
		Milk + Water				

	1). Which among the above three mixtures can be filterable? 2). Which mixture shows path of light beam? 3). Compare the particle size of the three mixtures. 4). In which mixture the particles settle down first? 5). Which of the above mixtures are---- (i). Homogeneous, (ii). Heterogeneous? By discussing the above questions and answers, teacher draws the conclusion that (A). The mixtures of groups-A & B are solutions which are homogeneous. (B). The mixture of group-C is a suspension. (C). The mixture of group-D is a colloid.	3). Explain why the particles of colloidal solution do not settle down when left undisturbed, while in the case of suspension they do. 4). Sea water can be classified as homogeneous as well as heterogeneous. Comment. 5) A student is asked to make a homogeneous mixture. He is provided with the followingsubstances.	

	By exhibiting the mixtures like Lemonade, tincture of Iodine and Soda water. Teacher asks the following questions and explains: what are solutions". 1). Write the components of given mixtures. 2). Did the components mix completely with each other? 3). Do you find any boundary of separation between the components of a mixture? 4). Can we call the above mixtures as homogeneous mixtures? 5). Write the components of the above mixtures---- (a) which is less in quantity? (b) which is more in quantity? **Discussion about the concept of Solution:** A solution is a homogeneous mixture of two or more components.	A. Water B. Soil C. Milk D. Chocolate powder E. Salt Which two substances should the student mix to form a homogeneous mixture? (a)A and B (b)C and D (c)B and E (d)A and E 6) A student listed some mixtures and classified them into various types.	Lemonade, tincture of Iodine and Soda water concept of Solution link: https://byjus.com/chemistry/solution-properties-

	We can also have solid solutions (alloys) and gaseous solutions (air). In a solution there is homogeneity at the particle level. A solution has a solvent and a solute as its components. The component of the solution that dissolves the other component in it (larger component) is called the solvent. The component of the solution that is dissolved in the solvent (lessercomponent) is called the solute.	<table><tr><th>Mixture</th><th>Components</th><th>Type of Mixture</th></tr><tr><td>W</td><td>Food colour + Water</td><td>Homogeneous solution</td></tr><tr><td>X</td><td>Sand + water</td><td>Colloidal solution</td></tr><tr><td>Y</td><td>Milk + sugar</td><td>Suspension</td></tr><tr><td>Z</td><td>Rice + Flour</td><td>Heterogeneous mixture</td></tr></table> Which mixtures are classified correctly? (a)W and X (b)X and Y (c)Y and Z (d)W and Z 7) A student crushed a piece of chalk and mixed the chalk powder in 100 mL water. Thewater appeared white and cloudy. After some time the particles settled at the bottom of thecontainer. She claims that the mixture is a suspension. What justifies her claim? (a)The particles mix completely with water. (b)The particles of chalk form a separate layer.	concentration/

		(c)The particles of chalk are visible through the naked eye. (d)The particles of chalk are uniformly distributed in water	

Teacher Reflection &Experiences :-

1) **Students investigate the properties of solution, suspension and colloid.**
2) **Students Understand and identifies components of a solution.**
3) **Students able to give daily life examples for various solutions**
4) **Students classifies the solutions into gaseous, liquid and solid solutions.**

PERIOD PLAN-3

Period time: 40 mins

Class: IXNameof the teachers: G Nagaraju & V Nagamani **Chapter: Is matter around us pure?** **Total no. of period:9** **Period No: 03** **Key concepts:Properties and Concentration of the Solution**			
Learning Outcomes	**Teaching-Learning Process**	**Pointers for formative assessment**	**Materials required**
1. Understands the properties and concentration of a solution. 2. Calculates the mass by mass percentage of a solution. 3. Defines solubility. 4. Differentiates saturated and un-	3. What is a solution? 4. What are the components of a solution? 5. Which one is known as solvent in a solution? 6. Is Solution a homogeneous mixture or heterogeneous mixture? 7. Why we cannot see path of light in a solution? 8. What happens when we filter a solution through filter paper? 9. How we can say a solution is stable?	1). Comment on the following	Properties of Solution link https://byjus.com/chemistry/solution-properties-

saturated solutions.

5. Relates the property of solubility of different substances in a given solvent at given temperature.

6. Calculates the concentration of a solution by using volume by volume method.

With reference to activity -2.2, and by discussing the above questions and answers, teacher conclude the properties of solutions.

Activity 2.3

To explain the concept of Concentrated and dilute solutions , and solubility at different temperatures, teacher perform and asks the following questions. Also instructs the students to note down the observations.

Q:Is the amount of salt and sugar or barium chloride that can be dissolved in water at a given temperature, the same?

Q: What happens to the solubility of the above solutions if increase the temperature?

(i). Is a solution always a liquid?

(ii). Can a solution be heterogeneous?

1. A solution contains 40gms NaCl in 320gms of water. Calculatethe concentration of a solution by using mass by mass percentage method.

2. Pragya tested the solubility of three different substances at different temperatures and collected the data as given below (results are given in the following table, as grams of substance dissolved in 100 grams of water to form a saturated solution

Substance	283 K	293 K	313 K	333 K	353 K

concentration/

Distinguish between solutions link.

https://diksha.gov.in/play/collection/do_3130736097780531201194 6?contentId=do_3131544082473205761166 1

	Q: What would happen if you were to take a saturated solution at a certain temperature and cool it slowly? We can infer from the above activity that different substances have different solubilities in a given solvent at same temperature. With these results Teacher explains the concepts of Solubility, unsaturated and saturated solutions. **Q:** How can express the amount of the solute present in the given solution? By giving the answer to the above question ,the teacher explains how to measure the concentration of the solution by using the following mathematical formulae.	dissolved						https://diksha.gov.in/play/collection/do_3130736097780531201194 6?contentId=do_3131545753105285121177 1  Water, Salt,
		Potassium nitrate	21	32	62	106	167	
		Sodium chloride	36	36	36	37	37	
		Potassium chloride	35	35	40	46	54	
		Ammonium chloride	24	37	41	55	66	
		a).What mass of potassium nitrate would be needed to produce a						

	The Concentration of the Solutions: The concentration of a solution is the amount (mass or volume) of solute present in a given amount (mass or volume) of solution. There are various ways of expressing the concentration of a solution, but here we will learn only three methods. (i) Mass by mass percentage of a solution $$\frac{mass of solute}{mass of solution} X\ 100$$ (ii) Mass by volume percentage of a solution $$\frac{mass of solute}{volume of solution} X\ 100$$ (iii) Volume by volume percentage of a solution $$\frac{volume of solute}{volume of solution} X\ 10$$	saturated solution of potassium nitrate in 50 grams of water at 313 K? (b) Pragya makes a saturated solution of potassium chloride in water at 353 K and leaves the solution to cool at room temperature. What would she observe as the solution cools? Explain. (c) Find the solubility of each salt at 293 K. Which salt has the highest solubility at this temperature? (d) What is the effect of change of temperature on the solubility of a salt? 3). To make a saturated solution, 36 g of sodium chloride is dissolved in 100 g of water at 293 K. Find its concentration at this temperature. 4) A student filled two glasses with	Sugar or Barium chloride. Concentration of solution link: https://diksha.gov.in/play/collection/do_31307360977805312011946?contentId=do_3130875264995409 9212243

		100 mL water in each. To glass 1, she added 5 mLorange food colour, and to glass 2 she added 10 mL orange food colour. Which water would appear darker of the two? (a)Glass 1 because it has less solute (b)Glass 2 because it has more solute (c)Glass 1 because it has more solvent (d)Glass 2 because it has more solvent 5)A student made four solutions using different quantities of water and blue ink. Thequantities are listed in the table. **Solution** | **Volume of Ink (mL)** | **Volume of Water (mL)** 1 | 25 | 200 2 | 10 | 100 3 | 15 | 50 4 | 50 | 250 Which solution has the least	

		concentration with the lightest blue colour? (a)solution 1 (b)solution 2 (c)solution 3 (d)solution 4	

Teacher Reflections &Experiences :-

1) **Students understands the properties and concentration of a solution.**

2) **Students Calculate the mass by mass percentage of a solution.**

3) **Students Differentiates saturated and un- saturated solutions.**

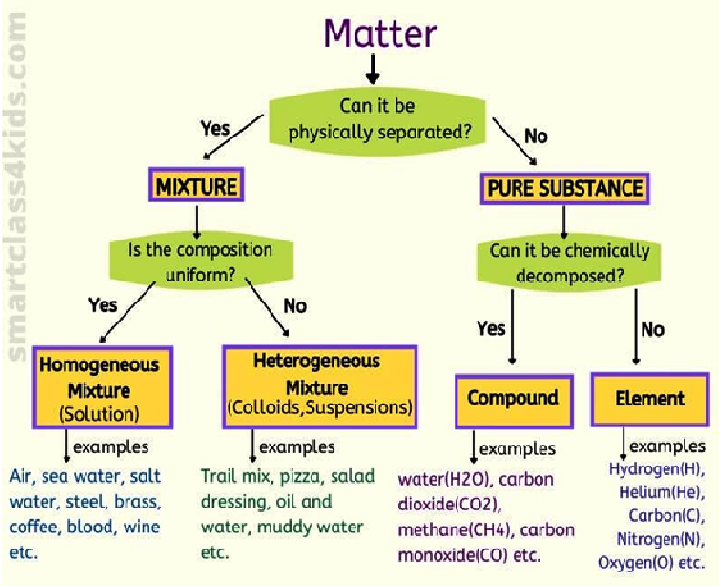
4) **Students Calculates the concentration of a solution by using volume by volume method.**

PERIOD PLAN-4,5&6

Period time:40 mins

Class: IXName of the teacher: G Nagaraju & V Nagamani **Chapter: IS MATTER AROUND US PURE?** **Total no. of periods: 09** **Period No.: 4,5 & 6** **Key concepts:(4). Suspensions and properties of suspensions ;(5). Colloids and Properties of colloids and (6). Types of Colloids**			
Learning Outcomes	**Teaching-Learning Process**	**Pointers for formative assessment.**	**Materials required**
1). Differentiates true solutions and suspensions based on characteristics. 2)Classify dispersed phase and dispersion medium 3). Plans and conducts experiment to verify Tyndall effect in lab and naturally.	**4 th Period** 1) What is a heterogeneous mixture? 2) Give examples for heterogeneous mixtures? 3)  		Ncert text book Labactivity material : Milk Glass beaker Torch light Starch powder Water Copper sulphate

What is a suspension?(with reference to Activity-2.2)



→The mixtures obtained by group A and B in activity 2.2 are homogenous mixtures.

→The mixture obtained by group C in activity 2.2 is a Suspension.

1). Is suspension homogeneous or heterogeneous in nature?

1). How are sol, solution and suspension different from each other?

Substance	Homogenous	Heterogenous

2).Complete the following table.

Glassrod

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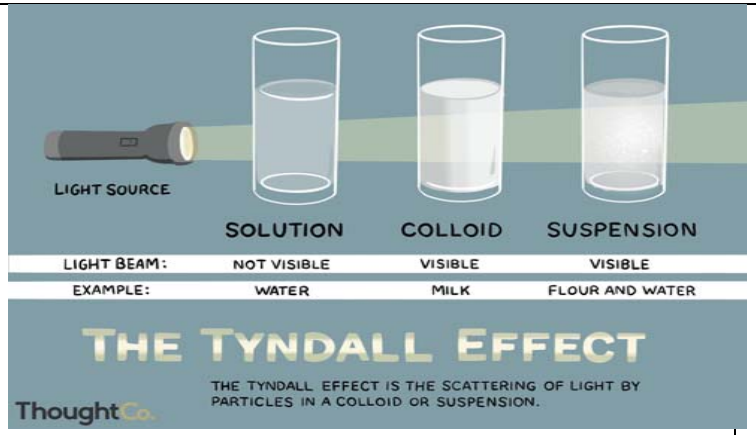
https://diksha.gov.in/play/content/do_3130875189279784961316 2

https://diksha.gov.in/play/content/do_3130929179

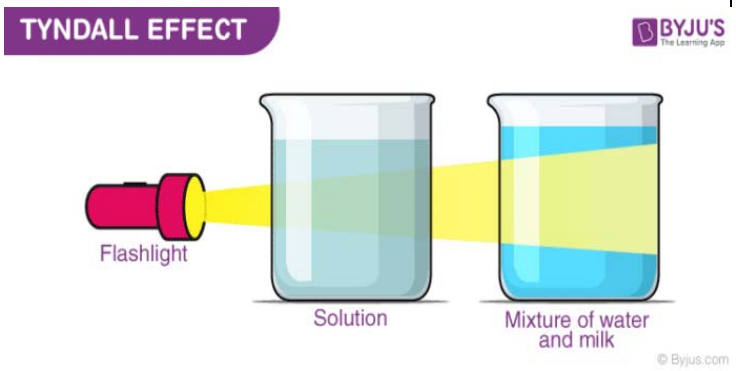
	2). Are Non-homogeneous systems in which solids are dispersed in liquids, are called Suspensions? Explain 3). How the solute particles present in the suspension? 4). Are the Particles of a suspension are visible to the naked eye? **Properties of a suspension:** Teacher explains the properties of the suspensions with suitable examples.	<table><tr><th></th><th>Or Solution</th><th>Colloids</th><th>Suspension</th></tr><tr><td>clouds</td><td></td><td></td><td></td></tr><tr><td>blood</td><td></td><td></td><td></td></tr><tr><td>ice cream</td><td></td><td></td><td></td></tr><tr><td>coffee</td><td></td><td></td><td></td></tr><tr><td>milk</td><td></td><td></td><td></td></tr><tr><td>curd</td><td></td><td></td><td></td></tr></table> 3). When will Suspension shows Tyndall and when does not shown?	49865984 1994 Byju's Links: https://youtu.be/RJyW0A57XK0 https://youtu.be/Z2G0l8rjVfQ https://youtu.be/lS-e3iOG874 Tyndall

1). Describes the properties of colloids. 2). Apply the concept of Tyndall effect in daily life. 3) Communicates the Tyndall effect effectively.	 **<u>5 th Period</u>** Why painters add thinner before using the paints? 1. What instruction is written on the syrup bottle to do before using it? 2. What difference we notice in the a)freshly prepared buttermilk b)after 30 min without causing any disturbance.		effect link: https://diksha.gov.in/play/collection/do_3130736097780531201946?contentId=do_313574983358963712110 79

a) Draw conceptual flow charts and concept maps. b) Draw conclusion on properties of Colloids and Suspensions	**WHAT IS A COLLOIDAL SOLUTION?** The mixture obtained by group D in activity-2.2 is called colloid or colloidal solution. 1) Is colloid homogeneous or heterogeneous? 2) Are the particles of colloids visible to naked eye? 3) Does the components of colloidal solution separated by filtration? 4) Is the colloid make the light path visible? 5) How the colloid different from the suspension? By discussion and assign the answers to the above questions, teacher explains "what are colloids and how they behave". And also explains the phase & medium of the colloid.	1). Explain the following with examples. (a) Saturated solution (b) Pure substance (c) Colloid (d) Suspension 2). Name the process by which separate the components of the colloidal solution. 3). Is Ice-cream Suspension or Colloid?	

Tyndall effect:

- The scattering of a beam of light is called theTyndall effect. (for example, milk)



(a) Solution of copper sulphate does notshow Tyndall effect, (b) mixture of waterand milk shows Tyndall effect.

→Tyndall effect can also be observed when a fine beam of light enters a room through a small

4). What is Tyndall effect? Explain with some examples.

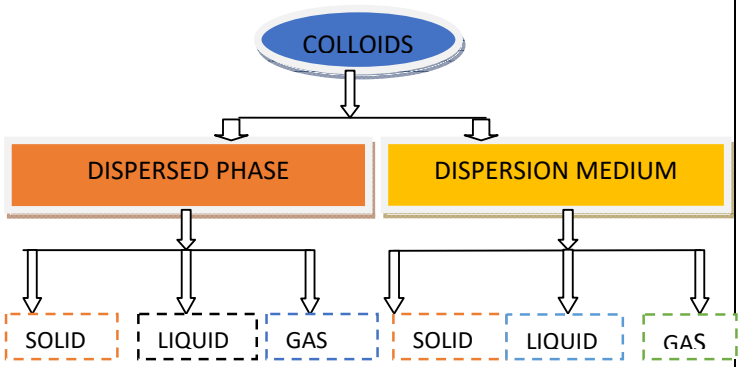
5). Compare the properties of solution, suspension and colloid.

property	Solution	Suspension	Colloid
Particle size			
Homogeneity			
Filtration			
Stability			
Tyndall effect			

6). Write the daily life applications of the Tyndall effect.

1). Identifies various examples of colloids from day-to-day life and differentiates between them. 2). Classify the colloids in to different types	hole.  →Tyndall effect can be observed when sunlight passes through the canopy of a dense forest. 		

	<u>6 th Period</u> **Types of colloids:** 1). What is the difference between milk and curd? 2). What is the dispersion medium present in Paints? 3). Do all colloids have same dispersion medium? By discussing the above questions and answers, teacher explains the classification of colloids based on the dispersing medium and thedispersed phase.	1). Write Dispersed phase and Dispersion medium in the following colloids. (a). Cloud, (b). Shaving cream, (c). Sponge,(d). Colored gem stones. 2). What is an Emulsion? Give two examples.	



