

KENDRIYA VIDYALAYA SANGATHAN



**STUDY MATERIAL FOR CLASS IX
SUBJECT - SCIENCE**

[SESSION-2012-2013]

**Zonal Institute of Education & Training
CHANDIGARH**

ACKNOWLEDGEMENTS

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PREFACE

Kendriya Vidyalayas are the pioneer institutions in the field of Education focusing all round development of the students. Keeping in view of the implementation of CCE it is desired to prepare study/ support material for Class IX to guide the students in the right direction and to equip the students to face the challenges with ease.

*The purpose of this **Study Material** is to help learners study more effectively and efficiently. It is designed to help increase the retention of what they are studying for the purpose of using it more successfully at a later time—while taking a test.*

For the academic year 2012-13 the task has been allotted to Kendriya Vidyalaya Sangathan ZONAL INSTITUTE OF EDUCATION & TRAINING, CHANDIGARH for preparation of study/ support material for Class IX Science. Kendriya Vidyalaya Sangathan ZONAL INSTITUTE OF EDUCATION & TRAINING, CHANDIGARH records appreciation for the sincere efforts of Mrs. Medha U (PGT Physics), Ms. Ameeta Kumari (PGT Chemistry) & Mr. G. varaprasad (PGT Biology) of this institution for preparing the study material.

The development of content is based on the detailed survey feed back taken from the students on all the concepts from each unit. I am confident that the study/ support material will definitely help the students to understand the concepts well and meet quality expectations.

(A.P. BHALLA)

Director

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Features : STUDY CUM SUPPORT MATERIAL

- ❖ *This study material is a supplement material to the NCERT textbook. It is neither a guide nor a refresher.*
- ❖ *The teachers can prepare the master card by taking the important topics/ points/ concepts / reactions/ terms etc from this study material for quick revision during the exams.*
- ❖ *The material can also be used during the crash course or remedial sessions depending upon the topics of the chapter.*
- ❖ *Systematic revision material of the different topics according to their level of difficulty & importance.*
- ❖ *The content given in the table formats can be used as worksheets or flash cards .*

COURSE STRUCTURE

FIRST TERM	Marks : 90
UNITS	Marks
I. Food ➤ Ch. 15 - Improvement in food resources	13
II. Matter - Its nature and behaviour ➤ Ch.1- Matter in our surroundings ➤ Ch.2- Is matter around us pure	29
III. Organisation in living world ➤ Ch.5 - Fundamental unit of life ➤ Ch.6 – Tissues	18
IV. Motion, Force and Work ➤ Ch.8 - Motion ➤ Ch.9 - Force and Law of motion ➤ Ch.10 – Gravitation	30
TOTAL	90

SECOND TERM	Marks :90
UNITS	Marks
I. Matter - Its nature and behavior ➤ Ch.3 - Atom & Molecules ➤ Ch.4 - Structure of atom	17
II. Organisation in the living world ➤ Ch.7 - Diversity in living organisms ➤ Ch.13 – Why do we fall ill ?	25
III. Motion, Force and Work ➤ Ch.10 - Gravitation (Floatation) ➤ Ch.11- Work ➤ Ch.12 –Sound	36
IV Our Environment ➤ Ch.14 - Natural Resources	12
TOTAL	90

CONTENTS

SECTION - CHEMISTRY

- ❖ CHAPTER - 1 : MATTER IN OUR SURROUNDINGS
- ❖ CHAPTER - 2 : IS MATTER AROUND US PURE ?
- ❖ CHAPTER - 3 : ATOM AND MOLECULES
- ❖ CHAPTER - 4 : STRUCTURE OF ATOM
- KEY CONCEPTS
- CONCEPT DETAILS
- QUESTION BANK
- PRACTICAL BASED MCQ

SECTION - BIOLOGY

- ❖ CHAPTER - 5 : FUNDAMENTAL UNIT OF LIFE
- ❖ CHAPTER - 6 : TISSUES
- ❖ CHAPTER - 7 : DIVERSITY IN LIVING ORGANISMS
- ❖ CHAPTER - 13 : WHY DO WE FALL ILL ?
- ❖ CHAPTER - 14: NATURAL RESOURCES
- ❖ CHAPTER - 15 : IMPROVEMENT IN FOOD RESOURCES
- KEY CONCEPTS
- CONCEPT DETAILS
- QUESTION BANK
- FORMATIVE ASSESSMENT SAMPLE PAPERS

SECTION - PHYSICS

- ❖ CHAPTER - 8 : MOTION
- ❖ CHAPTER - 9 : FORCE AND LAW OF MOTION
- ❖ CHAPTER - 10 : GRAVITATION
- ❖ CHAPTER - 11 : WORK
- ❖ CHAPTER - 12 : SOUND
- KEY CONCEPTS
- CONCEPT DETAILS
- QUESTION BANK

SAMPLE PAPERS : SUMMATIVE ASSESSMENT 1 & 2

SECTION : CHEMISTRY

CHAPTER – 1 “Matter in our Surroundings”