Teachers' reflections and experiences:

1) **Students Differentiates true solutions from suspensions 2)Students verify Tyndall effect in lab and naturally.**
2) **Students Identifies various examples of colloids from day-to-day life**

PERIOD PLAN-7

Period time: 40 mins

Class: 9 TH CLASS **Name of the teachers: G Nagaraju & V Nagamani** **Chapter: Is matter around us pure?** **Total no. of periods: 09** **Period number:07** **Key concepts:Physical and Chemical changes**			
Learning Outcomes	**Teaching-Learning Process**	**Pointers for formative assessment**	**Materials required**
1). Understand the interconversion of Physical states is a physical change and understand the chemical changes based on the nature of the substances. 2). Distinguish between Physical and Chemical changes. 3). Applies the knowledge of	By asking questions about (i). Rusting of Iron rod, (ii). Boiling of water to steam, (iii). Dissolving common salt in water and (iv). Blackening of Silver ornaments, Teacher introduces the concept Physical and Chemical changes. 1). What happen to Iron nail when exposed to moisture and air?		

physical and chemical changes in natural processes to understand the environment.	2). What do you observe while boiling of water to steam? 3). Name the colour of old and new Silver ornaments. **Activity-1** By doing lab activity (If possible) or Showing the different physical states of water(Ice, Water & Water vapour), the interconversion of Ice to water at room temperature and Water to Water vapour at boiling point of water. 1). What is inter-convertible temperature of (i). ice to water? ---------- (ii). Water to water vapour? ---------- 2). How the kinetic energy of matter changes, when (i). Ice to water----------(increases/decreases) (ii). Water to water vapour------ (decreases/increases)	1). What is a physical change? Give two examples. 2). What is a chemical change? Give two examples. 3). How do you distinguish water from cooking oil based on their nature? 4). Which one of the following highly inflammable (a). Coconut oil (b) water. (c). Custard oil (d) Both a&b. 1. Classify the following as chemical or physical changes: • cutting of trees, • melting of butter in a pan, • rusting of metal window, • boiling of water to form steam,	Water, cooking oil, vessels, ice and water vapour, burner, etc… Difference Between Physical and Chemical Change link. https://byj

	3). Which type of change is the change of Ice to water? **Activity-2** By doing lab activity (if possible) or asks the students to observe the boiling of water and boiling of cooking oil (sunflower oil or groundnut oil or rice bran oil) at home. Make the pupils to write"what are the differences observed like odors, burning nature of cooking oil, fire extinguish nature water etc……" 1). Do you observe any odour changes during cooking edible oil? 2). What happens to the water molecules while boiling? 3). What are the differences when boiling/cooking water/ edible oil? Similarly, probe the following questions Which type of changes takes place in the below	• passing of electric current, through water and the water breaking down into hydrogen and oxygen gases, • dissolving common salt in water, • making a fruit salad with raw fruits, and • burning of paper and wood.	us.com/chemistry/difference-between-physical-and-chemical-change/  Reversible and Irreversible Changes link. https://youtu.be/6V9KWU3i-TA

	examples 1). When cut the apple? 2). when lemon juice fall on marble floor? 3). When wood burns? By discussing the above questions and answers, Teacher discusses and explains the topic physical and chemical changes.		
Teachers' reflections and experiences: **1) Students Distinguish between Physical and Chemical changes.** **2) Students Applies the knowledge of physical and chemical changes in natural processes**			

PERIOD PLAN-8

Period time: 40 mins

Class: 9 TH CLASS **Name of the teachers: G Nagaraju & V Nagamani** **Chapter: Is matter around us pure?** **Total no. of periods:09** **Period number:08** **Sub Topic:Elements; Key concepts: Elements, metals, non-metals & metalloids, malleability, ductility, sonority &lustrous**			
Learning Outcomes	**Teaching-Learning Process**	**Pointers for formative assessment**	**Materials required**
1). Understand and give examples for elements. 2). Classify the Elements as metals, non-metals and metalloids. 3). Understand the peculiar properties of metals and Non-metals.	1). Name the matter that contains same type of particles. 2). What are the differences do we observe while writing the formulae of hydrogen as H_2 and water as H_2O? From the answers of the above questions,teacher explains the concept of molecule of element and compound. **Activity-1** By exhibiting Iron rod or Aluminum foil or Copper wire-explain how Iron rod or Aluminum foil or Copper wire are made-up with same		Iron rod or Aluminum foil or Copper wire, graphite rods, sulphur powder, hammer, Conduction of Electricity link: https://diksha.gov.

<table>
<tr>
<td>4).
Recollectingtheir eal-life benefits of metals, non-metals and metalloids.</td>
<td>type of tiny particles (atoms with similar mass, behavior etc.)

1). What is the colour of Iron rod or Aluminum foil or copper wire?

2). Do you bend the Iron rod easily?

3). How the iron rod or Aluminum foil or Copper wire made-up of?

By discussing the above questions and answers, teacher makes the learners to perceive “what is an element “.

Activity-2.
→By hitting the Iron sheet or Aluminum vessel with hammer or with stick to make the sense of sound(sonorous) generated by Metals.

→By exhibiting Steel sheets (malleability) and Copper wires(Ductility).

→Ask the students to collect graphite rods from used torch cells and Sulphur powder.</td>
<td>1). Define the concept of an element? Give few examples.

2). Classify the following elements in to metals, non-metals and Metalloids.
Iron, Copper, Silver, Carbon, Oxygen, Sulphur, Gold, Aluminum, Silicon, Phosphorus.

3). Write the peculiar properties of
(i). Metals.
(ii). non-metals.

4). Complete the following table

<table>
<tr><td>Name of the property</td><td>Metals (Yes/No)</td><td>Non-Metals (Yes/No)</td></tr>
<tr><td>Lustrous</td><td></td><td></td></tr>
<tr><td>Malleability</td><td></td><td></td></tr>
<tr><td>Ductility</td><td></td><td></td></tr>
</table>
</td>
<td>in/play/collection/do_31307360979522355211783?contentId=do_313644226764595200114 5

Heat Transfer link:

https://diksha.gov.in/play/collection/do_31307360979522355211783?contentId=do_313644228694884352187

Malleability link:
https://diksha.gov.</td>
</tr>
</table>

	1). Why Iron article will generate sound? Why not carbon (Graphite) rod? When hit with hammer. 2). Why Copper or Aluminum becomes as sheets? Why not Sulphur or phosphorus becomes sheets? 3). How Copper element becomes as sheets or wires? 4). Why Sulphur or Phosphorus not becomes as sheets or wires? 5). Write the nature of carbon as (i). Graphite rod (ii). Diamond. By discussing the above questions and answers, teacher explains the classification of elements as metals, metalloids and non-metals based on their behavior, appearance and peculiar properties. **Project** Ask to collect information about real life uses of metals and non-metals in different fields.	Sonority Conductivity		https://diksha.gov.in/play/collection/do_3130736097952235521178?contentId=do_3136449650328698881503 Ductility link: https://diksha.gov.in/play/collection/do_3130736097952235521178?contentId=do_3136449658998128641 54

Teachers' reflections and experiences:

1) **Students understands and give examples for elements.**
2) **Students Classify the Elements as metals, non-metals and metalloids.**

PERIOD PLAN-9

Period time: 40 mins

Class: 9 TH CLASSName of the Teachers: G Nagaraju & V Nagamani **Chapter: IS MATTER AROUND US PURE?** **Total no. of periods:09** **Period number:09** **Key concepts:Compounds and properties of compounds**			
Learning Outcomes	**Teaching-Learning Process**	**Pointers for formative assessment**	**Materials required**
1).Understands the concept – "Compounds". 2). Compare the properties of Mixtures and compounds. 3) Differentiate Mixtures and Compounds.	1). What is the difference in the composition of H_2 gas and H_2O? 2). How water is formed by combining atoms of which elements? 3). What do we get when two or more elements combined in affixed ratio? Compound is a substance composed of two or more elements in a fixed ratio. **Activity 2.4:** Divide the class in totwo groups. Give 5 g of Iron filings and 3 g of Sulphur powder in a China dish to	1). How compound different from element? 2). Classify the following into elements, compounds and mixtures. (a) Sodium (b) Soil (c) Sugar solution (d) Silver (e) Calcium carbonate (f) Tin (g) Silicon (h) Coal (i) Air (j) Soap (k) Methane (l) Carbon dioxide (m) Blood 3). How would you confirm that a colorless liquid given to you is pure water?	Iron filings, Sulphur powder, carbon

	both the groups. Ask **Group-I**: students to mix and crush Iron filings and Sulphur powder and **Group-II:** Students to mix crush Iron filings and Sulphur powder and heat the contents strongly till red hot. Remove flame and let the contents cool. (1) Make the two groups students to check the magnetism of the material obtained by them respectively by bring a magnet near the material, whether attracted or not attracted towards the magnet. (2) Ask the students of two groups divide the material obtained respectively into 2 parts, to one part add carbon disulphide and add dil hydrochloric acid to the other part. (3) Group-I students observe the insolubility of material in carbon disulphide and the liberation of hydrogen gas, whereas group-II students observe the solubility of material in carbon disulphide and the liberation of hydrogen sulphide gas **Now answer**	4). Write the differences between Mixtures and Compounds	disulphide, dil hydrochloric acid, china dishes, magnet, etc… Distingush between mixture and compounds https://diksha.gov.in/play/collection/do_3130736097780531201194 6?contentId=do_3131544079060746241110 4

	1). Did the material obtained by the two groups look the same? 2). Which group has obtained a material with magnetic properties? 3). Can we separate the components of the material obtained? 4). On adding dilute sulphuric acid or dilute hydrochloric acid, did both the groups obtain a gas? 5). Did the gas in both the cases smell the same or different? **Conclusion** Based on the varied behavior of the materials obtained by the two group students, they conclude that "physical change leads to the formation of mixture whereas the chemical change leads to the formation of compound.		 https://diksha.gov.in/play/collection/do_3130736097780531201194 6?contentId=do_3131545595315732481164 2 
Teachers' reflections and experiences: **1) Students Compare the properties of Mixtures and compounds** **2) Students Differentiate Mixtures and Compounds**			

Worksheet-1

Q1. Saltwater is an example of

(a) Physical change

(b) Chemical change

(c) Both (a) and (b)

(d) None of the above

Q2. Brass is composed of _____ and _____.

(a) Copper and sulphur

(b) Copper and zinc

(c) Zinc and sulphur

(d) None of the above

Q3. Rusting iron is an example of _____.

(a) Chemical change

(b) Physical change

(c) Both (a) and (b)

(d) None of the above

Q4. Which of the following is a lustrous non-metal?

(a) Carbon

(b) Iodine

(c) Bromine

(d) None of the above

Q5. Which of the following non-metal shows allotropy?

a) Sulphur

(b) Phosphorous

(c) Carbon

(d) All of the above

Q6. What is the base of solution classification into diluted, concentrated or saturated?

Q7. What is the primary difference between a true and colloidal solution?

Q8. Name a technique that can be used to separate liquids whose difference in boiling points is 27° C?

Q9. Why is crystallisation preferred over simple evaporation for the separation of substances?

Q10. Name a separatory technique that can be employed to separate camphor from salt.

Q11. Give an example of a solid-solid solution.

Q12. What are the applications of centrifugation?

Q13. Seawater can be homogeneous and heterogeneous. Justify the statement.

Q14. What will happen if aqueous sugar water is heated to dryness?

Q15. What is the primary difference between smoke and fog?

Q16. Calculate the mass by mass percentage of a solution containing 60 g sugar in 480 g water.

Q17. What will you observe if 12 mL of Dettol is added to 500 mL of water?

Q18. What is a saturated solution? How can you convert a saturated solution to an unsaturated solution?

Q19. What do you understand by the term chromatography? Explain its uses.

Q20. How will you differentiate sol, solution and suspension?

Worksheet - 2

Q1. Which of the following will exhibit the Tyndall effect?

(a) Saltwater

(b) Sugar water

(c) Soap water

(d) None of the above

Q2. Which of the following is solute in the tincture of iodine?

(a) Iodine

(b) Sulphuric acid

(c) Sodium hydroxide

(d) None of the above

Q3. Sugar water is an example of

(a) True solution

(b) False solution

(c) Standard solution

(d) None of the above

Q4. A tincture of iodine is a mixture of

(a) Iodine in potassium iodide solution

(b) Iodine in sodium iodide solution

(c) Iodine in ethanol

(d) None of the above

Q5. Blood and water are examples of

(a) Mixture

(b) Compound

(c) Both (a) and (b)

(d) None of the above

Q6. What sort of mixtures can be isolated by crystallisation?

Q7. What do you mean by the terms solute and solvent?

Q8. Why are alloys regarded as mixtures?

Q9. What will happen if a saturated solution is cooled?

Q10. What is a homogeneous mixture? Give some examples.

Q11. What are the applications of centrifugation?

Q12. Name a technique that can be used to separate butter from curd?

Q13. What do you understand by the term tincture of iodine?

Q14. Is water an element or a compound? Justify your answer.

Q15. Name any two elements that exist in the liquid state at standard conditions.

Q16. Why can true solution particles not be seen by the naked eye?

Q17. Draw a well-labelled diagram to show fractional distillation.

Q18. Name any two methods that can be used to isolate a solid-solid mixture.

Q19. How will you differentiate the compound from the mixture?

Q20. How will you separate a mixture containing kerosene and petrol (the difference in their boiling points is more than 25 o C), which are miscible with each other

Worksheet - 3

Q1. The size of colloidal particles ranges between

(a) 10^{-7} to 10^{-9} cm

(b) 10^{-5} to 10^{-7} cm

(c) 10^{-11} to 10^{-13} cm

(d) 10^{-9} to 10 -11 cm

Q2. Which of the following is not a pure substance?

(a) Aerated water

(b) Zinc

(c) Carbon dioxide

(d) None of the above

Q3. Which of the following is a homogeneous mixture?

(a) Sugar water

(b) Vinegar

(c) Thumbs up

(d) All of the above

Q4. Isotonic solutions are solutions having the same

(a) Surface tension

(b) Osmotic pressure

(c) Vapour pressure

(d) None of the above

Q5. Rusting of iron is known as

(a) Corrosion

(b) Dissolution

(c) Both (a) and (b)

(d) None of the above

Q6. Drying a shirt is a physical or chemical process? Justify your answer.

Q7. What would happen if a saturated solution of potassium chloride was cooled?

Q8. What is the primary difference between colloid and suspension?

Q9. Give an example of a liquid-liquid heterogeneous mixture?

Q10. How can you separate oil and water from their mixture?

Q11. Why can't we see particles of true solution from naked eyes?

Q12. What are colloidal solutions? Enlist its few properties.

Q13. How can you isolate an oil and water mixture?

Q14. Calculate the concentration of 20 g salt in 220 g solution.

Q15. Calculate the amount of salt in a solution containing 0.5 g of salt in 25 g of water.

Q16. (a) Distinguish gold and brass into elements or compounds.

(b) How will you distinguish a chemical process from a physical process?

Q17. Why is a mixture classified as an impure substance?

Q18. Why does the colour of copper sulphate change when an iron nail is kept in it? Justify your answer.

Q19. How will you differentiate between heterogeneous and homogeneous mixtures?

Q20. How will you differentiate between compounds and elements?

Worksheet – 4(MCQ)

1. What is true about a homogeneous mixture?

(a) Homogeneous mixture is the mixture of two or more than two components.

(b) In homogeneous mixture the composition and properties are uniform throughout the mixture

(c) Both (a) and (b) are true

(d) None of the above

2. Which of the following properties does not describe a compound?

(a) It is composed of two or more elements

(b) It is a pure substance.

(c) It cannot be separated into constituents by physical means

(d) It is mixed in any proportion by mass

3. In the tincture of iodine, find the solute and solvent?

(a) Alcohol is the solute and iodine is the solvent

(b) Iodine is the solute and alcohol is the solvent

(c) Any component can be considered as solute or solvent

(d) Tincture of iodine is not a solution

4. Which of the following is not a homogeneous mixture?

(a) Air

(b) Tincture of iodine

(c) Sugar solution

(d) Milk

5. What is the statement? “10 percent glucose in water by mass” signifies.

(a) 10 gram of glucose dissolved in 100 gram of water.

(b) 10 gram of glucose dissolved in 90 gram of water.

(c) 20 gram of glucose dissolved in 200 gram of water.

(d) 20 gram of glucose dissolved in 90 gram of water.

6. Sol and gel are examples of —----------

(a) Solid-solid colloids

(b) Sol is a solid-liquid colloid and gel is liquid-solid colloid

(c) Sol is solid- solid colloid and gel is solid-liquid colloid

(d) Sol is a liquid-solid colloid and gel is a solid-liquid colloid

7. Solid solution in which the solute is gas —--------

(a) Copper dissolved in gold

(b) Camphor in nitrogen gas

(c) Solution of hydrogen in palladium

(d) All of the above

8. An example of liquid metal and liquid non metal is

(a) Gallium, mercury

(b) Mercury, chlorine

(c) Mercury, bromine

(d) Bromine, sulphur

9. Which method is used to separate cream from milk?

(a) Centrifugation

(b) Adsorption

(c) Distillation

(d) Crystallization

10. Which of the statements is incorrect about the physical change?

(a) There is no gain or loss of energy.

(b) It is permanent and Irreversible

(c) Composition of the substance remains same

(d) No new substance is formed.

CBSE MODEL QUESTION PAPER

Time - 3 Hours Total Marks – 80

General Instructions

The question paper comprises two sections, A and B. Students have to attempt both the sections.
(ii) All given questions are compulsory.
(iii) All the questions of section A and section B are to be attempted separately. (iv) Questions 1 to 3 in section A are of one marks. These are to be answered in one word or in one sentence.
(v) Question numbers 4 to 6 in section A are two marks. These have to be answered in about 30 words each.
(vi) Questions 7 to 15 in section A are of three marks. These are to be answered in about 50 words.
(vii) Question number 16 to 21 in section A are of five marks. Question number 19, 20 and 21 have options.
(viii) Question number 22 to 30 in section B are multiple choice questions. Each question is of one mark. You are to select one appropriate response out of the four provided.
(ix) Question numbers 31 and 32 are of two marks each and are based on practical skill.

SECTION- A

Find below the 1-mark questions

1. What is a solution?

2. Where do the lipids and proteins constituting the cell membrane get synthesised?

3. What is second law of motion?

Below given are the 2 marks questions

4. Which postulate of Dalton's atomic theory is the result of the law of conservation of mass?

5. Will advanced organisms be the same as complex organisms? Why?

6. You have a bag of cotton and an iron bar, each indicating a mass of 100 kg when measured on a weighing machine. In reality, one is heavier than other. Can you say which one is heavier and why?

3 marks questions can be found below:

7. Write down the formulae of

(i) Sodium oxide

(ii) Aluminium chloride

(iii) Sodium sulphide

8. What are the limitations of J.J.Thomson's model of the atom?

9. What type of mixtures are separated by the technique of crystallization?

10. Which organelle is known as the powerhouse of the cell? Why?

11. What are the functions of areolar tissue?

12. Identify the kingdoms on the basis of the following features.

a. Multicellular eukaryotic autotrophic organisms

b. Heterotrophic eukaryotic organisms

c. Unicellular eukaryotic organism

13. A train starting from a railway station and moving with uniform acceleration attains a speed 40 km h–1 in 10 minutes. Find its acceleration.

14. A battery lights a bulb. Describe the energy changes involved in the process.

15. An automobile vehicle has a mass of 1500 kg. What must be the force between the vehicle and road if the vehicle is to be stopped with a negative acceleration of 1.7 ms-2?

Find below, the 5 marks Questions

16.How will you separate a mixture containing kerosene and petrol (difference in their boiling points is more than 25°C), which are miscible with each other?

17. Define mitochondria.

18. State which of the following situations are possible and give an example for each of these:

(a) An object with a constant acceleration but with zero velocity

(b) An object moving with acceleration but with uniform speed

(c) An object moving in a certain direction with acceleration in the perpendicular direction

19. Give the names of the elements present in the following compounds.

(a) Quick lime

(b) Hydrogen bromide

(c) Baking powder

(d) Potassium sulphate.

OR

When 3.0g of carbon is burnt in 8.00 g of oxygen, 11.00 g of carbon dioxide is produced. What mass of carbon dioxide will be formed when 3.00g of carbon is burnt in 50.00 g of oxygen? Which law of chemical combination will govern your answer?

20. How do substances like CO_2 and water move in and out of the cell? Discuss.

OR

Diagrammatically show the difference between the three types of muscle fibres.

21. What is the quantity which is measured by the area occupied below the velocity-time graph?

OR

Akhtar, Kiran, and Rahul were riding in a motorcar that was moving with a high velocity on an expressway when an insect hit the windshield and got stuck on the windscreen. Akhtar and Kiran started pondering over the situation. Kiran suggested that the insect suffered a greater change in momentum as compared to the change in momentum of the motorcar (because the change in the velocity of the insect was much more than that of the motorcar). Akhtar said that since the motorcar was moving with a larger velocity, it exerted a larger force on the insect. And as a result the insect died. Rahul while putting an entirely new explanation said that both the motorcar and the insect experienced the same force and a change in their momentum. Comment on these suggestions.

SECTION- B

MULTIPLE CHOICE QUESTIONS

22. Which of the following technique can be used for bringing genetically changes in plants?

(a) Tissue culture

(b) Asexual reproduction

(c) Gene manipulation

(d) All

23. Boiling point (°C) of Oxygen is ____

(a) -183

(b) -196

(c) – 186

(d) -200

24. The mass of an object is a measure of its inertia. Its SI unit is _____

(a) Kilogram (kg)

(b) m/s2

(c) Metre

(d) kg m s–1.

25. The weight is a force acting vertically downwards; It_____

(a) Has both magnitude and direction

(b) Has no magnitude

(c) Has no direction

(d) Does not have any direction or magnitude

26. Plant tissues are of two main types_____

(a) Merismatic and permanent

(b) Epithelial and connective

(c) Muscular

(d) Nervous

27. _____ is the rate of change of velocity

(a) Acceleration

(b) Force

(c) Momentum

(d) Weight

28. Mass of the Earth = _____

(a) 5.98 × 1024

(b) 6.78 × 1022

(c) 4.72 × 1020

(d) 7.36 × 1022

29. Cells were first discovered in 1665 by _____

(a) Purkinje

(b) Robert Brown

(c) Robert Hooke

(d) Virchow

30. Aerated drinks like soda water is _____

(a) a liquid solution

(b) a gas in liquid solution

(c) a solid

(d) a gas

Short Answers- 2 marks Questions

31. What are the drawbacks of Rutherford's model of the atom?

32. An athlete completes one round of a circular track of diameter 200 m in 40 s. What will be the distance covered and the displacement at the end of 2 minutes 20 s? **********THE END**********

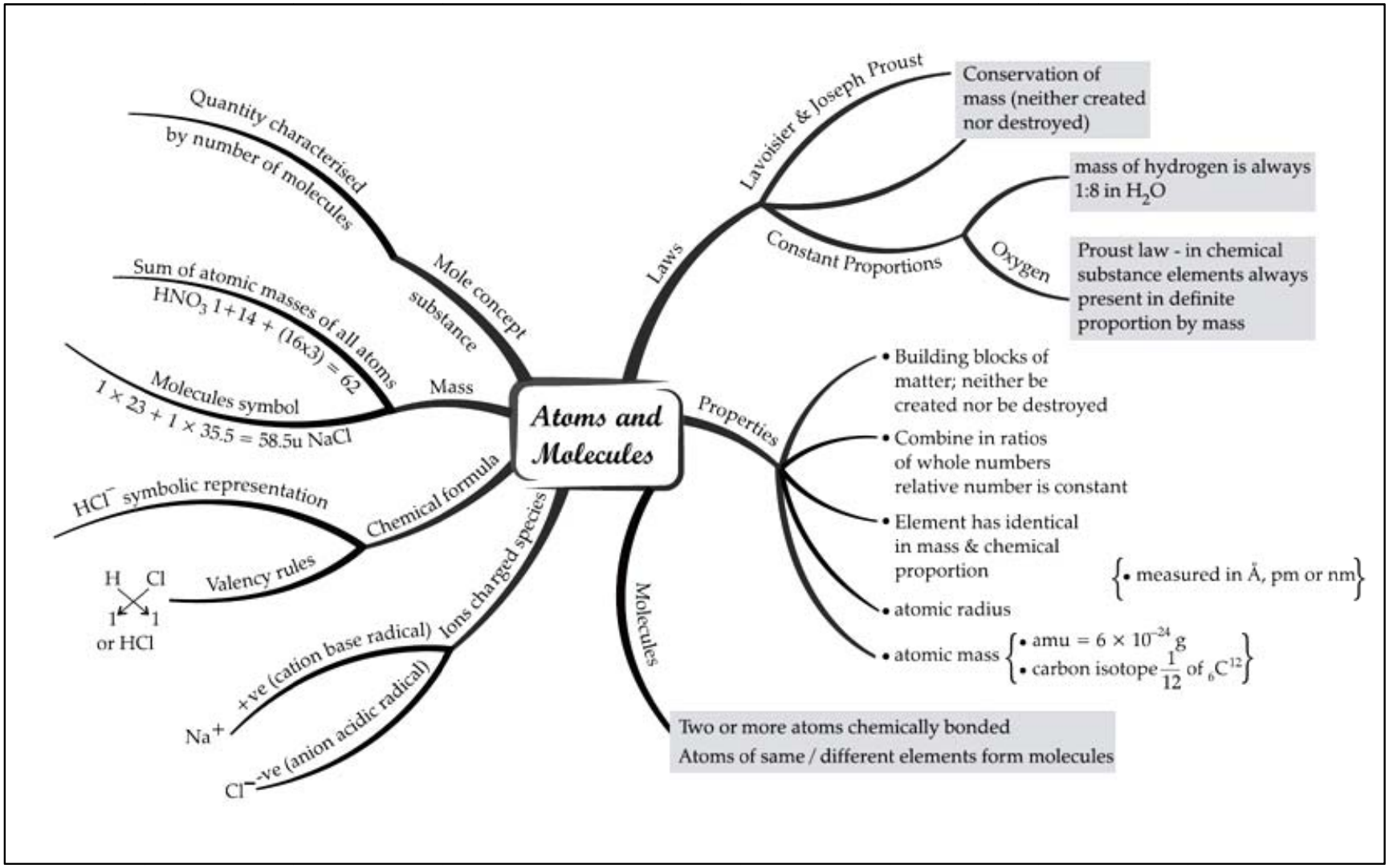
CLASS: IX **CHAPTER:03- ATOMS AND MOLECULES** **NO. OF PERIODS: 08**

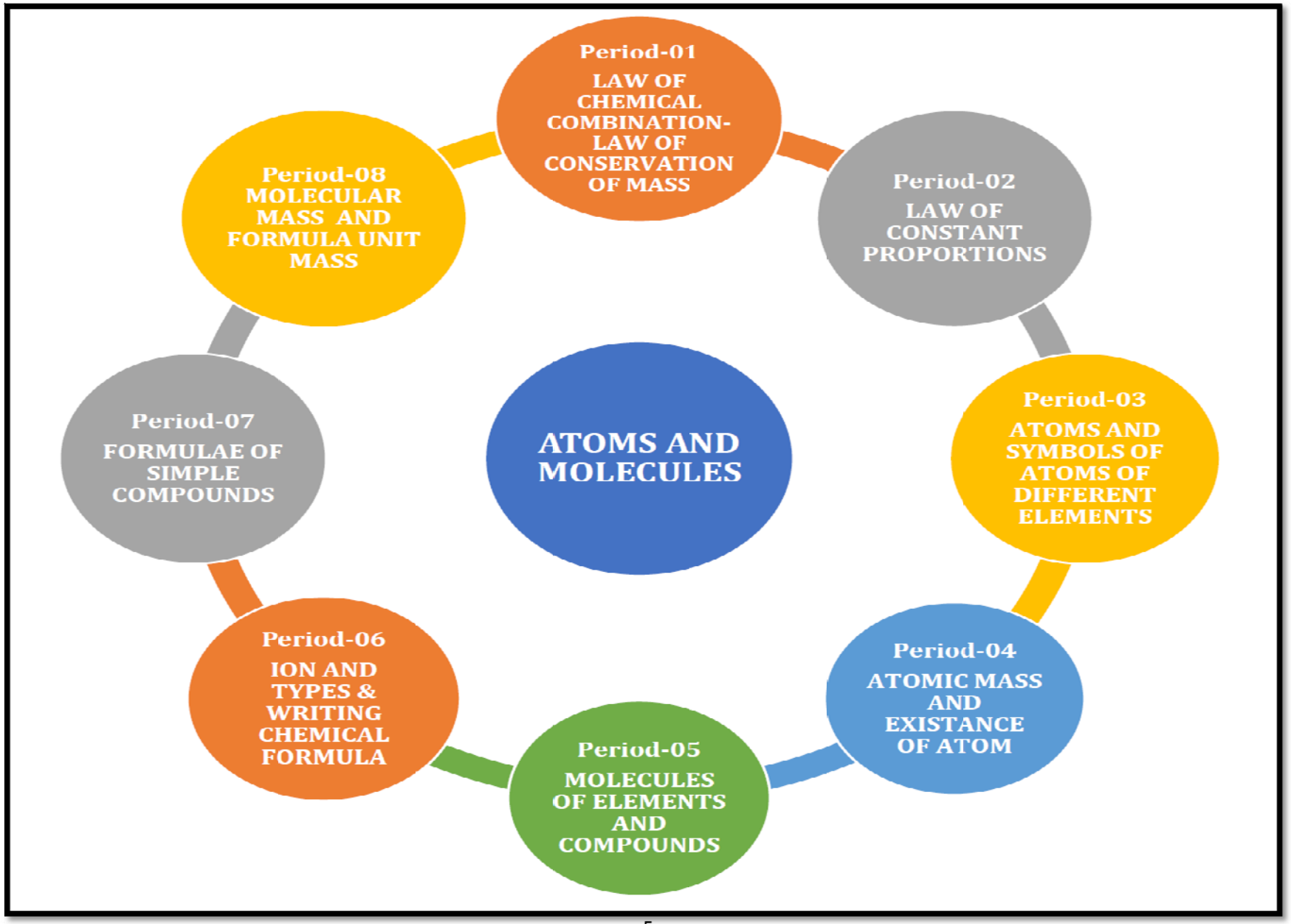
Aims of School Education	
The Learning Standards are guided by certain widely agreed upon broad Aims of School Education that are articulated in this NCF. These aims have been arrived at from the vision and purpose of education as envisaged by NEP 2020:	
a. Rational Thought and Autonomy.	Schools should aim to develop independent thinkers who make well-informed decisions based on a grounded understanding of the world around them.
b. Health and Well-being.	School education should be a wholesome experience for students.Students should acquire Knowledge, Capacities, and Dispositions that promote mind-body wellness.
c. Democratic and Community Participation.	School education should aim to develop such Knowledge, Capacities, and Values and Dispositions that enable students to participate and contribute to the democratic functioning of India.
d. Economic Participation.	School education should aim to develop Knowledge,Capacities, Values, and Dispositions that enable students to participate and contribute to the economy. Effective participation in the economy has a positive impact both for the individual and for society as a whole.
e. Cultural Participation.	School education should promote cultural literacy and enable students to acquire knowledge, capacities, and values and dispositions to participate meaningfully and contribute positively 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.

CURRICULAR GOALS	COMPETENCIES
CG-1 Explores the world of matter its interactions and properties at the atomic level.	1) Describe the formation of elements or compounds based on Dalton's Atomic Theory .
	2) Describes the formation of molecules based on their property(valency)
	3) Investigate the chemical formulae and molecular mass of new compounds and their properties
	4) Describes and represents the compounds using chemical formula by knowing the proportion of mass of atom
	5) Represents the compounds using chemical formula by symbols.
CG-2 Explores the physical world around them and understands scientific principles and laws based on observations and analysis,	1) Applies Daltons law to all the compound around us .
	2) Explains the relationship between the molecular mass and chemical formula
	3) Demonstrates the law of chemical combination using various reactions.
CG-4 Explores interconnection between molecules of matter and environment,	1) Illustrates the presence of various components in environment using chemical formula
CG-5 Draws linkages between scientific knowledge and knowledge across other curricular areas.	1) Applies the law of chemical combination, chemical formulae to explain the phenomenon in other subjects like Physics, Biological and Social Sciences

FLOW CHART


Atoms and Molecules
Laws
Lavoisier & Joseph Proust
Conservation of mass (neither created nor destroyed)
Constant Proportions
mass of hydrogen is always 1:8 in H_2O
Oxygen
Proust law - in chemical substance elements always present in definite proportion by mass
Properties
• Building blocks of matter; neither be created nor be destroyed
• Combine in ratios of whole numbers relative number is constant
• Element has identical in mass & chemical proportion
• measured in Å, pm or nm
• atomic radius
• atomic mass
• amu = 6×10^{-24} g
• carbon isotope $\frac{1}{12}$ of $_6C^{12}$
Molecules
Two or more atoms chemically bonded
Atoms of same / different elements form molecules
Ions charged species
+ve (cation base radical)
Na^+
-ve (anion acidic radical)
Cl^-
Chemical formula
HCl^- symbolic representation
Valency rules
H Cl
1 1
or HCl
Mass
Sum of atomic masses of all atoms
HNO_3 1+14 + (16x3) = 62
Molecules symbol
1 × 23 + 1 × 35.5 = 58.5u NaCl
Mole concept
Quantity characterised by number of molecules
substance


ATOMS AND MOLECULES
Period-01
LAW OF CHEMICAL COMBINATION- LAW OF CONSERVATION OF MASS
Period-02
LAW OF CONSTANT PROPORTIONS
Period-03
ATOMS AND SYMBOLS OF ATOMS OF DIFFERENT ELEMENTS
Period-04
ATOMIC MASS AND EXISTANCE OF ATOM
Period-05
MOLECULES OF ELEMENTS AND COMPOUNDS
Period-06
ION AND TYPES & WRITING CHEMICAL FORMULA
Period-07
FORMULAE OF SIMPLE COMPOUNDS
Period-08
MOLECULAR MASS AND FORMULA UNIT MASS

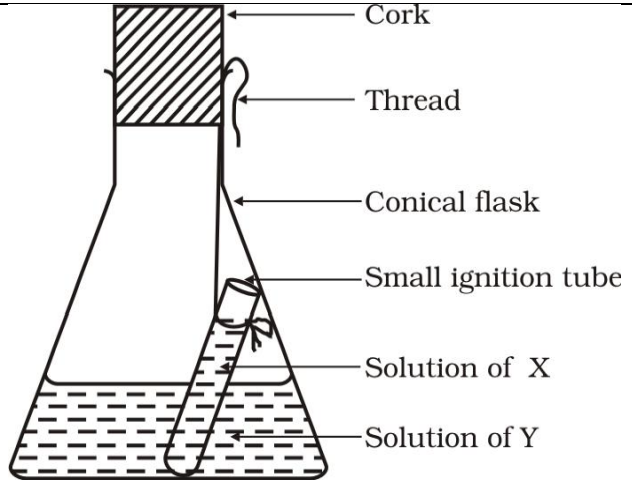
PERIOD NO	KEY-CONCEPT	LEARNING OUTCOMES
Period-01	**LAW OF CHEMICAL COMBINATION-LAW OF CONSERVATION OF MASS**	1. Describes the law of conservation of mass with examples 2. Demonstrates the law of chemical combination using various reactions 3. Applies the law of chemical combination, chemical formulae to explain the phenomenon in other subjects like Physics, Biological and Social Sciences 4. Understand and appreciate the greatness of our ancient Indian Philosopher Maharshi Kanad work and ancient Greek philosophers
Period-02	**LAW OF CONSTANT PROPORTIONS**	**1.** Describe the formation of elements or compounds based on Dalton's Atomic Theory. **2.** Describes and represents the compounds using chemical formula by knowing the proportion of mass of atoms **3.** Applies Daltons law to all the compound around us
Period-03	**ATOMS AND SYMBOLS OF ATOMS OF DIFFERENT ELEMENTS**	**1.** Describe the symbols of elements based onDalton and Berzelius. **2.** Describes and represents the element from Latin, Greek languages **3.** Applies symbols of elements around us
Period-04	**ATOMIC MASS AND EXISTANCE OF ATOM**	**1.** Describes and represents the compounds using chemical formula by knowing the proportion of mass of atoms **2.** Defines the atomic mass andcalculating them using mathematical operations.

Period-05	**MOLECULES OF ELEMENTS AND COMPOUNDS**	1) Explains atoms, molecules and represents compounds using chemical formulae 2) Classify the molecules based on atomicity. 3) Identifies the difference between atoms and molecules 4) Calculates using the data given about the ratio of atoms With the given ratio by mass of the compound
Period-06	**ION AND TYPES & WRITING CHEMICAL FORMULA**	1. Explains salts contains ions. 2. Classify the ions based on charge. 3. Identifies the difference between cation and anion. 4. Describes and represents chemical formulae by using ions and their valencies. 5. Identifies the cation and anion in given salts. 6. Explains the importance of ions and salts in our daily life.
Period-07	**FORMULAE OF SIMPLE COMPOUNDS**	**1.** Describes and represents the compounds using chemical formula **2.** Investigate the valency of ions present in any given compound. **3.** Explains the formation of simple compounds by various methods
Period-08	**MOLECULAR MASS AND FORMULA UNIT MASS**	**1.** Describes the procedure for calculating the Molecular mass of the compounds using atomic masses. **2.** Applies the procedure in calculating molecular mass of various compounds in daily life. **3.** Differentiate between Molecular mass and formula unit mass.