CONCEPT DETAILS

KEY CONCEPTS : [*rating as per the significance of concept]

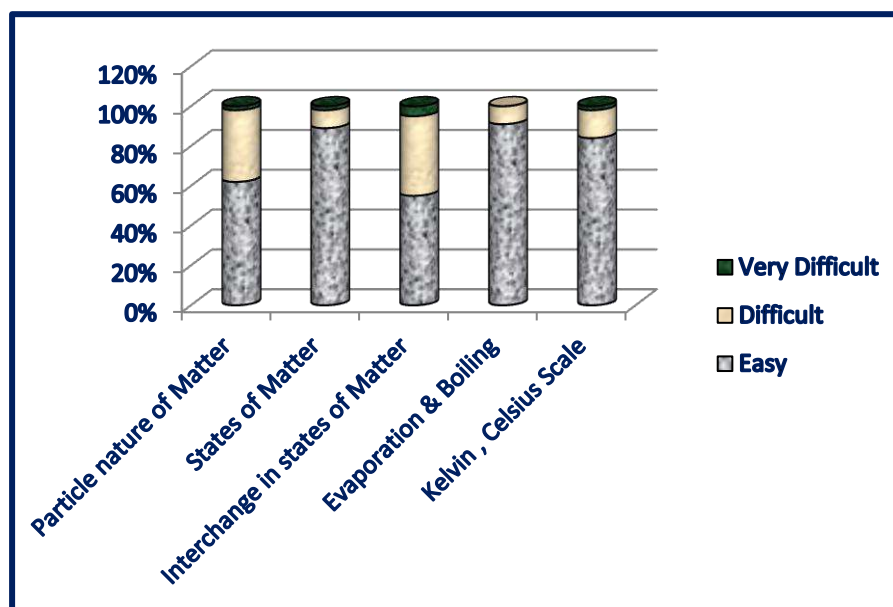
1. Particle nature of Matter	***
2. States of Matter	****
3. Interchange in states of Matter	*****
4. Evaporation & Boiling	****
5. Kelvin , Celsius scale	***

🌈 Pre requisites

- Definition of matter.
- Elementary idea of three physical states of matter .

SURVEY ANALYSIS

Conceptual levels of comprehension on the basis of feedback taken from the students



1. Particle Nature of Matter

[refer NCERT text book activities 1.1 to 1.8]

- Anything that occupies space and has mass and is felt by senses is called matter.
- Matter is the form of five basic elements the Panch tatva – air , earth ,fire , sky and water.
- **Characteristics of particles of matter**
 - Made of tiny particles.
 - Vacant spaces exist in particles.
 - Particles are in continuous motion.
 - Particles are held together by forces of attraction.

Q.1 Define matter.

Q.2 What happens if you put copper sulphate crystals in water?

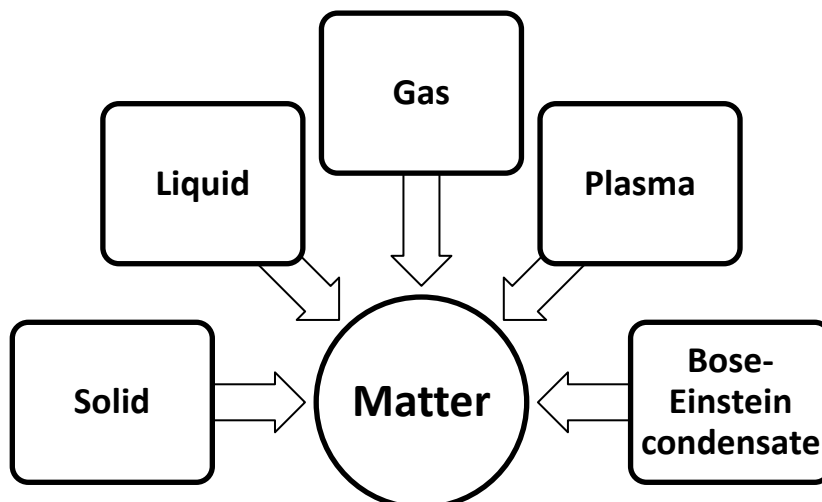
2. States of Matter

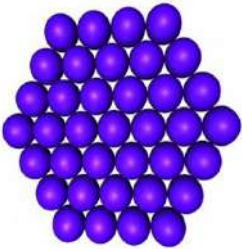
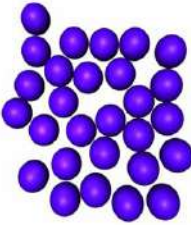
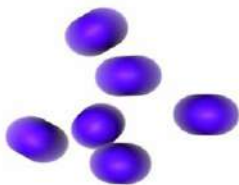
[refer NCERT text book activities 1.9 to 1.11]

Basis of Classification of Types


- Based upon particle arrangement
- Based upon energy of particles
- Based upon distance between particles

➤ Five states of matter

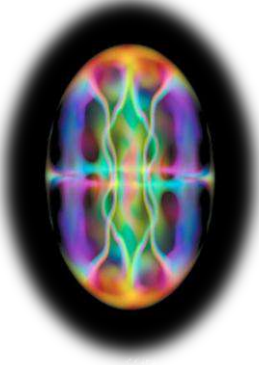


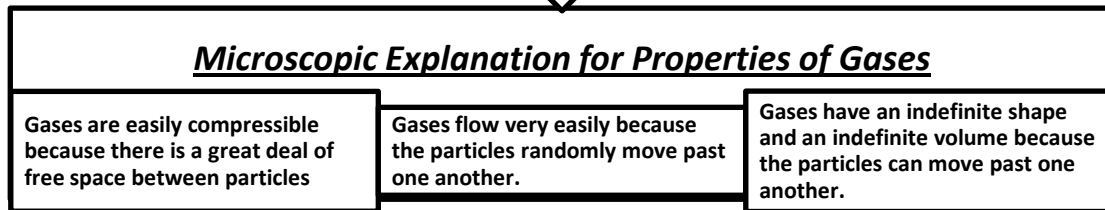
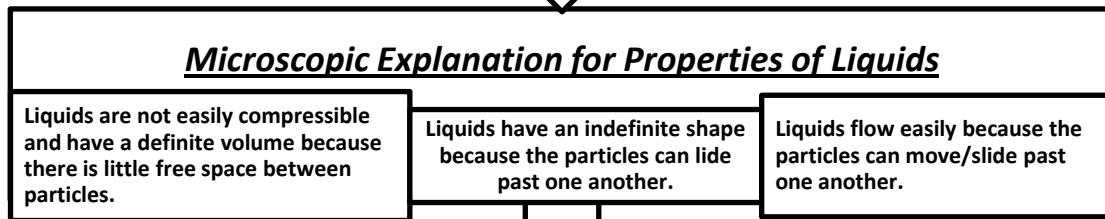
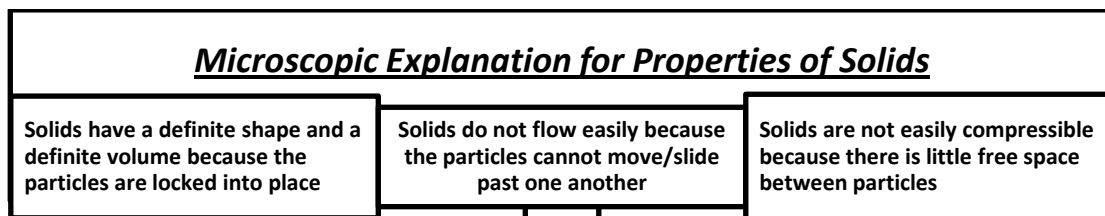
(i) SOLID	(ii) LIQUID	(iii) GAS
		
<ul style="list-style-type: none"> • Fixed shape and definite volume . 	<ul style="list-style-type: none"> • Not fixed shape but fixed volume. 	<ul style="list-style-type: none"> • Neither fixed shape nor fixed volume.
<ul style="list-style-type: none"> • Inter particle distances are smallest. 	<ul style="list-style-type: none"> • Inter particle distances are larger. 	<ul style="list-style-type: none"> • Inter particle distances are largest.
<ul style="list-style-type: none"> • Incompressible. 	<ul style="list-style-type: none"> • Almost incompressible. 	<ul style="list-style-type: none"> • Highly compressible.
<ul style="list-style-type: none"> • High density and do not diffuse. 	<ul style="list-style-type: none"> • Density is lower than solids and diffuse. 	<ul style="list-style-type: none"> • Density is least and diffuse.
<ul style="list-style-type: none"> • Inter particle forces of attraction are strongest. 	<ul style="list-style-type: none"> • Inter particle forces of attraction are weaker than solids . 	<ul style="list-style-type: none"> • Inter particle forces of attraction are weakest.
<ul style="list-style-type: none"> • Constituent particles are very closely packed. 	<ul style="list-style-type: none"> • Constituent particles are less closely packed. 	<ul style="list-style-type: none"> • Constituent particles are free to move about.

(iv) Plasma (non –evaluative)

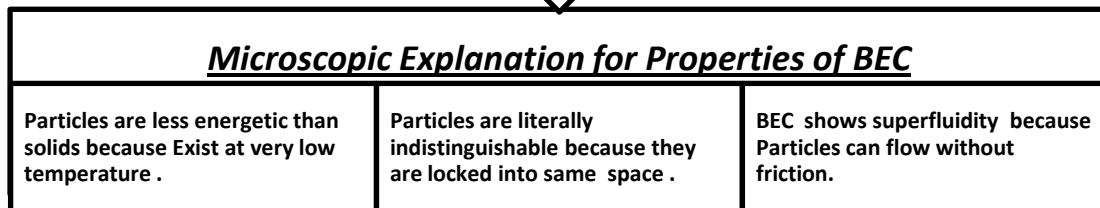
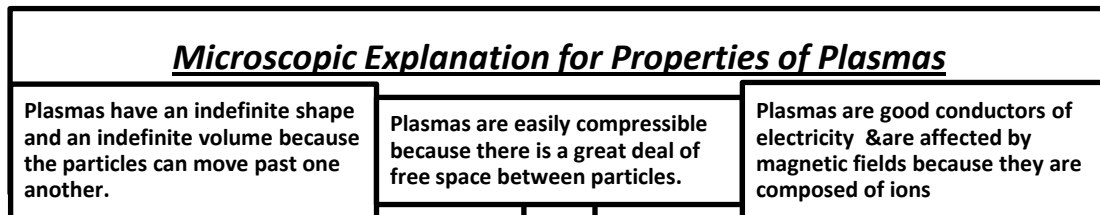
	<ul style="list-style-type: none"> • A plasma is an ionized gas. • A plasma is a very good conductor of electricity and is affected by magnetic fields. • Plasma, like gases have an indefinite shape and an indefinite volume. Ex. Ionized gas
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(v) Bose-Einstein condensate (non –evaluative)