Class: IX
Chapter: ATOMS AND MOLECULES
Total no. of periods for this chapter:08
Period No.01
Key concepts: LAW OF CHEMICAL COMBINATION- LAW OF CONSERVATION OF MASS

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Material required
1.Describes the law of conservation of mass with examples 2. Demonstrates the law of chemical combination using various reactions 3. Applies the law of chemical combination, chemical formulae to explain the phenomenon in other subjects like Physics, Biological and Social Sciences 4.Understand and appreciate the greatness of our ancient Indian Philosopher Maharshi Kanad work and ancient Greek	Students were asked to break a chalk piece or a paper into further smaller pieces until it cannot be broken further. Do you know the name of the smallest particle beyond which further division will not be possible? Ancient Greek Philosophers **Democritus** and **Leucippus** suggested that the smallest indivisible particles are called 'Atoms' What is the difference between element and compounds? Do you know how compounds are formed?	1. What is the difference between atom and element? 2. Which of the following statements is not true about an atom? (a) Atoms are not able to exist independently (b) Atoms are the basic units from which molecules and ions are formed (c) Atoms are always neutral in nature (d) Atoms aggregate in large numbers to form the matter that we can see,feel or touch	Paper Chalk piece Conical flask Ignition tube Rubber cork Thread Required Chemicals $BaCl_2$ Na_2SO_4

philosophers	How elements combine to form compounds? What happens when they combine? Antoine Lavoisier established two important laws of chemical combination. They are 1. Law of Conservation of Mass 2. Law of Constant Proportions **Activity 3.1** Take a conical flask and take 10ml of 5% Na_2SO_4 . Take 10ml of $BaCl_2$ in the ignition tube. Hang the ignition tube in the conical flask carefully without mixing the two solutions. What happens if they are mixed? While doing this experiment put the cork on the mouth of the flask. Weigh the flask with contents carefully and record as W_1	3. Repeat activity 3.1 with copper sulphate solution in the conical flask and sodium carbonate solution in the ignition tube. 4. Does the same experimental results observed? 5. Complete the following reaction i)Copper sulphate + Sodium carbonate---→_____ +_____	e-Links https://youtu.be/i2OE9ljBKD8

	 Now tilt and swirl the flask, so that two solutions are mixed and weigh again after tilting. Record the weight as W_2. Do you observe what happened to the contents in the conical flask? Do you know the name of the white precipitate formed in the flask? The white precipitate formed in the flask after mixing the solution is Barium Sulphate ($BaSO_4$)	6. Which of the following statements depict the law of conservation of mass? o In a chemical reaction, the sum of masses of the reactants in always equal to the sum of masses of the products. o Physical states of substances taking part in a reaction change during the reaction. o Mass is created in a chemical reaction. o Energy of reactants changes during a chemical reaction.	

	What is the weight of the contents before and after mixing? Is it same? What are the products formed if contents in the flasks are reversed? Yes, the weight of the reaction before mixing (W_1) is equal to Weight of the reaction after mixing(W_2) So **W_1=W_2** **Law of conservation of mass** states that "**Mass can neither be created nor destroyed in a chemical reaction"**	7. Choose the products when lead Nitrate reacts with Sodium Chloride a) Lead sulphate b) sodium Nitrate c)lead chloride d) sodium carbonate 1) a&b 2) b&c 3) c&d 4) d&a	
Teachers' reflections and experiences: **1)** **2)**			

Class: IX
Chapter: ATOMS AND MOLECULES
Total no. of periods for this chapter:08
Period No.02
Key concepts:LAW OF CONSTANT PROPORTIONS

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materialrequir d
4. Describe the formation of elements or compounds based on Dalton's Atomic Theory. 5. Describes and represents the compounds using chemical formula by knowing the proportion of mass of atoms 6. Applies Daltons law to all the compound around us	Who proposed law of conservation of mass? What is law of conservation of mass? What is a compound? What is the chemical formula of water? How many hydrogen and oxygen atoms present in one water molecule and what is their ratio? The ratio of atoms in water molecule is same everywhere is 2:1(H:O)	1)How many grams of hydrogen and oxygen are obtained when 9 gms of Water is decomposed? 2)How many grams of nitrogen is required to prepare ammonia if 3 grams of Hydrogen is used?	Ball and stick model of Wate molecule. https://youtu.b /08-96_wkUi8

	According to Lavoisier "**many compounds were composed of two or more elements and each such compound had the same elements in the same proportions, irrespective of where the compound came from or who prepared it**". In a compound such as water, the ratio of the mass of hydrogen to the mass of oxygen is always 1:8, whatever the source of water. • This led to the **law of constant proportions** which is also known as the **law of definite proportions**. This law was stated by Proust as **"In a chemical substance the elements are always present in definite proportions by mass"** • Dalton's atomic theory provided an explanation for the law of conservation of mass and the law	3)What is law of constant proportions? 4)The ratio of the mass of hydrogen to the mass of nitrogen in NH_3. 5) In a reaction 5.3g of sodium carbonate reacted with 6g of Acetic acid. The products were 2.2g of carbon dioxide, 0.9gm of water and 8.2g of sodium acetate. Show that these observations are in agreement with the law of conservation of mass? 6)Hydrogen and oxygen combinein the ratio of 1:8 by mass to form water. What mass of oxygen gas would be required to react completely with 3 g of hydrogen gas?	https://youtu.be/v1n-vNmt3uw

	ofdefinite proportions. • According to Dalton's atomic theory, all matter, whether an element, a compound or a mixture is composed of small particles called atoms.	7) Which postulate of theory is the result of the law of conservation of mass? 8) Which postulate of Dalton's atomic theory can explain law of constant proportions?	
Teachers' reflections and experiences:			

Class: IX
Chapter: ATOMS AND MOLECULES
Total no. of periods for this chapter:08
Period No.03
Key concepts:ATOMS , SYMBOLS OF ATOMS OF DIFFERENT ELEMENTS

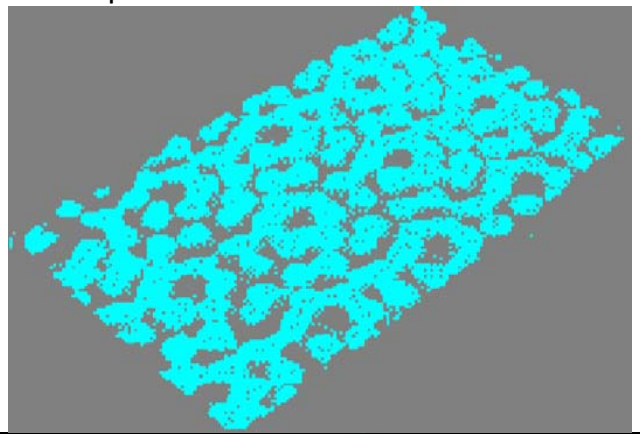
Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materialrequired
7. Describe the symbols of elements based onDalton and Berzelius. **8.** Describes and represents the element from Latin,Greek languages **9.** Applies symbols of elements around us	1)What is law of constant proportions? 2) Which postulate of Dalton's atomic theory is the result of the law of conservation of mass? 3) Which postulate of Dalton's atomic theory can explain the law of constant proportion? 4) Have you ever observed a mason building Walls?(Yes/No) 5)These walls form a room?(Yes/No) 6)A collection of rooms will form a building? (Yes/No) 7)What is the building block of the huge building? 8)What about the building block of an ant-hill? 9) Similarly what are the building blocks of	1)Define an atom? 2)What is the unit for the measurement of atomic radius? 3)Who is the first scientist to use the symbol for elements?	Charts showing symbols of elements Flash cards containing each element and their symbol. Periodic table chart. e-Links https://youtu.be/l1VXM_b2KFY

	matter? ATOM is the building block of matter. 10)How big are atoms? 11)Can we see an atom with our naked eye or by microscope? 12)Which instruments are used to see an atom? 13)What are the units of atomic radius? Atomic radius is measured in nanometers. Express atomic radius in meters and give the relative sizes? $1/10^{9}$ m = 1 nm=10^{-9} m 1 m = 10^{9} nm From the given table find out the particle of small size and large size?	4)Which scientist proposed the names of the elements based on their names? 5)What is the symbol of sodium?	 https://youtu.b /1bnp2G-bhJI 

Give their increasing order ?

Radii (in m)	Example
10^{-10}	Atom of hydrogen
10^{-9}	Molecule of water
10^{-8}	Molecule of haemoglobin
10^{-4}	Grain of sand

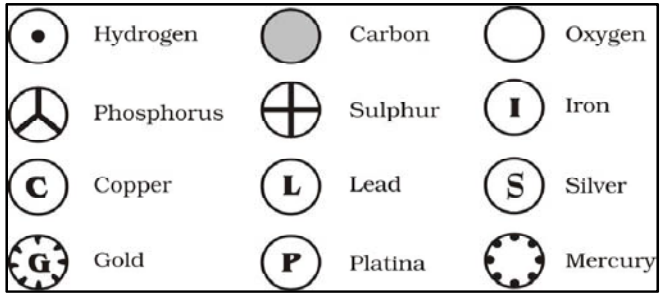
Using modern techniques,we can produce magnified images of surfaces of elements showing atoms.What are the modern techniques used?



- An image of the surface of silicon

If atoms are so insignificant in size, why should we care about them?
What are the modern day symbols of atoms of different elements?

Dalton represented the symbols of the some elements as shown below



What is the difference between these symbols and the modern day symbols?

Can you tell the Modern day symbols of the above elements?
What is Berzilius suggestion on symbols of elements?

6)

Match the following		
1)	Carbon	a)Ca
2)	Calcium	b)Co
3)	Cobalt	c)Cu
4)	Copper	d)C

7)The chemical symbol for nitrogen gas is
(a) Ni (b) N_2 (c) N^+ (d) N

8)The chemical symbol for sodium is
(a) So (b) Sd (c) NA (d) Na

9)Which of the following symbols of elements are incorrect? Give their correct symbols?

(a)	Cobalt	CO
(b)	Carbon	c
(c)	Aluminium	AL
(d)	Helium	He
(e)	Sodium	So

How the elements symbols are unique worldwide?
What is IUPAC?

Many of the symbols are the first one or two letters of the element's name in English.

For example

(i) Hydrogen	**H**
ii) Boron	**B**
iii) Carbon	**C**
iv) Nitrogen	**N**

The first letter of a symbol is always written as a capital letter (uppercase) and thesecond letter as a small letter (lowercase).

For example

(i) Lithium	**Li** and not LI
ii) Beryllium	**Be** and not BE
(iii) Aluminium	**Al** and not AL
(iv) Cobalt	**Co** and not CO.

Symbols of some elements are formed from the first letter of the name and a letter,appearing later in the name.

	Examples are: (i)Chlorine, Cl, (ii) Zinc, Zn etc. What is the symbol of the element Iron? Why is it written as Fe? Which symbols have been taken from the names of elements in Latin, German or Greek? For example, the symbol of Iron is Fe from its Latin name Ferrum. List out the symbols of other elements from their Latin, German or Greek?		
Teachers' reflections and experiences:			

Class: IX
Chapter: ATOMS AND MOLECULES
Total no. of periods for this chapter:08
Period No.04
Key concepts:ATOMIC MASS AND EXISTENCE OF ATOM

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materialre quired
10. Describes and represents the compounds using chemical formula by knowing the proportion of mass of atoms **11.** Defines the atomic mass andcalculating them using mathematical operations.	1)What is the unit for the measurement of atomic radius? 2)What is the mass of an atom? 3)If atom cannot be seen with a microscope how it can be weighed? 4) Do you know the mass of one atom of oxygen? 5)What is relative atomic mass? 6)Why is it difficult to determine the exact mass of atom? 7)How Laws of chemical combinations are used to determine the relative atomic mass? 8)What is atomic mass unit? The atomic mass unit is equal to the mass of one carbon atom, then we would assign	1)What do you mean by atomic mass? 2)What is atomic mass unit and how is it measured? 3) Complete the table **Element** | **Atomic mass (u)** Hydrogen | 1	Charts showing symbols of elements and atomic masses Flash cards containing each element symbol and their atomic mass. Periodic table chart.

	carbon an atomic mass of 1.0 U and oxygen an atomic mass of 1.33 U. where U is the unit for atomic mass called unified mass. As it is more convenient to have these numbers as whole numbers or as near to a whole numberas possible. After considering atomic mass unit as the 1/16 of the mass of the oxygen atom , later in 1961 universally accepted atomic mass unit, carbon-12 isotope was chosen as the standard reference for measuring atomic masses. One atomic massunit is a mass unit equal to exactly one-twelfth(1/12th) the mass of one atom of carbon-12. The relative atomic masses of all elements have been found with respect to an atom of carbon-12. The relative atomic mass of the atom of an element is defined as the averagemass of the atom, as compared to	<table><tr><td>Carbon</td><td>12</td></tr><tr><td>Nitrogen</td><td>14</td></tr><tr><td>Oxygen</td><td>16</td></tr><tr><td>Sodium</td><td>?</td></tr><tr><td>calcium</td><td>?</td></tr></table> 4) Why it is not possible to see an atom with naked eyes? 5) Match the following <table><tr><td>a) Chlorine</td><td>i)14</td></tr><tr><td>b) Sodium</td><td>ii)35.5</td></tr><tr><td>c) nitrogen</td><td>iii)16</td></tr><tr><td>d) oxygen</td><td>iv)23</td></tr></table> 6)Carbon monoxide (CO) is formed by carbon and oxygen. It was observed experimentally that 3 g of carbon combines with 4 g of	e-Links https://youtu.be/8NuSzMIsir0 https://youtu.be/KuyE-445gQM

	1/12th themass of one carbon-12 atom. 	Element	Atomic Mass (u)
---	---
Hydrogen	1
Carbon	12
Nitrogen	14
Oxygen	16
Sodium	23
Magnesium	24
Sulphur	32
Chlorine	35.5
Calcium	40 | **Existence of an Atom:** Atoms of most elements exist in the form of molecules and ions which aggregate in large numbers to form matter.	oxygen to form CO. In other words, carbon combines with 4/3 times its mass of oxygen.If carbon and oxygen form CO_2 then-------. a)3g of carbon combines with 6g of oxygen b) 3g of carbon combines with 8g of oxygen c) 4g of carbon combines with 8g of oxygen d) 4g of carbon combines with 6g of oxygen	
Teachers' reflections and experiences:			

Class: IX

Chapter: ATOMS AND MOLECULES

Total no. of periods for this chapter: 08

Period No.05

Key concepts:MOLECULES OF ELEMENTS AND COMPOUNDS

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Material required
1) Explains atoms, molecules and represents compounds using chemical formulae 2) Classify the molecules based on atomicity. 3) Identifies the difference between atoms and molecules 4) Calculates using the data given about the ratio of atoms With the given ratio by mass of the compound	1) What is the building block of matter? 2) Why do atoms combine to form molecule? 3) Which atoms do not combine or react? 4) What is a molecule? 5) How does a molecule formed from its atoms? 6) Why it is not possible to see molecule with naked eye? 7) Which element is represented with symbol 'N'? 8) How many types of molecules are formed from atoms? 9) How to find out the mass of a molecule? **Molecules of Elements:** The molecules of an element are constituted by	How do we represent the molecule of element Oxygen and ozone? What is the name of S_8 and P_4? Can you name some other monoatomic molecules? Classify each of the following on the basis of their atomicity. (a) F_2 (b) NO_2 (c) N_2O (d) C_2H_6 (e) P_4 (f) H_2O_2 (g) P_4O_{10} (H) O_3 (i) HCl (j) CH_4 (k) He (l) Ag	1)Atomic models of various molecule 2) Byju's tab 3) chart showing symbols and atomic mass of various elements e-Links https://youtu.be/jaNR3RwrSLU

	the same type of atoms. Some molecules are made up of only one atom of that element called **Monoatomic molecule.** Eg:-Gases like Helium(He),Neon(Ne), Argon(Ar), Krypton(Kr). Most of the metals are monoatomic in nature like Sodium(Na), Potassium (K), Gold(Au) etc. What are the poly-atomic elements? List out different poly-atomic elements with examples? If 3 atoms of oxygen unite to form a molecule, we get Ozone with is represented by O_3. What is the name of this molecule? If 4 or more atoms unite to form a molecule then they are called Polyatomic molecules. Can you give few examples of poly-atomic? What is atomicity? The number of atoms constituting a molecule is known as its **atomicity**. Molecules are formed only by same type of atoms	Can you name some other diatomic molecules? Identify the poly-atomic, mono-atomic and compounds from the above lists?	

	or different atoms? If molecules are formed by different atoms then they are called as---------? **Molecules of compounds:** If a molecule is formed from the combination of two or more atoms of different elements in a definite proportion then it is called **Compound.** **Molecules of some compounds** **Activity: 3.2** With the following procedure we can calculate the ratio of number of atoms in the compound	With the given ratio by mass of the compound can you find the ratio of number of atoms ? Calculate the ratio of number of atoms in the compound CO_2 by this method.	