	<ul style="list-style-type: none"> • A BEC is a state of matter that can arise at very low temperatures. • The scientists who worked with the Bose-Einstein condensate received a Nobel Prize for their work in 1995. • The BEC is all about molecules that are really close to each other (even closer than atoms in a solid).
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(non –evaluative)↓



- Q.1 A substance has a definite volume but no definite shape ? State whether this substance is a solid , a liquid or a gas.
- Q.2 Arrange the following substances in increasing order of force of attraction between the particles. (a) Milk (b) Salt (c) Oxygen.
- Q.3 A substance has neither a fixed shape nor a fixed volume . State whether it is a solid , a liquid or a gas.
- Q.4 The melting point of a substance is below the room temperature . Predict its physical state.

3. Interchange in states of matter

[refer NCERT text book activities 1.12 to 1.14]

Matter Can Change its State

Water can exist in three states of matter –

- Solid, as ice ,
- Liquid, as the familiar water, and
- Gas, as water vapour.

Sublimation : The changing of solid directly into vapours on heating & vapours into solid on cooling. Ex. Ammonium chloride , camphor & iodine.

a) Effect of change in temperature

The temperature effect on heating a solid varies depending on the nature of the solid & the conditions required in bringing the change .

- On increasing the temperature of solids, the kinetic energy of the particles increases which overcomes the forces of attraction between the particles thereby solid melts and is converted to a liquid.
- The 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 273.16 K.
- The process of melting, that is, change of solid state into liquid state is also known as fusion.

b) Effect of Change of Pressure

- Increasing or decreasing the pressure can change the state of matter. Applying pressure and reducing temperature can liquefy gases.
- ***Solid carbon dioxide (CO₂) is stored under high pressure. Solid CO₂ gets converted directly to gaseous state on decrease of pressure to 1 atmosphere without coming into liquid state. This is the reason that solid carbon dioxide is also known as dry ice.***

Latent Heat :

The hidden heat which breaks the force of attraction between the molecules during change of state.

Fusion	Vaporisation
Heat energy required to change 1kg of solid into liquid.	Heat energy required to change 1kg of liquid to gas at atmospheric pressure at its boiling point.

Thus, we can say that pressure and temperature determine the state of a substance , whether it will be solid, liquid or gas.

[refer fig. 1.9 NCERT Text Book , page-8]

- Q.1 What is vapour ?
- Q.2 Name the temperature at which the solid and liquid states of substance can exist together .
- Q.3 What is the effect of pressure on boiling point?
- Q.4 Name any two substances which sublime.
- Q.5 Define Condensation.
- Q.6 For any substance, why does the temperature remain constant during the change of state?

4. Evaporation & Boiling

- Particles of matter are always moving and are never at rest.
- At a given temperature in any gas, liquid or solid, there are particles with different amounts of kinetic energy.
- In the case of liquids, a small fraction of particles at the surface, having higher kinetic energy, is able to break away from the forces of attraction of other particles and gets converted into vapour .
- This phenomenon of change of a liquid into vapours at any temperature below its boiling point is called evaporation.
 - **Factors Affecting Evaporation**
- The rate of evaporation increases with an increase of surface area.
- With the increase of temperature, more number of particles get enough kinetic energy to go into the vapour state.
- Humidity is the amount of water vapour present in air. The air around us cannot hold more than a definite amount of water vapour at a given temperature. If the amount of water in air is already high, the rate of evaporation decreases.
- Wind speed : the higher the wind speed , the more evaporation.

Evaporation cause cooling.

The particles of liquid absorb energy from the surrounding to regain the energy lost during evaporation,

Evaporation Vs Boiling

- Boiling is a bulk phenomenon. Particles from the bulk (whole) of the liquid change into vapour state.
- Evaporation is a surface phenomenon. Particles from the surface gain enough energy to overcome the forces of attraction present in the liquid and change into the vapour state.

Q.1 Which is the slow process , Evaporation or Boiling ?

Q.2 State the effect of surface area on rate of evaporation.

Q.3 Why are we able to sip hot tea faster from saucer rather than from a cup?