Compound	*Combining Elements*	*Ratio by Mass*
Water (H_2O)	Hydrogen, Oxygen	1:8
Ammonia (NH_3)	Nitrogen, Hydrogen	14:3
Carbon dioxide (CO_2)	Carbon, Oxygen	3:8

	<table><tr><th>Element</th><th>Ratio by mass</th><th>Atomic mass (u)</th><th>Mass ratio/ atomic mass</th><th>Simplest ratio</th></tr><tr><td>H</td><td>1</td><td>1</td><td>$\frac{1}{1}=1$</td><td>2</td></tr><tr><td>O</td><td>8</td><td>16</td><td>$\frac{8}{16}=\frac{1}{2}$</td><td>1</td></tr></table> Thus, the ratio by number of atoms for water is H:O = 2:1 Hence we write the formula of water as H_2O.		
Teachers' reflections and experiences:			

Class: IX	**Name of the teacher: PVR SATISH KUMAR & D ANJANI DEVI**		
Chapter: ATOMS AND MOLECULES	**9441285149 & 63001998824**		
Total no. of periods for this chapter: 08			
Period No.06			
Key concepts:ION AND TYPES& WRITING CHEMICAL FORMULA			
Learning Outcomes	**Teaching-Learning Process**	**Pointers for formative assessment**	**Material required**
5) Explains salts contains ions. 6) Classify the ions based on charge. 7) Identifies the difference between cation and anion 8) Describes and represents chemical formulae by using ions and their valencies. a) Identifies the cation and anion in given salts	**Recapitulation** 10) What is a molecule? 11) What is the formula of hydrogen molecule? 12) What is the atomicity of hydrogen molecule 13) What is atomicity? 14) What is a compound? **What is an Ion:**	What type of batteries used in the mobile phones and rechargable electronic gadgets? (Lithium ion batteries) What is an Ion? What is the name of the substance which added to the food while cooking gives taste to the food? (Answer is table salt) What is the chemical name of table salt? What solution is given to the person who is suffering from diarrhea or dehydrated due to hot summer? (Answer is ORS- Oral rehydration salt)	1)Table salt 2) Byju's tab 3) mobile phone battery 4) flash cards 5) power point slide e-Links https://yo

b) Explains the importance of ions and salts in our daily life	The substance table salt we use regularly in daily life is chemically called Sodium Chloride The sodium chloride is formed from the charged species of Sodium and chlorine called Ions. The charged species are known as *ions*. Ions may consist of a single charged atom or a group of atoms that have a net charge on them. An ion can be negatively or positively charged. A negatively charged ion is called an 'Anion' and the positively charged ion, a 'Cation'. In sodium chloride (NaCl). Its constituent particles are positively charged sodium ions (Na^+) and negatively charged chloride ions (Cl^-). **Examples of cations and anions: (time10M)**	Define Ion. Define cation and anion and give examples?	utu.be/PC ZtnbxtXqE https://yc utu.be/9C 0dXBWgx 3Y

Vale-ncy	*Name of ion*	*Symbol*	*Non-metallic element*	*Symbol*
1.	Sodium	Na^{+}	Hydrogen	H^{+}
	Potassium	K^{+}	Hydride	H^{-}
	Silver	Ag^{+}	Chloride	Cl^{-}
	Copper (I)*	Cu^{+}	Bromide	Br^{-}
			Iodide	I^{-}
2.	Magnesium	Mg^{2+}	Oxide	O^{2-}
	Calcium	Ca^{2+}	Sulphide	S^{2-}
	Zinc	Zn^{2+}		
	Iron (II)*	Fe^{2+}		
	Copper (II)*	Cu^{2+}		
3.	Aluminium	Al^{3+}	Nitride	N^{3-}
	Iron (III)*	Fe^{3+}		

A group of atoms carrying a charge is known as a

Polyatomic ion (Time : 10Min)

Vale-ncy	Polyatomic ions	Symbol
1.	Ammonium	NH_4^+
	Hydroxide	OH^-
	Nitrate	NO_3^-
	Hydrogen carbonate	HCO_3^-
2.	Carbonate	CO_3^{2-}
	Sulphite	SO_3^{2-}
	Sulphate	SO_4^{2-}
3.	Phosphate	PO_4^{3-}

What are polyatomic ions? Give examples.

Some ionic compounds

Ionic Compound	Constituting Elements	Ratio by Mass
Calcium oxide	Calcium and oxygen	5:2
Magnesium sulphide	Magnesium and sulphur	3:4
Sodium chloride	Sodium and chlorine	23:35.5

Writing Chemical Formula:

	The chemical formula of a compound is a symbolic representation of its composition. TO Write a chemical formula we must learn the symbols and combining capacity of the elements. The combining power (or capacity) of an element is known as its valency. Valency canbe used to find out how the atoms of anelement will combine with the atom(s) of another element to form a chemical compound. The following rules to be followed while writing a chemical formula. 1) The valencies or charges on the ions must be balanced. 2) If the compound has both metal and nonmetal then the symbol of the metal should be written first and then nonmetal symbol. Ex: Calcium oxide: CaO Sodium Chloride: NaCl Magnesium Bromide: $MgBr_2$ 3) In compounds formed with polyatomic ions, the number of ions present in the compound	Define Valency? What is the valency of M in the molecule having chemical formula MCl_3.? Write the chemical formulae of the following combination of ions.	

Ions	Cl^-	OH^-	SO_4^{2-}
Na^+			
Mg^{+2}			
Ca^{+2}			

	is indicated by enclosing the formula of ion in a bracket and writing the number of ions outside the bracket Ex: Magnesium Hydroxide: $Mg(OH)_2$. Aluminium carbonate: $Al_2(CO_3)_3$ 4) In case the number of polyatomic ion is one, the bracket is not required. Ex:Sodium Hydroxide: NaOH Barium Sulphate : $BaSO_4$		
Teachers' reflections and experiences: **3)**			

Class: IX **Name of the teacher:PVR SATISH KUMAR & D ANJANI DEVI**

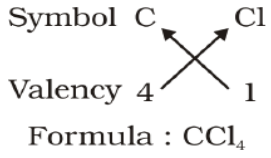
Chapter: ATOMS AND MOLECULES9441285149 & 63001998824

Total no. of periods for this chapter:08

Period No.07

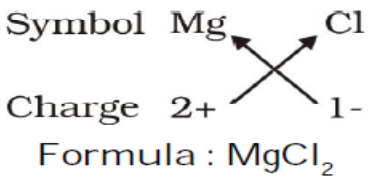
Key concepts:FORMULAE OF SIMPLE COMPOUNDS

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materialrequir
1) Describes and represents the compounds using chemical formula 2) Investigate the valency of ions present in any given compound. 3) Explains the formation of simple compounds by various methods.	1) What is an ion? 2) What type compound is formed from ions? 3) What type of forces exist among ions? 4) Define valency? 5) What is the formula of sodium chloride? 6) What is the valency of Sodium in NaCl? 7) What are polyatomic ions? Give example? 8) Do you know what is a binary compound? Let us discuss about binary compound and writing the formulae of simple compounds. The simplest compounds, which are made up of two different elements are called binarycompounds.	1) Write down the formulae of (i) sodium oxide (ii) aluminium chloride (iii) sodium suphide (iv) magnesium hydroxide 2) Write down the names of compounds represented by the following formulae: (i) $Al_2(SO4)_3$ (ii) $CaCl_2$ (iii) K_2SO_4 (iv) KNO_3 (v) $CaCO_3$ 3) What is meant by the term chemical formula?	Charts showing sym elements and valen Flash cards containi symbol of ions e-Links https://youtu.be/cY d5JE

	While writing the chemical formulae for compounds, we write the constituent elementsand their valenciesandthen we must crossover the valencies of the combining atoms. This method is called criss-cross method. 3. Formula of carbon tetrachloride  Formula : CCl_4	4) How many atoms are present in a (i) H_2S molecule and (ii) $(PO_4)^{3-}$ ion? 5.Ramu wrote the formula of sodium carbonate as $NaCO_3$. Is he write or wrong? Justify your answer. 6.The formula of calcium hydroxide is $Ca(OH)_2$ and not $CaOH_2$. Justify your answer? 7.Read the following paragraph and answer questions 2(a) -2(d) on the basis of your understanding of the paragraph and the related studied concepts. The compounds containing metal and non-metals consist ofcharges particles called ions. In ionic compounds the ions are present in a fixed ratio by mass. The formula of an Ionic compound gives the simple whole number	

*For ionic compounds containing metal and non-metal ions, we write thesymbol of cation first followed by the symbol of anion.
Then their charges arecriss-crossed to get the formula.

Formula of magnesium chloride



Formula : $MgCl_2$

ratio of ions present in it. The valency of an atom may be used to find out how many atoms of one element combine with other to form a chemical formula.

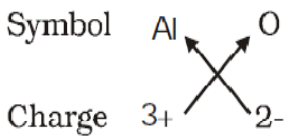
Three elements A,B and C exhibit the following valencies.

A	A'	B	B'	C	C'
+1	+3	+2	+3	+2	+4

a) Write the chemical formula of B' phosphate.
b) Which out of A or A' has larger atomic mass?
c) Between C sulphate and C' sulphate,larger mass is possessed by_____?
d) In between A nitrate and A' nitrate more number of oxygen atoms are present in____?

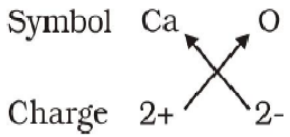
Some more examples

(a) Formula for aluminium oxide:



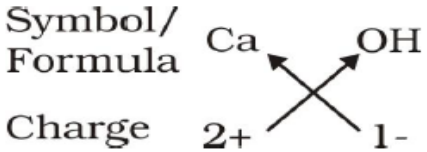
Formula : Al_2O_3

(b) Formula for calcium oxide:



Here, the valencies of the two elements are the same. You may arrive at the formula Ca_2O_2. But we simplify the formula as CaO.

Formula of calcium hydroxide:



Formula : $Ca(OH)_2$

Teachers' reflections and experiences:

Class: IX
Chapter: ATOMS AND MOLECULES
Total no. of periods for this chapter:08
Period No.08
Key concepts:MOLECULAR MASS AND FORMULA UNIT MASS

Learning Outcomes	Teaching-Learning Process	Pointers for formative assessment	Materialre quired
1) Describes the procedure for calculating the Molecular mass of the compounds using atomic masses. 2) Applies the procedure in calculating molecular mass of various compounds in daily life. 3) Differentiate between Molecular mass and formula unit mass.	1) What is an atom? 2) Does it have any mass? 3) Can you define atomic mass? 4) What is a molecule? 5) What is the difference between atom and molecule? 6) Does molecule mass calculated from atomic mass? The molecular mass of a substance is the sum of the atomic masses of all the atoms in a molecule of the substance. 7) Why is it called relative molecular mass of a molecule? 8) What are the units of relative molecular mass? 9) How to calculate the relative molecular mass of a molecule? It is expressed in ***atomic mass units (U)***.	1) Do molecules experience gravity?	Charts showing Element symbols and atomic mass Chart showing molecular masses of various compound. Byju's Tab exercise.

Ex:1) Water - H_2O
Atomic mass of Hydrogen=1 U
Atomic mass of Oxygen= 16U

Molecular mass of H_2O
= 2(Atomic mass of H)+ 1(Atomic Mass of O)
=2(1)+1(16)
=**18 U**

2) Nitric acid - HNO_3
Atomic mass of Hydrogen=1 U
Atomic mass of Nitrogen= 14 U
Atomic mass of Oxygen= 16U
Molecular mass of HNO_3
= 1(Atomic mass of H)+ 1(Atomic Mass of N)
+ 3(Atomic Mass of O)
=1(1)+1(14)+3(16)
=1+14+48
=**63U**

2) Fill the blanks

SUBSTANCE	ATOMS PRESENT	RELATIVE MOLECULAR MASS
AMMONIA	1XN+3XH	
OXYGEN-O_2		
CARBON DI OXIDE-CO_2	1XC+2XO	1X12+2X32=44
POTASSIUM CARBONATE -K_2CO_3	2XK+1XC +3xO	
SULPHURIC ACID-H_2SO_4		2X1+1X32+4X16=98

3) Arrange the molecular masses of H_2, O_2, Cl_2, CO_2, CH_4, C_2H_6,C_2H_4, NH_3, CH_3OH in the increasing order.

e-Link
https://diksha.gov.in/play/collection/do_31290463348844134413717?contentId=do_3129024738996060161502

	10) What is formula unit mass? 11) How is it different from the relative molecular mass? 12) How to calculate relative formula mass from relative atomic mass? The formula unit mass of a substance is a sum of the atomic masses of all atoms in a formula unit of a compound. The only difference between Molecular mass and Formula unit mass is that we use the word Formula unit mass for those substances whose constituent particles are ions. Ex:1) Calculate the formula unit mass of NaCl Sol: Atomic mass of Na=23 U Atomic mass of chlorine=35.5 U Molecular mass of NaCl =1(Atomic Mass of Na)+1(Atomic mass of Cl) =1(23)+1(35.5) =**58.5 U**	4)Calculate the formula unit masses of ZnO, Na_2O, K_2CO_3. (Given atomic masses of Zn = 65 U,Na = 23 U, K = 39 U, C = 12 U, and O = 16 U). 5) Match the following Molecule | Molecular mass a)Na_2CO_3 | i)098 b)H_2SO_4 | ii)106 c)HNO_3 | iii)040 d)NaOH | iv)063 6)The Formula Unit Mass of $MgCl_2$ is_____U a) 95 b) 97 c) 93 d) 94	
Teachers' reflections and experiences:			

Class 9 - Chapter 3 Atoms andMolecules

Worksheet - Set 1

Q1. The atomic number of an element is 13. What will be the number of electrons in its ion?

a.) 13

b.) 12

c.) 11

d.) 10

Q2. The formula of a compound is A3B2. The valency of element B will be:

a.) 2

b.) 3

c.) 1

d.) Cannot be determined

Q3. Atoms of the same element combine to form:

a.) molecules

b.) ions

c.) atoms

d.) compounds

Q4. The correct symbol of lead is

a.) L

b.) Le

c.) Pb

d.) Pu

Q5. The discovery of ___ proved that the atom is divisible.

a.) protons

b.) electrons

c.) neutrons

d.) All of the above

Q6. What is the Avogadro constant?

Q7. The relative atomic mass of the oxygen atom is 16. Explain its meaning.

Q8. What is the difference between 2N and N2?

Q9. What were the drawbacks of Dalton's atomic theory?

Q10. Define the Law of conservation of mass.

Q11. What is meant by a molecule? Give examples.

Q12. Define atomic mass.

Q13. Calculate the molecular mass of the following compounds:

(Atomic masses: C = 12 **μ**, H = 1 **μ**, Cl = 35.5 **μ**, S = 32 **μ**, O = 16 **μ**, Na = 23 **μ**)

a.) Chloroform

b.) Sulphuric acid

c.) Sodium hydroxide

Q14. What are ions?

Q15. Fill in the blanks.

a.) Clusters of atoms that act as an ion are called ___ ions

b.) A chemical formula is also known as a ___.

c.) The valency of an ion is ___ to the charge on the ion.

d.) The mass of 1 mole of a substance is called its ____.

e.) The formula mass of Na_2O is ___.

Q16. How many grams of oxygen gas contain the same number of molecules as 16 grams of sulphurdioxide gas? (O = 16 **μ**, S = 32 **μ**)

Q17. Write the symbols of the following:

a.) Copper

b.) mercury

c.) iron

d.) silver

e.) gold

f.) argon

h.) zinc

Q18. Write the chemical formula of the following compound:

a.) Magnesium chloride

b.) Calcium oxide

c.) Copper nitrate

d.) Aluminium chloride

Q19. a.)The atomic number of three elements A, B and C are 9, 10 and 13 respectively. Which of themwill form a cation?

b.) Give an example to show the law of conservation of mass applies to physical changes also.

Q20. a.) What is meant by the molar mass of a substance? State the unit in which molar mass isusually expressed.

b.) Calculate the molar masses of the following substances

i.) Ozone molecule O_3

ii.) Ethanoic acid CH_3COOH

c.) Calculate the number of molecules in 4g of oxygen.

Class 9 - Chapter 3 Atoms andMolecules

Worksheet - Set 2

Q1. A negatively charged ion is known as:

a.) cation

b.) anion

c.) polyatomic ion

d.) None of the above

Q2. An atom is similar to its ion in:

a.) nuclear charge

b.) mass number

c.) number of electrons

d.) number of neutrons

Q3. The chemical formula of water is:

a.) HO

b.) H_2O

c.) O_2H

d.) H_3O

Q4. Who proposed the statement that the atom is indivisible?

a.) Rutherford

b.) Dalton

c.) Bohr

d.) Lavoisier

Q5. The smallest unit of a chemical compound is:

a.) Atom

b.) Ion

c.) Electron

d.) Molecule

Q6. Name the law of chemical combination which was given by:

a.) Lavoisier

b.) Proust

Q7. An element X has a valency of 1 and the other element Y has a valency of 2. What will the formulaof its compound be?

Q8. How does an atom exist?

Q9. What is meant by the symbol of an element? Explain with examples.

Q10. What do you mean by the Law of constant proportions?

Q11. Hydrogen and oxygen combine in the ratio of 1:8 by mass to form water. What mass of oxygengas would be required to react completely with 3g of hydrogen gas?

Q12. Define polyatomic ions.

Q13. What is the chemical formula? Explain by giving examples.

Q14. Define 1 mole. Illustrate its relationship with the Avogadro constant.

Q15. Fill in the blanks.

a.) Mole is the link between the ___ atoms and the ___ atoms.

b.) A compound made up of only two elements is called a ____.

c.) Ionic compounds are formed by the combination between ____ and ____.

d.) If an atom has less electrons than normal, then it gets ____ charge.

e.) ____ represents the name of the substance.

Q16. Differentiate between:

a.) Atoms and molecules

b.) Cations and anions

c.) Molecular mass and molar mass

Q17. **Answer the following**

a.) In which one of the following cases is the number of hydrogen atoms is more?

Two moles of HCl or one mole of NH3

b.) Calculate the mass of 1 mole of CaCO3

c.) Give two examples of triatomic molecules.

Q18.Answer the following

a.) When 3.0 g of carbon is burnt in 8.00 g oxygen, 11.00 g of carbon dioxide is produced. Whatmass of carbon dioxide will be formed when 3.00 g of carbon is burnt in 50.00 g of oxygen? Which lawof chemical combination will govern your answer?

b.) If one mole of carbon atoms weighs 12 grams, what is the mass (in grams) of 1 atom of carbon?

Q19.Answer the following

a.) Calculate the mole ratio of 240 g of calcium and 240 g of magnesium.

b.) If sulphur exists as S8 molecules, calculate the number of moles in 100 g of sulphur.

Q20. The mass of a single atom of an element X is 2.65×10^{-23} g. What is its atomic mass? What couldthis element be?

Class 9 - Chapter 3 Atoms andMolecules

Worksheet - Set 3

Q1. One nm is equal to:

a.) 10^{-9} mm

b.) 10^{-7} cm

c.) 10^{-9} cm

d.) 10^{-6} m

Q2. In water, the proportion of oxygen and hydrogen by mass is:

a.) 1: 4

b.) 1: 8

c.) 4 : 1

d.) 8 : 1

Q3. Molecular compounds are usually formed by the combination between:

a.) a metal and a non-metal

b.) two different non-metals

c.) two different metals

d.) any two gaseous elements

Q4. Which of the following has the maximum number of atoms?

a.) 18 g of H_2O

b.) 18 g of O_2

c.) 18 g of CO_2

d.) 18 g of CH_4

Q5. The number of moles in 2×10^{24} atoms of iron are:

a.) 3.3

b.) 4.5

c.) 5.2

d.) 2.1

Q6. Define molecule.

Q7. State True or False.

a.) A sodium ion has a positive charge because it has more protons than a neutral atom.

b.) A chloride ion has a negative charge because it has more electrons than a neutral atom.

Q8. Give three significance of mole

Q9. Define valency.

Q10. What is Avogadro's constant?

Q11. Define the term gram atom. How is it related to mole and Avogadro number?

Q12. State the postulates of Dalton's atomic theory.

Q13. What is a mole? What is the unit of a mole? How many molecules are there in a certain mass of asubstance?

Q14. Write the name of the following compounds. Also, show the ions present in them:

a.) $Al_2(SO_4)_3$

b.) $CaCl_2$

c.) K_2SO_4

d.) KNO_3

e.) $CaCO_3$

Q15. An element X forms an oxide XO_3.

a.) What is the valency of element X?

b.) What will be the formula of chloride of X?

Q16. What are ionic and molecular compounds? Give examples.

Q17. a.) Define atomicity.

b.) Write the atomicity of the following:

i.) I_2

ii.) H_2S

iii.) HNO_3

iv.) Na_2SO_4

V.) S_8

Q18. a.) Why the definition of an atom given by Dalton is no longer valid?

b.) Why is necessary to use symbols for the elements?

c.) Name any two elements whose symbols do not start with the same letter as that of the name of theelement.

Q19. a.) Differentiate between formula unit mass and molecular mass.

b.) Calculate the molar mass of the following compounds:

i.) MgO

ii.) Na_2CO_3

iii.) H_3PO_4

iv.) $Ca(OH)_2$

Q20. Calculate the number of particles in each of the following:

a.) 46 g of Na atoms

b.) 8 g of O2 molecules

c.) 0.1 moles of carbon atoms

Class 9 - Chapter 3 - Atoms and Molecules

Multiple Choice Questions

1. Which of the following correctly represents 360 g of water?

(i) 2 moles of H_20

(ii) 20 moles of water

(iii) 6.022×10^{23} molecules of water

(iv) 1.2044×10^{25} molecules of water

(a) (i) (b) (i) and (iv)

(c) (ii) and (iii) (d) (ii) and (iv)

2. Which of the following statements is not true about an atom?

(a) Atoms are not able to exist independently

(b) Atoms are the basic units from which molecules and ions are formed

(c) Atoms are always neutral in nature

(d) Atoms aggregate in large numbers to form the matter that we can see,feel or touch

3. The chemical symbol for nitrogen gas is

(a) Ni (b) N_2 (c) N+ (d) N

4. The chemical symbol for sodium is

(a) So (b) Sd (c) NA (d) Na

5. Which of the following would weigh the highest?

(a) 0.2 mole of sucrose ($C_{12}H_{22}O_{11}$)

(b) 2 moles of CO_2

(c) 2 moles of $CaCO_3$

(d) 10 moles of H_2O

6. Which of the following has maximum number of atoms?

(a) 18g of H_2O

(b) 18g of O_2

(c) 18g of CO_2

(d) 18g of CH_4

7. Which of the following contains maximum number of molecules?

(a) 1g CO_2

(b) 1g N_2

(c) 1g H_2

(d) 1g CH_4

8. Mass of one atom of oxygen is

(a) $16/6.023\times 10^{23}$ g

(b) $32/ 6.023\times 10^{23}$g

(c) $1/ 6.023 \times 10^{23}$g

(d) 8u

9. 3.42 g of sucrose are dissolved in 18g of water in a beaker. The number of oxygen atoms in the solution are

(a) 6.68×10^{23}

(b) 6.09×10^{22}

(c) 6.022×10^{23}

(d) 6.022×10^{21}

10. A change in the physical state can be brought about

(a) only when energy is given to the system

(b) only when energy is taken out from the system

(c) when energy is either given to, or taken out from the system

(d) without any energy change

CLASS-9 CHAPTER-4 STRUCTURE OF ATOM

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:	
a. Rational Thought and Autonomy.	Schools should aim to develop independent thinkers who make well-informed decisions based on a grounded understanding of the world around them.
b. Health and Well-being.	School education should be a wholesome experience for students.Students should acquire Knowledge, Capacities, and Dispositions that promote mind-body wellness.
c. Democratic and Community Participation.	School education should aim to develop such Knowledge, Capacities, and Values and Dispositions that enable students to participate and contribute to the democratic functioning of India.
d. Economic Participation.	School education should aim to develop Knowledge,Capacities, Values, and Dispositions that enable students to participate and contribute to the economy. Effective participation in the economy has a positive impact both for the individual and for society as a whole.
e. Cultural Participation.	School education should promote cultural literacy and enable students to acquire knowledge, capacities, and values and dispositions to participate meaningfully and contribute positively to culture.

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.

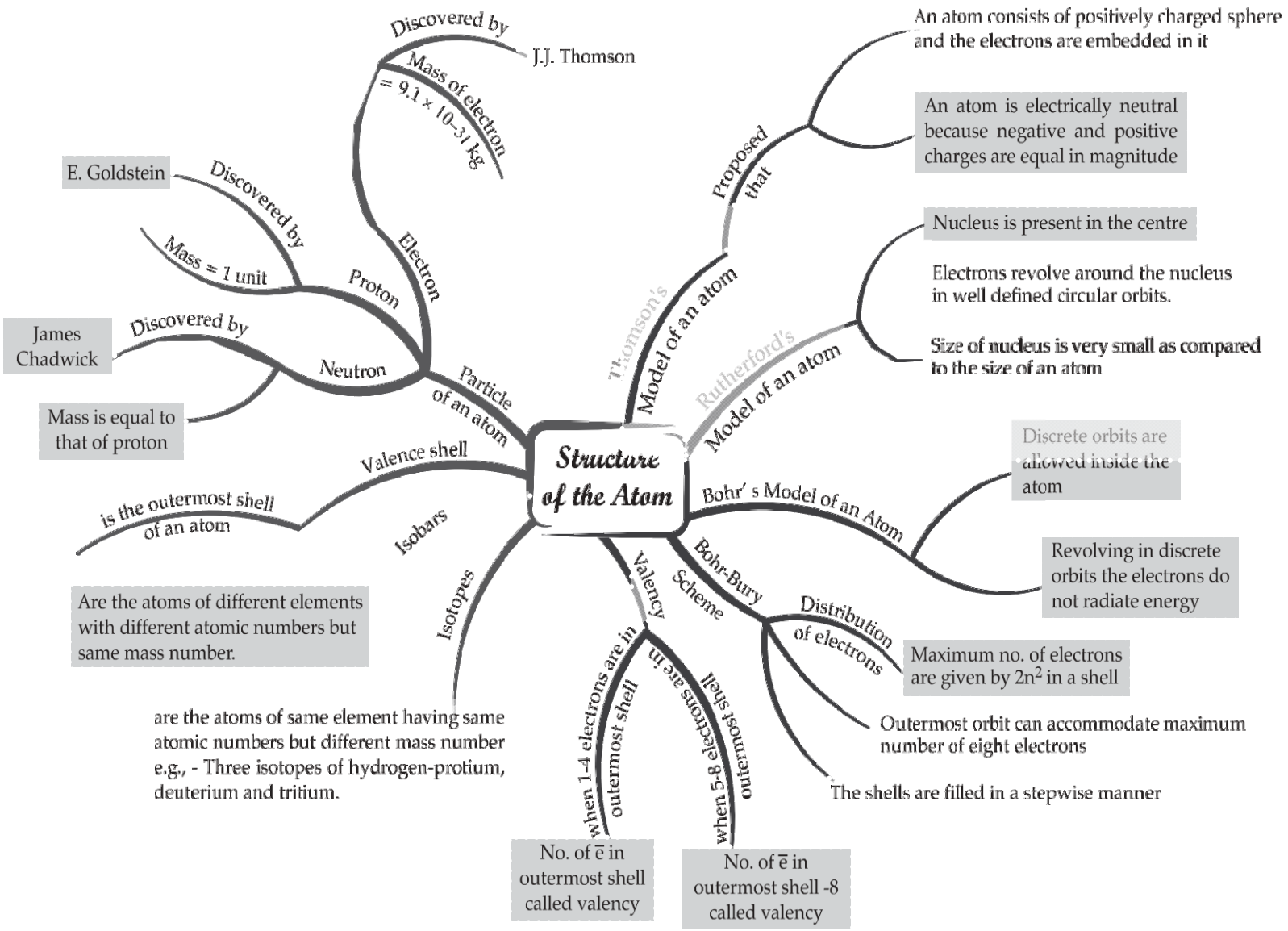
CURRICULAR GOALS	COMPETENCIES
Explores the world of matter, its interactions, and properties at the atomic level	Describes and identify the three sub-atomic particles: electrons, protons and neutrons.
	Investigates the nature and properties of sub-atomic particles.
	Define and understand the concept 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 structure of atom being studied.
	States questions related to structure of atom in the quantum mechanics for which current scientific understanding is well recognized 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.

STRUCTURED PEDAGOGY

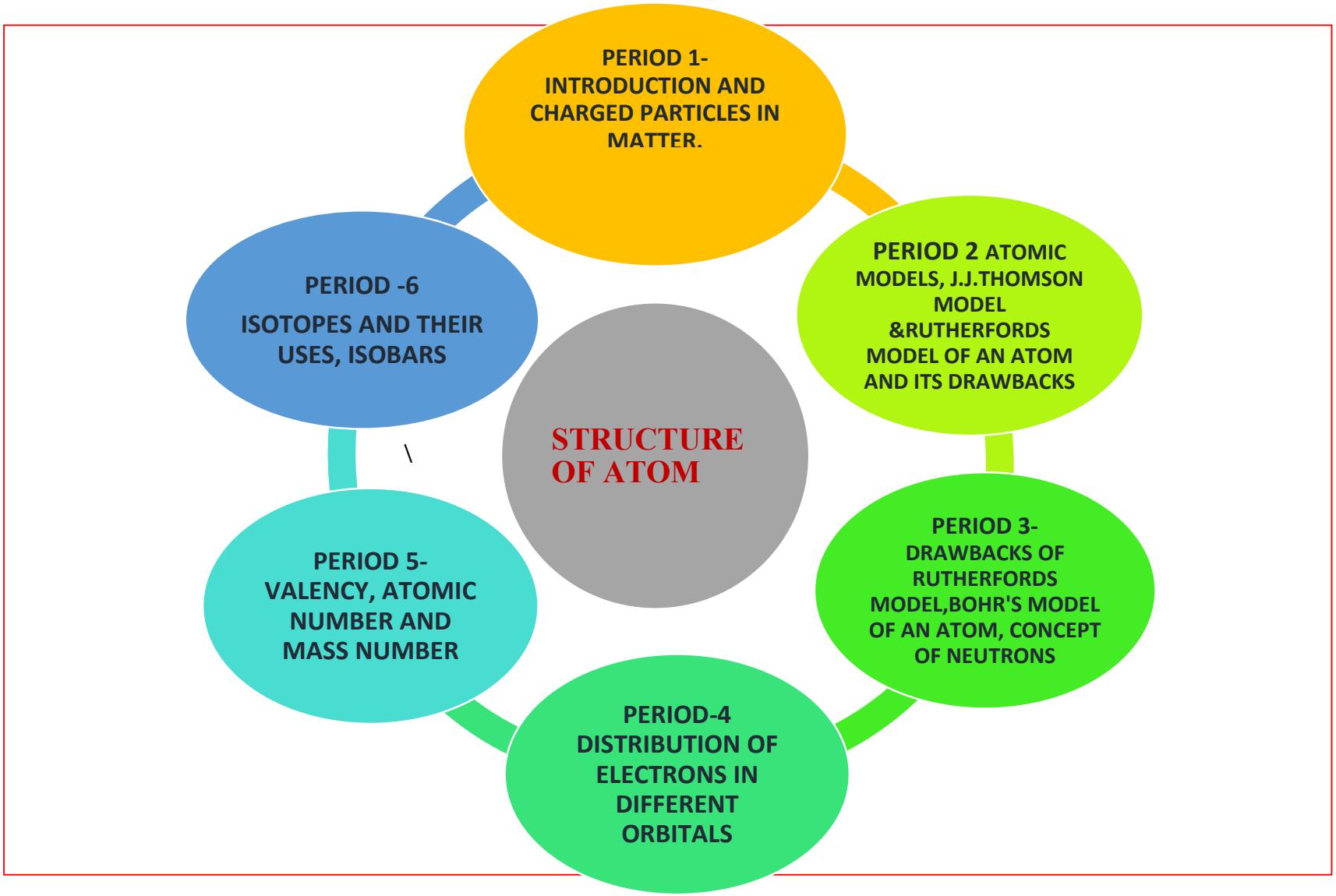
PERIOD	KEY CONCEPTS	LEARNING OUTCOMES
1	**Introduction, charged particles in matter.**	1) Describes scientific discoveries and inventions. 2) Differentiates materials based on properties/characteristics.
2	**J.J.Thomson and Ruther ford atomic models of an atom**	1) Describes scientific discoveries and inventions
3	**Bohr's model of an atom, shell, orbit ,orbital& neutrons etc.**	1) Explains processes and phenomena. 2) Uses scientific conventions, symbols, and equations to represent various quantities, elements, and units 3) Draws labelled diagrams, flow charts, concept maps, graphs
4	**Energy level index**	1) Uses scientific conventions, symbols, and equations to represent various quantities, elements, and units. 2) Draws labelled diagrams, flow charts, concept maps, graphs
5	**Valency,mass numbers, atomic number, symbol of element**	1)Uses scientific conventions, symbols, and equations to represent various quantities, elements, and units 2)Explains processes and phenomena 3) Drawslabeled diagrams, flow charts, concept maps, graphs.
6	**Isotopes , average atomic mass of an element and isobars**	1) Explains processes and phenomena. 2) Uses scientific conventions, symbols, and equations to represent various quantities, elements, and units.

STRUCTURED PEDAGOGY

CONCEPT MAP-THE STRUCTURE OF ATOM



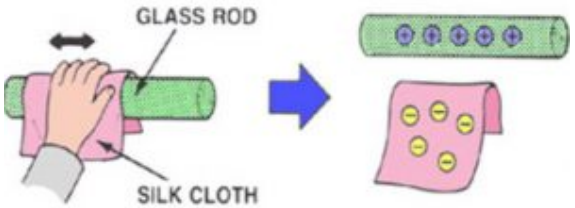
STRUCTURED PEDAGOGY



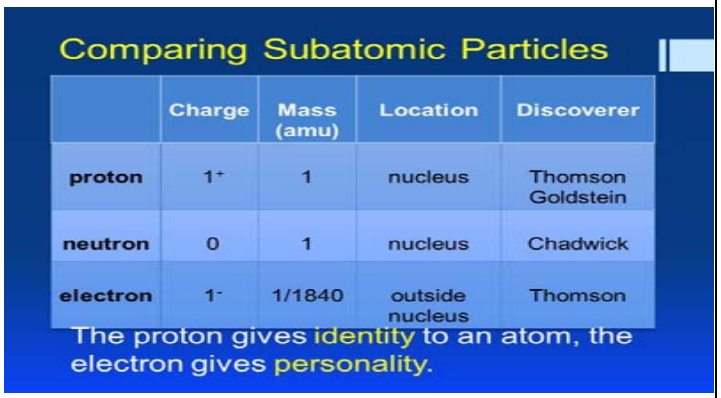
PERIOD MAP

PERIOD PLAN-1

Class: 9		**Name of the Chapter: Structure of the atom**	
Total No.of Periods:06		**Period No: 01**	
Key Concepts:	**Introduction-Charged particles in matter**		
Learning Outcomes	**Teaching-Learning Process**	**Pointers for assessment**	**Materials required**
Learning Outcomes:- 1. Describes classification of sub-atomic particles. 2. Differentiates elements based on the number of protons, electrons and neutrons **Indicators:-** 1. Differentiates isotopes and isobars. 2.Differentiates three subatomic particles of an atom with respect to theirs charge and mass.	The teacher starts the lesson by probing questions to check for prior knowledge: - What are the fundamental building blocks of matter? - What makes the atom of one element different from the atom of another element? - Are atoms really indivisible as proposed by Dalton?(or) Are there smaller constituents inside the atom? Today let us learn about sub-atomic particles and the various models that havebeen proposed to explain how these sub-atomic particlesare arranged inside the atom. Based on the series of experimentations, and from studying the staticelectricity and the	1) If an atom contains one electron and one proton, will it carry any charge or not? 2) What are canal rays? 3) What charges are developed on comb and hair after we comb? 4) How electron and proton have equal charge (magnitude) when their masses are different? 5) Dalton's atomic theory successfully explained (i) Law of conservation of mass	1.Comb 2.Inflated balloon 3. A piece of Silk cloth. 4. Model of atom showing arrangement of sub atomic particles. Textual resources: 1)text book 2)worksheets 3)formative and summative assessments E-resources:

	conditions under whichelectricity is conducted by different substances, it was found that an atom is divisible. **Activity - 4.1** A. Does the comb attract small pieces of paper after combing dry hair?  B. Rub the glass rod with a silk cloth andbring the rod near to an inflated balloon.  Observe what happens. Can we confirm that the rubbing of two objects together, they become electrically charged? Where does this charge come from?	(ii) Law of constant composition (iii) Law of radioactivity (iv) Law of multiple proportion (a) (i), (ii) and (iii) (b) (i), (iii) and (iv) (c) (ii), (iii) and (iv) (d) (i), (ii) and (iv) 6) Whatare the forces operate between electron and proton?	Digital content in byju's tab Diksha E-patashala Ncert,scert official you-tube channel https://diksha.gov.in/play/collection/do_3132190924591022081217 5?contentId=do_31321903580662169612449

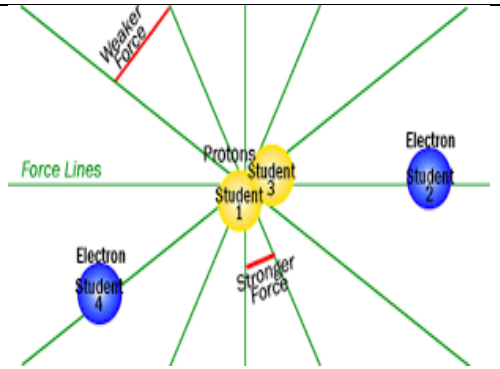
Many scientists contributed in revealing the presence of charged particles in an atom.
An atom is divisible and consists of charged particles.