5. Kelvin & Celsius Scale

- Kelvin is the SI unit of temperature, $0^{\circ}\text{C} = 273.16\text{ K}$. we take $0^{\circ}\text{C} = 273\text{ K}$.
- SI unit of temperature is Kelvin. $T(\text{K}) = T(^{\circ}\text{C}) + 273$
- Kelvin scale of temperature has always positive sign , hence regarded as better scale than Celsius.
- Atmosphere (atm) is a unit of measuring pressure exerted by a gas. The SI unit of pressure is Pascal (Pa):
- 1 atmosphere = $1.01 \times (10 \text{ to the power } 5)\text{ Pa}$. The pressure of air in atmosphere is called atmospheric pressure. The atmospheric pressure at sea level is 1 atmosphere, and is taken as the normal atmospheric pressure.

Q.1 What is the SI unit of temperature?

Q.2 Kelvin scale of temperature is regarded as better scale than Celsius. Why?

Q.3 Convert 10°C into Kelvin scale.

QUESTION BANK [*HOTS]

1 Mark Questions:

1. Pressure on the surface of a gas is increased. What will happen to the inter particle forces?
2. Name the three states of matter.
3. What happens when a liquid is heated ?
4. A gas can exert pressure on the walls of the container. Assign reason.
5. Convert the following temperature to Kelvin Scale (a) 100°C (b) 37°C
6. What is meant by density?
7. Give the characteristics of the particles of matter.
8. Water droplets seen on the outer surface of a glass containing ice-cold water is due to _____ .
9. Change of gaseous state directly to solid state without going through liquid state is called _____ .
10. _____ is a surface phenomenon.

2 Marks Questions:

1. Define Latent heat of vaporisation.
2. Explain why temperature remain constant during the change of state of any substance?
3. Define Sublimation with examples.
4. *Do we sweat more on a dry day or humid day ? Justify your reason.
5. Why do we see water droplets on the outer surface of a glass containing ice cold water?
6. Convert the following temperature to the Kelvin scale (a) 25°C (b) 373°C
7. List two properties that liquids have in common with solids.
8. List two properties that liquids have in common with gases.
9. *What will happen to the melting point temperature of ice if some common salt is added to it? Justify your answer.
10. *How will you show that air has maximum compressibility?

3 Marks Questions:

1. Define the term (a) Latent heat of fusion (b) Latent heat of vaporization
2. *State the effect of (i) surface area (ii) nature of the liquid on the rate of evaporation.
3. *Liquids generally have lower density as compared to solids. But you must have observed that ice floats on water. Why?
4. What is the physical state of water at 250°C, 100°C, 0°C?
5. Give reasons :
 - i) A sponge can be pressed easily; still it is called a solid.
 - ii) Water vapours have more energy than water at same temperature.
6. What are intermolecular forces ? How are these related to the three states of matter ?
7. Is it possible to liquify atmospheric gases? If yes, suggest a method.

5 marks Questions:

1. a) What is meant by evaporation? What are the factors on which the rate of evaporation depend upon?
b) How does evaporation causes cooling?
2. State the properties of all the five states of matter.
3. Define : Melting point , Freezing point & Boiling point

You are expected to know.....

- Particle nature of matter.
- All five states of matter & their behaviour
- Inter conversion of states of matter
- Latent heat
- Conversion between Kelvin scale & Celsius scale

CHAPTER – 2 “Is Matter Around Us Pure”

CONCEPT DETAILS

KEY CONCEPTS : [*rating as per the significance of concept]

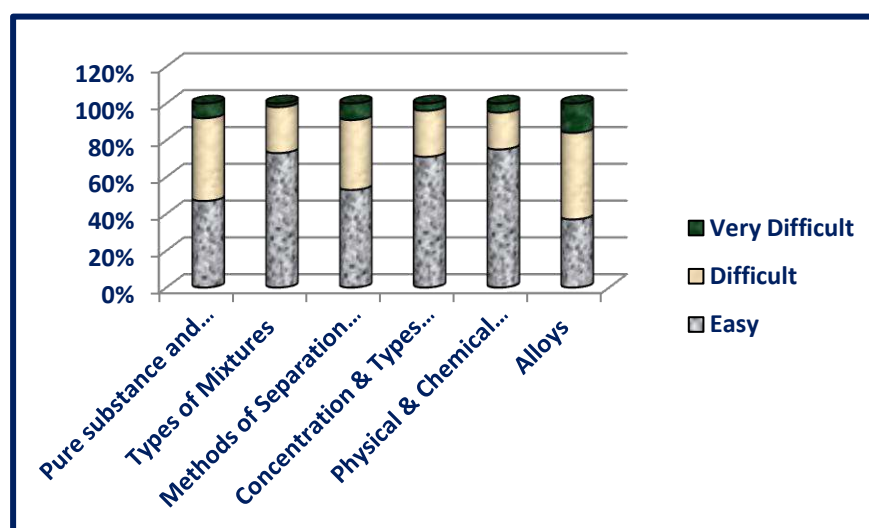
1. Pure Substance & Mixture	***
2. Types of Mixtures	****
3. Methods of Separation of Mixtures	*****
4. Concentration & Types of Solutions	*****
5. Physical & Chemical Changes	***
6. Alloys	**

Pre requisites

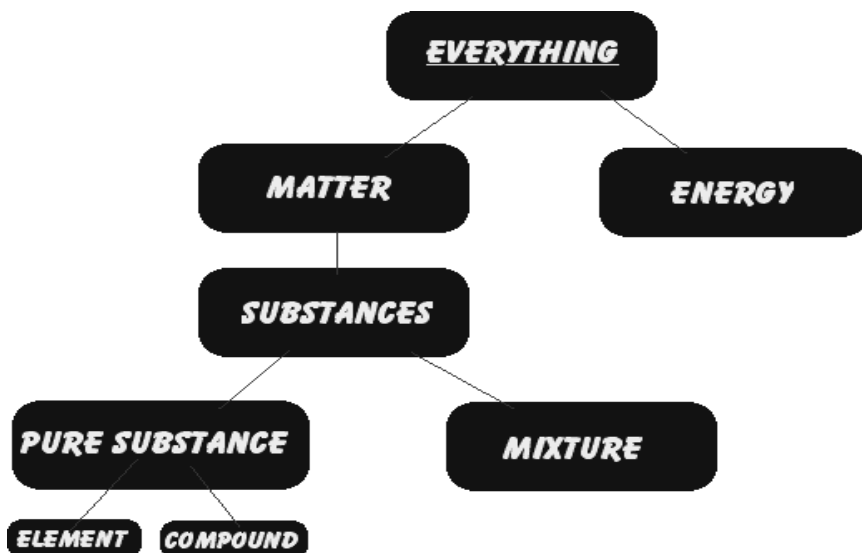
- Basic knowledge of particle nature of matter
- Different states of matter

SURVEY ANALYSIS

Conceptual levels of comprehension on the basis of feedback taken from the students



1. Pure Substance & mixture



PURE SUBSTANCE	MIXTURE
<ul style="list-style-type: none"> • Pure substance consists of a single type of substance . 	<ul style="list-style-type: none"> • Mixture consists of two or more pure substances.
<ul style="list-style-type: none"> • Pure substance cannot be separated into other substances by physical methods. 	<ul style="list-style-type: none"> • Mixture can be separated into its components by physical methods.
<ul style="list-style-type: none"> • Pure substance has its own definite properties. 	<ul style="list-style-type: none"> • Mixture shows the properties of its components.

Elements are made up of one kind of atoms only. Compounds are made up of one kind of molecules only.

Difference between Compound & Mixture

[refer NCERT text Book Tab.2.2, page 26]

Q.1 Is air around us a compound or mixture?

Q.2 Water is a compound. Justify.

Q.3 Classify the following as element , compound and mixture: Iron , sea water , Milk

Q.4 Are the naturally occurring material in nature chemically pure substances?

2. Types of Mixtures

Mixtures can also be grouped

i) on the basis of their physical states:

	SOLID	LIQUID	GAS
SOLID	<ul style="list-style-type: none">• Salt and sugar	<ul style="list-style-type: none">• Salt and water	<ul style="list-style-type: none">• Dust in air
LIQUID	<ul style="list-style-type: none">• Mercury and copper	<ul style="list-style-type: none">• Alcohol and water	<ul style="list-style-type: none">• Clouds
GAS	<ul style="list-style-type: none">• Hydrogen and palladium	<ul style="list-style-type: none">• Oxygen and water	<ul style="list-style-type: none">• Air

ii) on the basis of miscibility:

Homogeneous Mixture	Heterogeneous Mixture
<ul style="list-style-type: none">• It consists of single phase.• Uniform composition.• Example: Sugar dissolved in water	<ul style="list-style-type: none">• It consists of two or more phase.• Does not have uniform composition.• Example: Air, sand and common salt.

- Q.1 Give one example for each of the following mixtures: i) Solid/solid (homogeneous) ii) Solid/solid (heterogeneous) iii) Liquid/liquid (homogeneous) iv) Liquid/liquid (heterogeneous) v) Gas/liquid (homogeneous)..
- Q.2 Classify the following as homogeneous & heterogeneous mixture:
i) sodium chloride & water ii) glucose & water iii) sand & water iv) air

4. Separating the components of a mixture

The components of a heterogeneous mixture can be separated by

- **simple methods like -**
 - hand picking , sieving , & Winnowing
- **special techniques like -**
 - Evaporation** : a mixture of salt and water or sugar and water.
 - Centrifugation** : Butter from curd, Fine mud particles suspended in water.
 - Decantation (Using separating funnel)** : Oil from water.
 - Sublimation** : Camphor from salt,
 - Chromatography** : Different pigments from an extract of flower petals.
 - Distillation and fractional distillation** : Separating components of Petroleum
 - Magnetic separation:** Iron pins from sand.