- The electron identified by J.J. Thomson, E. Goldstein discovered the presence of new radiations in gas discharge tubes.

What are canal rays?
These rays were positively charged radiations which ultimately led to the discovery of another sub-atomic particle.

- This sub-atomic particle had a charge, equal in magnitude but opposite in sign to that of the electron.
- Its mass was approximately 2000 times as that of the electron.
- It was named as proton.
- In general, an electron isrepresented as



7) Define
(a)Weaker forces
(b)Stronger forces.

8) Collect the information about scientists who discovered fundamental particles and prepare charts with all relevant pictures?

	‘e–’ and a proton as ‘p+’. • Themass of a proton is taken as one unit and itscharge as plus one. • The mass of an electron isconsidered to be negligible and its charge isminus one. • An atom was composed of protons and electrons, mutually balancing their charges. • It also appeared that the protons were in the interior of the atom. • Electrons could easily be removed off butnot protons.		

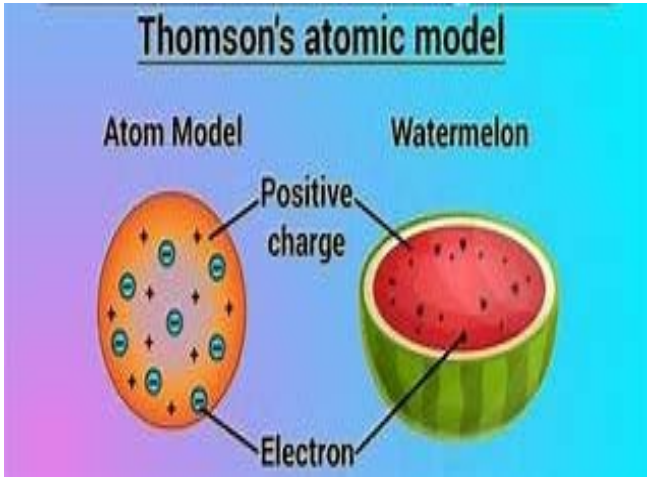
TEACHERS REFLECTIONS:

1. Students are able to differentiate and identify the sub-atomic particles based on their charge and location in the atom.
2. Students differentiate the isotopes of different elements based on the number and type of sub-atomic particles present in them.

PERIOD PLAN-2

Class: 9	**Chapter: Structure of the Atom**
Total No; of Periods: 06	**Period:02**
Key Concepts:Thomson model and Rutherford model	

Learning Out-Comes	Teaching – Learning Process	Pointers for assessment	TLM
1.Students develop accurate and appropriate models to represent atom structure **Micro competence / Indicators:** Students develop accurate and appropriate models to represent the Thomson's and Rutherford models of an atom	Interaction with the students to know their precious knowledge about the Content of the topic. 1. Does the comb attract the small pieces of paper after combing dry hair? 2. Rub the glass rod with a silk cloth and bring the rod near to an inflated balloon, observe what happens. 3. Name the three sub atomic particles of an atom? 4. Write the charge of electron, proton and neutron. Let us discuss the arrangement of these sub-atomic particles in an atom by using various atomic models		

	J.J.thomsonatomic Model: Thomson proposed that: 1. An atom consists of positively charged sphere and the electrons are embedded in it 2.The negative and positive charges are equal in magnitude, So the atom is electrically neutral  • The result of this experiment could not explain the proper arrangement of sub-	1. Thomson atomic model is also known as…… 2. What are embedded in the positive sphere of an atom? 3. Who is the father of Nuclear Physics? 4.In the Thomson's model of atom, which of the following statments are correct? (i) the mass of the atom is assumed to be uniformly distributed over the atom (ii) the positive charge is assumed to be uniformly distributed over the atom (iii) the electrons are uniformly distributed in the positively charged	Thomson atomic modal by using thermo-coal Https://obj.diksha.gov.in/ntp-content-production/content/assets/do_313105714754682880012451/copy-of-thomsons-model.mp4

	atomic particles; hence other atomic models were developed. **Rutherford's Atomic Model:**  **E. Rutherford (1871–1937) was born at Spring Grove on 30 August 1871. He was known as the 'Father' of nuclear physics. He is famous for his work on radioactivity and the discovery of the nucleus of an atom with the gold foil experiment. He got the Nobel prize in chemistry in 1908.**	sphere (iv) the electrons attract each other to stabilise the atom. (a) (i), (ii) and (iii) (b) (i) and (iii) (c) (i) and (iv) (d) (i), (iii) and (iv) 5.Which of the following statements about Rutherford's model of atom are correct? (i) considered the nucleus as positively charged (ii) established that the α–particles are four times as heavy as a hydrogen atom (iii) can be compared to solar system (iv) was in agreement with Thomson's model (a) (i) and (iii) (b) (ii) and (iii) (c) (i) and (iv) (d) only (i)	Https://obj.diksha.gov.in/ntp-content-production/content/assets/do_313105731796361216124 58/copy-of-copy-of-rutherford-model_1.mp4

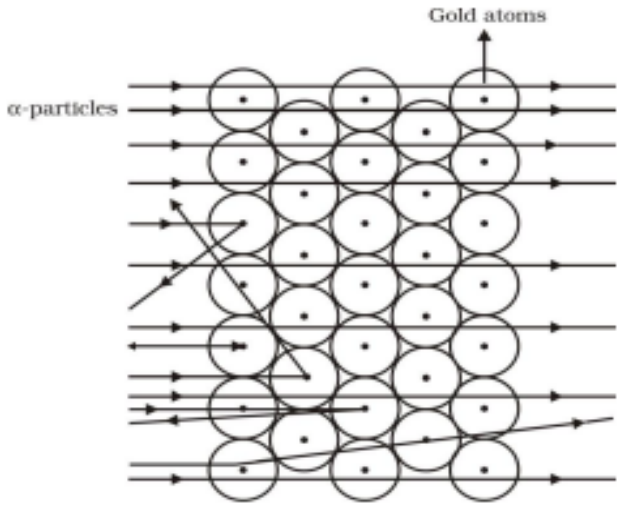


Fig. 4.2: Scattering of α-particles by a gold foil

Observations:

(i) Most of the α-particles penetrate through the gold foil and travel in a straight line.

(ii) Some of the α-particles were deflected with some angles.

(iii) Surprisingly one out of every 12000 particles appeared to rebound (bounced back). In the words of Rutherford, "This result was almost as incredible as if you fire a 15- inch shell at a piece of tissue paper and it comes back and hits you".

❖ **Rutherford concluded from the α-particle scattering experiment that**

(i) Most of the space inside the atom is empty because most of the α-particles passed through

6.Rutherford's α–particle scattering experiment showed that
(i) electrons have negative charge
(ii) the mass and positive charge of the atom is concentrated in the nucleus
(iii) neutron exists in the nucleus
(iv) most of the space in atom is empty
Which of the above statements are correct?
(a) (i) and (iii)
(b) (ii) and (iv)
(c) (i) and (iv)
(d) (iii) and (iv)

7. What are the observations made by Rutherford during the α-

Chart of Scattering of α-particles by a gold foil

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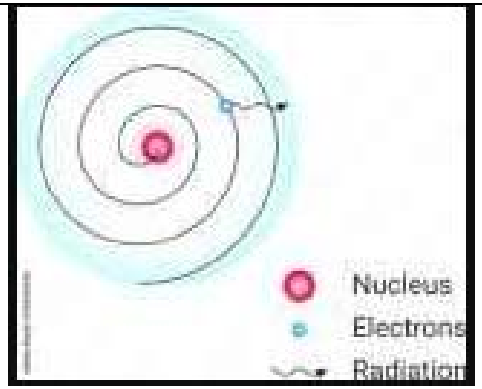
	the gold foil without deviation. (ii) Very few particles were deflected from their path, indicating that the positive charge of the atom occupies very small space. (iii) A very small fraction of α-particles was deflected, indicating that all the positive charge and mass of the gold atom were concentrated in a very small volume within the atom. ❖ **On the basis of his experiment, Rutherford put forward the nuclear model of an atom, which has the following features:** (i) There is positively charged centre in an atom called as a nucleus. Nearly all the mass of an atom resides in the nucleus. (ii) The electrons revolve around the nucleus in circular paths. (iii) The size of nucleus is very small as compared to the size of the atom Drawbacks of Rutherford's model of an atom	particle scattering experiment? 8. What are the postulates proposed by Rutherford for atomic model of an atom? 9.Rutherford's 'alpha (α) particles scattering experiment' resulted in to discovery of (a) Electron (b) Proton (c) Nucleus in the atom (d) Atomic mass 10. What is drawback of Rutherford atomic model?	 Https://www.youtube.com/watch?V=ddpntwnzxdc  Https://www.youtube.com/watch?V=1xxekbookic

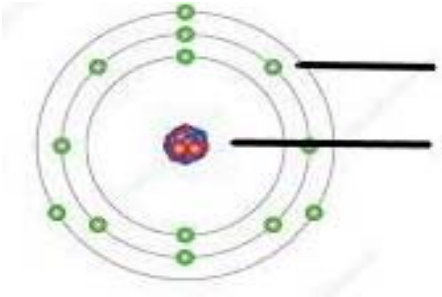
	 The revolution of the electron in a circular path is not expected to be stable. Any particle in a circular path would undergo acceleration. During the acceleration, charged particles would radiate energy. Thus, the revolving electron would lose energy and finally fall into the nucleus, if this was so, then the atom should be highly unstable and hence matter would not exist in the form that we know. We know that atoms are quite stable.		Chart of revolution of electron around the nucleus.

TEACHER REFLECTIONS :

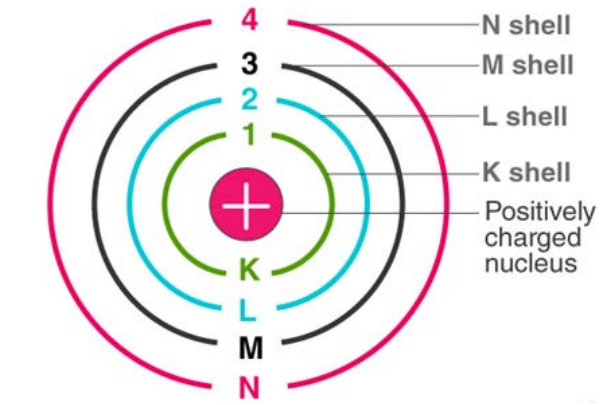
1) Students understand the structure of atom given by J.J.Thomson and Rutherford
2) Students realize that the Rutherford atomic model resembles the planetary system((Solar system).

PERIOD-PLAN-3

Class:9
Chapter: Structure of the Atom
Total No; of periods: 06
Period:03
key concepts: Bohr's model of an atom, shell, orbit, orbital& neutrons etc.

Learning Out Come	Teaching – Learning Process	Pointers for assessment	TLM
Students describe and represent the arrangement of sub-atomic particles in Bohr's point of view. Students analyse Thomson, Rutherfordand Bohratomic models **Micro competence / Indicators:** Students can develop appropriate atomic models according to Bohr's postulates Students explainthe	Interaction with students to know their previous knowledge regarding to the Concept of the topic. 1. What is an atomic model? 2. Where are positively charged particles accumulated as per the nuclear model of an atom? 3. What are the drawbacks of Rutherford's atomic model of an atom? 4. How do the scientists overcome these drawbacks to give appropriate atomic model? 	1.For which book Bohr got Nobel prize? 2.The book **"Atomic Theory and description of Nature"**containswhose writings?	https://obj.diksha.gov.in/ntp-content-production/content/assets/do_31310573479659929612962/copy-of-copy-of-bohrs-model.mp4

significance of neutron in nucleus	**Label the parts in the diagram of aluminium atom given below and answer the questions that follow:** 1.Which subatomic particles are present at the centre of the atom? 2.Which subatomic particle is negatively charged? 3.Which subatomic particle is positively charged? 4.Name the subatomic particle which is neutral. 5.Find the number of protons present in the nuclues of aluminium atom? **POSTULATES OF BOHR'S ATOMIC MODEL** Type equation here.**:-** 1.Only certain special orbits known as discrete orbits of electrons are allowed inside the atom. 2. While revolving in discrete orbits the electrons do not radiate energy. These orbits or shells are called energy levels; these orbits are represented with K, L, M, N…etc. What do you mean by discrete orbits? What happens if electrons radiate energy while revolving round the nucleus?	3. What is a discrete orbit? 4. "K" refers to which orbit in an atom? 5. Arrange the orbits in increasing order of their energies. 6. Make the model of an atom as per the postulates of Bohr's atomic theory? 7. Who discovered Neutron? 8. What is the notation of Neutron?	https://youtu.be/LS37ZRI9350



BOHR'S MODEL OF AN ATOM

A few energy levels in an atom, increasing order of energy of energy levels or orbits

K< L < M < N…

Q) Which forces operates between like charges?

Q) What are the charged particles present in the nucleus of an atom?

Q) How repulsions between Positive charged particles (Protons) are controlled in the nucleus to make it stable?

9. Where is the position of Neutron in the atom?

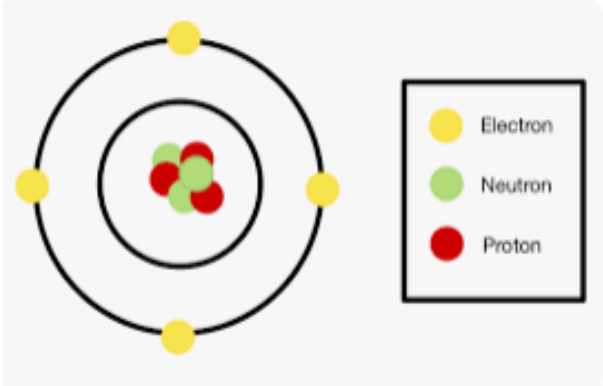
10. Which charged particle has themass nearly equal to that of the neutron?

11. Which element doesn't contain neutron?

Neils Bohr (1885–1962) was born in Copenhagen on 7 October 1885. He was appointed professor of physics at Copenhagen University in 1916. He got the Nobel prize for his work on the structure of atom in 1922. Among Professor Bohr's numerous writings, three appearing as books are:
(i) The Theory of Spectra and Atomic Constitution, (ii) Atomic Theory and, (iii) The Description of Nature.

Chart-representing Bohr's model.

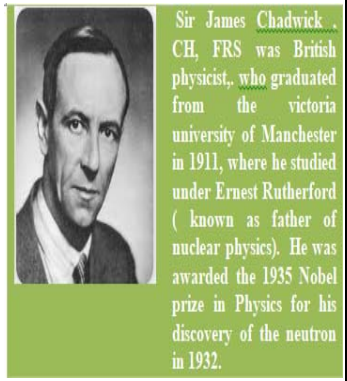
Neutron(n):



i.Neutron is another sub atomic particle and represented by “n”, which had no charge with mass nearly equal to that of proton.
Which is heavier between proton and neutron?
ii. Neutrons are present in the nucleus of all atoms (except Hydrogen-zero neutrons).
Why electrons and neutrons are not kept in the nucleus?
What is the reason for the protons to present only in the nucleus?

Electron has negligible mass (9.1 x 10^{-31} kilograms), the mass of an atom is therefore given as the sum of the masses of protons and neutrons present in nucleus, it is known as **ATOMIC MASS NUMBER**

https://www.youtube.com/watch?v=8L8xsFTR5Gg



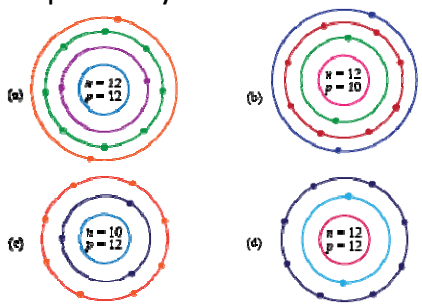
Model of an atom

	represented by "**A**".		