Q.1 Name the process you would use to :
 i) recover sugar from an aqueous sugar solution.
 ii) separate mixture of salt solution and sand.
 Q.2 How will you separate a mixture of sand , water and mustard oil ?

5. Concentration of Solution

The amount of solute present in a given amount (mass or volume) of solution.

$$\text{Concentration of a solution} = \frac{\text{Amount of solute}}{\text{Amount of solvent}} \quad \text{OR} \quad \frac{\text{Amount of solute}}{\text{Amount of solution}}$$

The concentration of a solution can be expressed as mass by mass percentage or as mass by volume percentage.

Mass by mass percentage of a solution = $\frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$

Mass by volume percentage of a solution = $\frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100$

Types of Solutions

a) on the basis of size of solute particles:

True solution	Sol [Colloid]	Suspension
<ul style="list-style-type: none"> Homogeneous 	<ul style="list-style-type: none"> Heterogeneous 	<ul style="list-style-type: none"> Heterogeneous
<ul style="list-style-type: none"> Size of solute particles is less than 1 nm or 10^{-9} m . 	<ul style="list-style-type: none"> Size of solute particles is between 1 nm to 1000 nm. 	<ul style="list-style-type: none"> Size of solute particles is more than 1000 nm.
<ul style="list-style-type: none"> Particles cannot pass through filter paper. 	<ul style="list-style-type: none"> Particles can pass through filter paper. 	<ul style="list-style-type: none"> Particles cannot pass thorough filter paper.
<ul style="list-style-type: none"> Stable 	<ul style="list-style-type: none"> Stable and settle only on centrifugation. 	<ul style="list-style-type: none"> Unstable and settle down on its own.
<ul style="list-style-type: none"> Solution of sodium chloride in water, sugar & water. 	<ul style="list-style-type: none"> Milk , Fog 	<ul style="list-style-type: none"> muddy water, chalk & water, smoke in the air.

[types of colloids : refer NCERT Text Book table 2.1 , page 18]

Colloidal solution is a heterogeneous mixture. It consists of two phases:-

(i) **Dispersed phase** : component present in small proportion

(ii) **Dispersion medium** : component present in large proportion

The particles of colloid are large enough to scatter a beam of light passing through it and make its path visible. Thus, they show **Tyndall effect**.

The colloidal particles are moving at random in a zigzag motion in all directions.

This type of zig-zag motion of colloidal particles is called **Brownian movement**.

b) on the basis of amount of solute:

Unsaturated solution	Saturated Solution	Supersaturated solution
A solution which has lesser amount of solute that it can dissolve at a given temperature is known as unsaturated solution.	A solution which has maximum amount of solute that it can dissolve at a given temperature is known as saturated solution.	A solution which can dissolve amount of solute by increasing temperature saturated solution is known as supersaturated solution.

c) on the basis of nature of solvent

Aqueous solution	Non-Aqueous solution
The solution in which the solvent is water is known as aqueous solution.	The solution in which the solvent is other than water (ether, alcohol or acetone) known as non-aqueous solution.

Q.1 Classify the following substances into true solutions and colloidal solutions.

Milk , ink , starch dissolved in water.

Q.2 A solution has been prepared by dissolving 5g of urea in 95 g of water. What is the mass percent of urea in the solution?

Q.3 Give an example of an aqueous solution in which gas is dissolved.

6.Physical & Chemical Changes

Physical changes - Changes that do not result in the production of a new substance.

- If you melt a block of ice, you still have H₂O at the end of the change.
- If you break a bottle, you still have glass.

Examples : melting, freezing, condensing, breaking, crushing, cutting, and bending.

Chemical changes - Changes that result in the production of another substance.

- As in the case of autumn leaves, a change in color is a clue to indicate a chemical change.
- a half eaten apple that turns brown.

Q.1 Which of the following is an example of physical change?

- a. Mixing baking soda and vinegar together, and this causes bubbles and foam.
- b. A glass cup falls from the counter and shatters on the ground.
- c. Lighting a piece of paper on fire and the paper burns up and leaves ashes.
- d. Baking a birthday cake for your mother.

Q.2. Which of the following is an example of chemical change?

- a. Filling up a balloon with hot air.
- b. Taking a glass of water and freezing it by placing it in the freezer.
- c. A plant collecting sunlight and turning it into food.
- d. Your dog ripping up your homework.

3. Which change can be easily be reversed?

- a. Chemical Change
- b. Physical Change
- c. Both a physical and chemical change
- d. Neither a physical or chemical change

7. Alloys

A material that has metallic properties and is composed of two or more chemical elements of which at least one is a metal .

- These cannot be separated into their components by physical methods.
- However, these are considered as mixture because these show the properties of its constituents and can have variable composition.

The benefit of alloys is that you can combine metals that have varying characteristics to create an end product that is stronger, more flexible, or otherwise desirable to manufacturers.

- Aluminium alloys are extensively used in the production of automotive engine parts.
- Copper alloys have excellent electrical and thermal performance, good corrosion resistance, high ductility and relatively low cost.