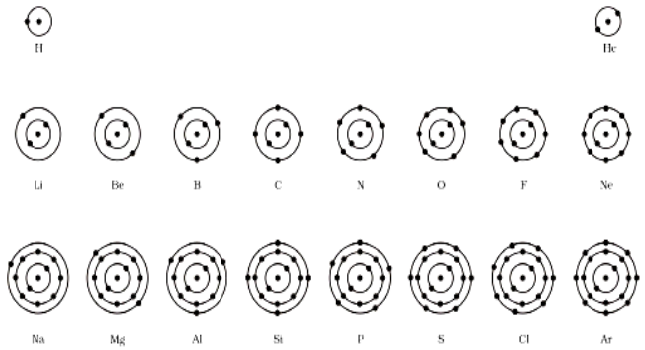
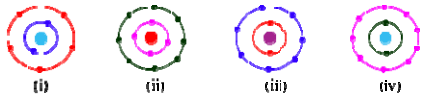
1) **<u>TEACHER REFLECTIONS</u>:**
2) **Students differentiate an orbit from an orbital.**
3) **Students differentiate between the sub-atomic particles.**

PERIOD PLAN-4

Class: 9		**Chapter: Structure of the Atom**	
Total No.of periods: 06		**Period: 4**	
Key concepts:Energy level index			
Learning Out-Come	**Teaching – Learning Process**	**Pointers for assessment**	**TLM required**
1. Students describe discrete energy levels around nucleus. 2. Students design various orbits around the nucleus. 3. Student states concepts to calculate maximum number of electrons for a particular orbit. 4. Students designs and	By interacting with the students to know their previous knowledge about the context of the topic. 1. What is an orbit? 2. What is another name for an orbit? 3. When do electrons not radiate energy? 4. How many electrons can accommodate in an orbital? 5. How electrons are distributed in different orbits / shells? **Bohr - Bury Rules :**	1)Prepare **five** questions on the content given below? **Orbit** which is **closer** to the nucleus known as **core orbit** and orbit which is far away from nucleus known as valence orbit i.e., outermost orbit called as valence orbit **Orbit** is an energy level around the nucleus whereas**Orbital** is a three dimensional space in which the probability of finding the electron is maximum.	Chart-showing difference between orbit and orbital. Card-board model of arrangement of electrons in atoms with atomic number 1 to 20. PROJECT WORK Prepare valency Placards with symbols of elements.

implement a plan to accommodate electronsin various discrete orbits around the nucleus.	1. The maximum number of electrons present in a shell is given by the formula **$2n^2$**(where n is the orbit number or energy level index, 1, 2, 3, ….etc) Hence the maximum number of electrons in different shells are as follows Frist orbit or K Shell will be = 2 x 1^2 = 2 Second orbit or L- Shell will be = 2 x 2^2 = 8 2. The maximum number of electrons that can be accommodated in the outer most orbit is 8 Explain energy wise occupation of elctrons? 3. Electrons are not accommodated in a given shell, unless the inner shells filled. That is, the shells are filled in a step - wise manner. Do all the elements have arrangement of electrons in the shells or any difference is observed?Explain?	2) What is the formula used to calculate maximum number of electrons? 3)Make the statistic atomic model displaying electronic configuration of first eighteen elements 4) Identify the Mg^{2+} ion from the Figure where n and p represent the number of neutrons and protons respectively 	https://diksha.gov.in/play/collection/do_31307360977847910412088?contentId=do_3131340061490626561855 https://diksha.gov.in/play/collection/do_31307360977847910412088?contentId=do_3131538520986419201712

STRUCTURED PEDAGOGY

	 Schematic Atomic structure of first eighteen elements	5)Which of the following in Fig. 4.2 do not represent Bohr's model of an atom correctly?  Fig. 1.2 **Group Activity:-** Make placards with symbols and valencies of the elements separately. Each student should hold twoplacards, one with the symbol in the right hand and the other with the valency in the left hand for first 20 elements.	https://byjus.com/chemistry/valency/

TEACHER REFLECTIONS:

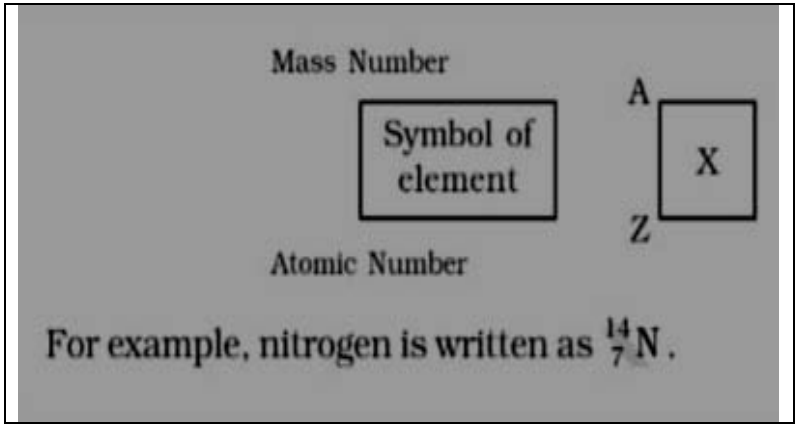
1) Students able to calculate the No.of electrons present in any orbit.
2) Students are able to write the electronic configuration of elements.

PERIOD PLAN-5

CLASS-IX	CHAPTER: THE STRUCTURE OF THE ATOM
TOTAL NUMBER OF PERIODS:06	PERIOD:05
KEY CONCEPTS:Valency,Mass numbers, Atomic number, Symbol of Element	

Learning Out Comes.	Teaching – Learning Process	Pointer for formative assessment	TLM required
1) Students applies knowledge of sub atomic particles (electrons protons and neutrons) to calculate Mass number and atomic numbers 2) Student defines mass number an atomic number and represents relationship between them. **3)** Students can develops appropriate pattern to represent element along with **Mass numbers, Atomic number**	Interaction with students to know their previous knowledge regarding the concept of the topic. 1. What are nucleons? 2. Name the sub atomic particle with negligible mass? 3. What formula is used to calculate the number of electrons present in each orbit? 4. What is the name of inner orbit of an atom? 5. What is the name of outer orbit of an atom? 6.Name the electrons in the outer-most orbit? 7.What are valency electrons? 8.What is the difference between valency and valence-electrons? **Valence electrons:** The number of electrons present in the outer most shell of an atom are known as Valence electrons**.** **Valency:**Combining capacity of an atom with other atoms is valency.	1) Elements with valency 1 are (a) always metals (b) always metalloids (c) either metals or non-metals (d) always non-metals 2)Find the no.of valence electrons in first 9 elements of the periodic table? 3)Write their valency? 4)How many valence electrons are there in Neon(Ne)?	https://www.khanacademy.org/science/ap-chemistry-beta/x2eef969c74e0d802:atomic-structure-and-properties/x2eef969c74e0d802:atomic-structure-and-electron-configuration/v/valence-electrons

	In the Table given below can say atomic number, valence electrons and valency of an element. **Example:** Chlorine (Cl): Atomic number:17 Valence electrons: 7 Valency: 1 How to calculate the number of nucleons and protons in an atom by using atomic number(Z) and mass number(A). What is an Atomic number? What is a Mass number? **ATOMIC NUMBER**: • Total number of protons present in the nucleus of an atom is defined as Atomic number. • This number is also equal to the number of electrons present in a neutral atom • It is denoted by "Z" **Example :** Let us consider Hydrogen Z=1 No of protons =1 Number of electrons =1	5)What is the valency of Neon (Ne)? 6)Which of the following are true for an element? (i) Atomic number = number of protons + number of electrons (ii) Mass number = number of protons + number of neutrons (iii) Atomic mass = number of protons = number of neutrons (iv) Atomic number = number of protons = number of electrons (a) (i) and (ii) (b) (i) and (iii) (c) (ii) and (iii) (d) (ii) and (iv) 7)The ion of an element	https://www.youtube.com/watch?v=2ugSvI-F_I https://diksha.gov.in/play/collection/do_3132190924591022081217 5?contentType=TextBook

	MASS NUMBER: • Protons and neutrons are present in the nucleus of an atom and the mass of an atom resides in its nucleus. • "The sum of total number of protons and neutrons present in the nucleus of an atom is defined as Mass number" • It is denoted by 'A' • In the notation for an atom , the atomic number mass number and symbol of element are written as:  	has 3 positive charges. Mass number of the atom is 27 and the number of neutrons is 14. What is the number of electrons in the ion? (a) 13 (b) 10 (c) 14 (d) 16 8)The number of electrons in an element X is 15 and the number of neutrons is 16. Which of the following is the correct representation of the element? (a) $_{15}X^{31}$ (b) $_{16}X^{31}$ (c) $_{15}X^{16}$ (d) $_{16}X^{15}$ 9)Which of the following correctly	https://www.youtube.com/watch?v=_S7ov25y3_M&pp=ygU6dmVkaW9lIHJlYWdhcmRpbmcgYXRvbWljIG51bWJlciBhbmQgbWFzcyBudW1iZXIgb2YgYW4gYXRvbQ%3D%3D

		represent the electronic distribution in the Mg atom? (a) 3, 8, 1 (b) 2, 8, 2 (c) 1, 8, 3 (d) 8, 2, 2	

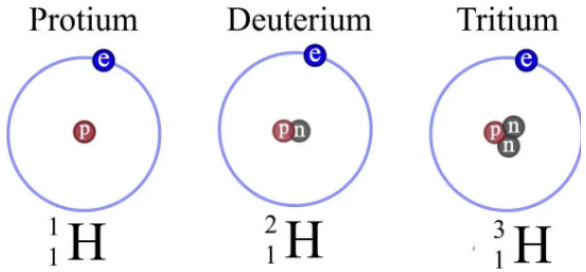
Teacher reflections:

1) Student defines mass number an atomic number and represents relationship between them.
2) Students able to calculate the no. of neutrons with mass number and atomic number.

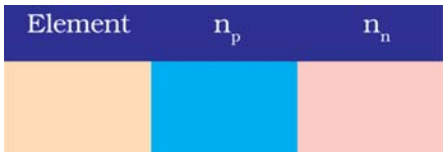
PERIOD PLAN-6

CLASS-9	CHAPTER:STRUCTURE OF THE ATOM
TOTAL NO. OF PERIODS: 06	PERIOD:6
KEY CONCEPTS:Isotopes, Average atomic mass of an element Isobars	

Learning Out-comes	Teaching – Learning Process	Pointer for formative assessment	TLM required
1.Student analyses Isotopes and Isobars 2.Students knows and explains significant applications of isotopes in various fields	Interaction with students to know their previous knowledge regarding the concept of the topic. 1.Write symbols for the following elements? (i)Element with 1 proton and 1 electron? (ii)Element with 1 proton , 1 neutron and 1 electron? (iii)Element with 1 proton , 2 neutrons and 1 electron ? 2. Are these three atoms same or different? 3.What is the nucleus composition of these atoms? 4. What is the name of these three atoms? 5. Give the relation between atomic number and mass number of these atoms? 6.What are isotopes? “The atoms of same element with different mass numbers	1)Atomic models have been improved over the years. Arrange the following atomic models in the order of their chronological order. (i) Rutherford’s atomic model. (ii) Thomson’s atomic model. (iii) Bohr’s atomic model (a) (i), (ii) and (iii) (b) (ii), (iii) and (i) (c) (ii), (i) and (iii) (d) (iii), (ii) and (i) 2)Will $_{35}Cl$ and $_{37}Cl$ have different valencies? Justify your answer? 3)The atomic number of	https://diksha.gov.in/play/collection/do_31307360977847910412088?contentId=do_312795712831201280111722

Students can represent various isotopes and isobars	are called as Isotopes" **Examples:** Hydrogen:  Carbon: $_{6}C^{12}$ **and** $_{6}C^{14}$ Chlorine: $_{17}Cl^{35}$ **and** $_{17}C^{37}$ The mass of chlorine is taken as 35.5 instead of 35 or 37.Why? What do you mean by average atomic mass? What is natural abundance of $_{17}Cl^{35}$ **and** $_{17}C^{37}$? The mass of an atoms of an element is taken as the average mass of all the naturally occurring isotopes of that elements Average-Mass = $NA_1 \times A_1 + NA_2 \times A_2 + \ldots\ldots\ldots\ldots$ NA =Natural Abundance of isotope A =Mass no of isotope **Example**: The average atomic mass of chlorine atom is	calcium and argon are 20 and 18 respectively, but the mass number of both these elements is 40. What is the name given to such a pair of elements? 4)Complete the Table 4.1 on the basis of information available in the symbols given below **(a)** $_{17}Cl^{35}$ **(b)** $_{6}C^{12}$ **(c)** $_{35}Br^{81}$ | Element	n_p	n_n | |---|---|---| | | | | | | | | | | | | 5) Define Isotopes ? 6) Are electrons, Protons and Neutrons same in isotopes? 7) Why mass number is	https://diksha.gov.in/play/collection/do_31307360977847910412088?contentId=do_31310571465012838412193 https://obj.diksha.gov.in/ntp-

Element	n_p	n_n



$$[35X\frac{75}{100} + 37X\frac{25}{100}] = \left\{\frac{105}{4} + \frac{37}{4}\right\} = \frac{142}{4} = \mathbf{35.5\ u}$$

What are the uses of different isotopes?

1.An Isotope of uranium is used as fuel in nuclear reactor.

2. An isotope of Cobalt is used as in the treatment of cancer

3. An isotope of Iodine is use in the treatment of goitre.

What are isobars?

Atoms of different elements with same mass number are known as Isobars .

Examples:

$_{20}Ca^{40}$,$_{18}Ar^{40}$

different for isotopes?

8) Three elements X,Y,Z has following electrons, protons, neutrons.

Atom	e	p	n
X	6	6	6
Y	7	7	7
Z	6	6	8

a) Name the isotopes out of X, Y, Z ?

(b)Write the isobars out of X ,Y,Z ?

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Teacher reflections:

1) Students appreciates the importance of isotopes in various fields
2) Students differentiates the istopes and isobars.

WORKSHEET-1

1. Atomic number (Z) is equal to----------

(a) Number of protons in the nucleus of an atom.

(b) Number of electrons in a neutral atom

(c) Both (a) and (b)

(d) None of the above

2. Two atoms are said to be Isobars if ----------

(a) They have same atomic number but different mass number

(b) They have same number of electrons but different number of neutrons

(c) They have the same number of neutrons but different numbers of electrons.

(d) None of the above

3. Mass of proton is ----------

(a) 1.000 amu (b) 0.9073 amu

(c) 1.0073 amu (d) 5.486 x 10-4 amu

4. The mass number of the element is ----------

(a) sum of the number of electrons and protons

(b) sum of the number of protons and neutrons

(c) the number of neutrons

(d) the number of protons

5. The atomic number of an element is equal to----------

(a) number of neutrons

(b) number of electrons

(c) number of protons

(d) number of neutrons + number of proton

6. An alpha particle is also known as ----------

(a) subatomic particle

(b) an unionised helium atom

(c) a neutral particle

(d) a doubly-charged helium ion

7. Which of the following statements about the electron is incorrect?

(a) It is a negatively charged particles

(b) The mass of electron is equal to the mass of neutron

(c) It is a basic constituent of all atom

(d) It is constituent of cathode rays

8. How many electrons are occupy in M shell?

(a) 8 (b) 16 (c) 18 (d) 32

9. Who discovered the electron?

(a) Goldstein (b) J.J Thomson (c) Chadwick (d) Eugen Goldstein

10. $_{7}N^{15}$ and $_{8}O^{16}$ are pair of----------

(a) Isotopes (b) Isobars (c) Isotones (d) none of these

KEY AND SOLUTIONS

1.Ans:(a)

Solution: Atomic number (Z) is equal to the number of protons in the nucleus

2. Ans: (d)

Solution: Two atoms are said to be Isobars if they have the same mass number but different atomic numbers .

3.Ans: (c)

Solution: Mass of proton is 1.0073 amu

4. Ans: (b)

Solution: the mass number of the element is sum of the number of protons and neutrons.

5. Ans: (c)

Solution: The atomic number of an element is equal to number of protons

6. Ans: (d)

Solution: An alpha particle is a doubly-charged helium ion i.e He^{2+}

7. Ans: (b)

Solution: the mass of an electron is equal to 1/1836 the mass of a proton or neutron.

8. Ans: (c)

Solution: The electrons are occupy in the shell by using 2n2 rule. For M shell n=3 , so total 2 x 32= 18 electrons.

9. Ans: (b)

Solution: J.J Thomson discovered the electron

10. Ans: (c)

Solution: $_{7}\mathbf{N}^{15}$ and $_{8}\mathbf{O}^{16}$ are pair of isotones. Isotones are atomic species that share the same number of neutrons and differ in the number of protons. In case of $_{7}\mathbf{N}^{15}$ (number of proton = 7, number of neutron =8) $_{8}\mathbf{O}^{16}$ (number of proton = 8, number of neutron =8)

WORKSHEET-2

Q-1: A unit charge monoatomic anion contains 74 neutrons and 54 electrons. Find the atomic number, mass number, and identification of the ion.

Q-2: Except for one exception, neutrons can be found in all atomic nuclei. Which is this atomic nucleus and what does it consist of?

Q-3: Name the subatomic particle whose relative charge is (a) +1 (b) -1 (c) 0.

Q-4: In Rutherford's experiment, thin foils of heavy atoms such as gold, platinum, and others were bombarded by □-particles.What difference would there be between the above results if a thin foil of atoms such as aluminium was used?

Q-5: Why do electrons present around an atom's nucleus not fall into the nucleus?

Q-6: Why are the atomic masses the average values?

Q-7: Bohr's theory does not apply to which of the following species?

a) Li^{2+} b) He^{2+} c) H d) Be^{3+}

Q-8: A neutral atom of element has 2K, 8L and 4M electrons. Find out the following:

a) Atomic number of the element

b) Name of the element

c) Number of neutrons in the nucleus

d) Valency of the element

Q-9: Give one example of each of the following:

i) Isotope of $_7N^{14}$ ii) Isobar of $_7N^{14}$ iii) Isotone of $_6C^{14}$

Q-10: Electron was discovered by

a) Arrhenius

b) J.J. Thomson

c) Michael Faraday

d) Neils Bohr

Q-11: Which subatomic particle was missing from Thomson's model of the atom?

a) electron

b) proton

c) neutron

d) All of the above

Q-12: Which of the following atom characteristics is not a direct result of Rutherford's experiment?

a) The atom's extraordinary hollow nature

b) the existence of circular electronic orbits

c) the nucleus's small size

d) the nucleus's exceptionally high density

Q-13: The smallest part of an element that retains the element's chemical properties is

a) electron b) proton c) an atom d) molecule

Q-14: Which of the following statements about the properties of cathode rays is false?

a) The nature of the gas present in the cathode ray tube determines the characteristics of cathode rays.

b) The characteristics of cathode rays are unaffected by the material of the electrode in the cathode ray tube.

c) In the absence of an external electrical or magnetic field, they travel in a straight line.

d) They begin at the cathode and work their way to the anode.

Q-15: A compound is made up of two elements, X and Y, with X accounting for 80% and Y accounting for 20%. Their moles in the compound are 1.30 and 1.98, respectively. Determine the atomic masses of elements X and Y.

Q-16: Is the law of constant composition true for the compounds obtained from different isotopes of the same element?

Q-17: The electronic configuration of a metallic ion M^{+2} is 2,8,14, and the ionic weight is 56 amu. The total number of neutrons and protons is

a) 30,26 b) 32,24 c) 34,22 d) 42,14

Q-18: Which of the following pairs contains two species that are both isoelectronic and isotopic? Atomic numbers: Ca=20, Ar=18, Mg=12, Fe=26, Na=11.

a) $_{40}Ca^{2+}$ and $_{40}Ar$ b) $_{57}Fe^{3+}$ and $_{56}Fe^{2+}$

c) $_{23}Na^{+}$ and $_{24}Na^{+}$ d) $_{24}Mg^{2+}$ and $_{25}Mg$.

Q-19: According to Bohr, if the atomic shells are complete then the atom will be

a) more reactive b) less stable c) less reactive d) can't be predicted

Q-20: Consider the electronic configurations:

i) 2,8,1 ii)2,8,0,1

Answer the following questions:

a) What is the element that corresponds to i)?

b) Is ii) the same or a different element?

c) How is ii) obtained from i)?

d) Is it easier to extract one electron from ii) or i)? Explain.

RESOURCES:-

FOR MORE QUESTIONS VISIT https://ncert.nic.in/ncerts/l/ieep104.pdf

QUIZ-1

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QUIZ-2

https://diksha.gov.in/play/collection/do_31290463348845772813 86?contentId=do_31290247394467020815 05

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