- Stainless steel alloys are used for many commercial applications such as watch straps, cutlery etc.
- Titanium alloys have high strength, toughness and stiffness & are used in aerospace structures .

Q.1 Why should we use alloys instead of pure metals?

Q.2 State uses of Aluminium & Stainless steel alloys.

QUESTION BANK [*HOTS]

1 Mark Questions:

1. What is meant by pure substance?
2. What is meant by mass percentage of solution?
3. Name the process of separation of miscible liquids.
4. Arrange the following in decreasing order of size of the particles.
True Solution , Suspension , Colloid.
5. *Give an example of an aqueous solution in which gas is dissolved.
6. Name the dispersion medium and dispersed phase in the white material inside an egg.
7. What happens when hot saturated solution is cooled?
8. How would you separate a mixture of chalk and water?
9. *How much water should be added to 15 grams of salt to obtain 15 % salt solution?
10. What type of mixtures are separated by technique of crystallization ?

2 Marks Questions:

1. Which of the following materials fall in the category of a pure substance?
 - a) Ice b) Milk c) Iron d) Hydrochloric acid
 - e) Calcium oxide f) Mercury g) Brick h) Wood.
2. What do you understand by saturated solution and unsaturated solution?
3. *What do you observe when sunlight passes through a dense forest?
4. List two points of differences between homogeneous and heterogeneous mixtures.
5. State the difference between aqueous & non aqueous solution .
6. Which of the following will show “Tyndal Effect” & Why ?
 - a) Salt Solution b) Milk c) Copper Sulphate Solution d) Starch Solution

7. *How can we obtain pure copper sulphate from an impure sample?
8. Give two differences between compounds and mixtures.
9. Why is hydrogen considered as element? Give two reasons.
10. Why water is a compound and not a mixture?

3 Marks Questions:

1. 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.
2. Give any two applications of centrifugation.
3. Which of the following is chemical change?
a) Growth of a plant b) Rusting of iron c) Mixing of iron fillings and sand
d) Cooking of food e) Digestion of food f) Freezing of water g) Burning of a candle.
4. *State the difference between simple distillation & fractional distillation.
5. * A solution contains 40 ml of ethanol mixed with 100 ml of water. Calculate the concentration in terms of volume by volume percentage of the solution.

5 Marks Questions:

1. *What is meant by Tyndall effect? What is its cause? Illustrate with example.
2. How would you separate the mixture containing sulphur and sand?
3. What is crystallization? Give its two applications.
4. How are sol, solution and suspension different from each other?
5. How do we obtain coloured components, i.e. dye from Blue/Black ink?

You are expected to know.....

- Types of mixtures.
- Method of Separation of mixtures.
- Types of solutions.
- Concentration terms of solution.
- Physical and Chemical Change.
- Significance of alloys.

CHAPTER - 3 “Atoms and Molecules”

CONCEPT DETAILS

KEY CONCEPTS : [*rating as per the significance of concept]

1. Laws of Chemical Combination	***
2. John Daltons Atomic Theory	**
3. Atoms, ions & Chemical Formula	****
4. Mole Concept	*****
5. Molar Mass & Avogadro constant	****

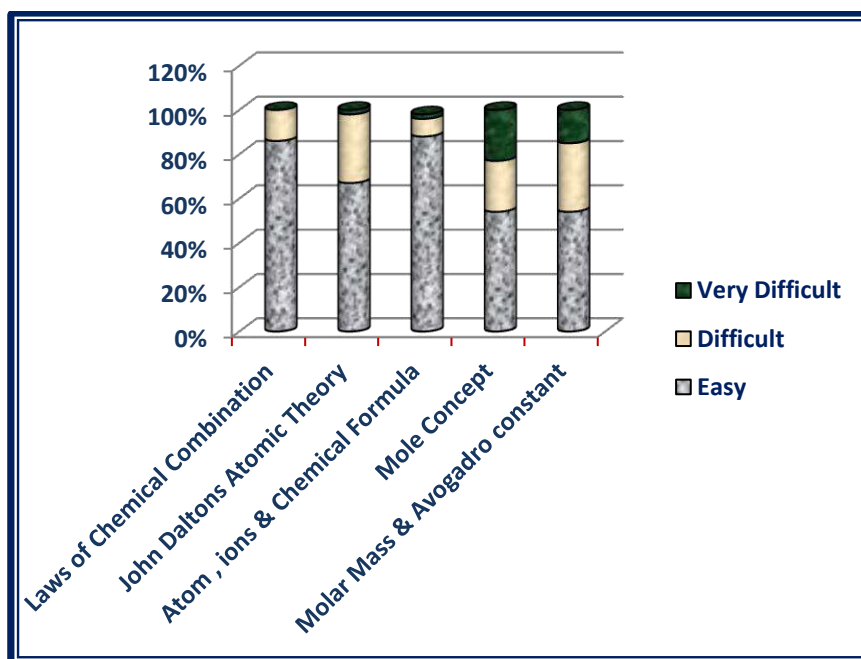
Pre requisites

Basic knowledge all states of matter.

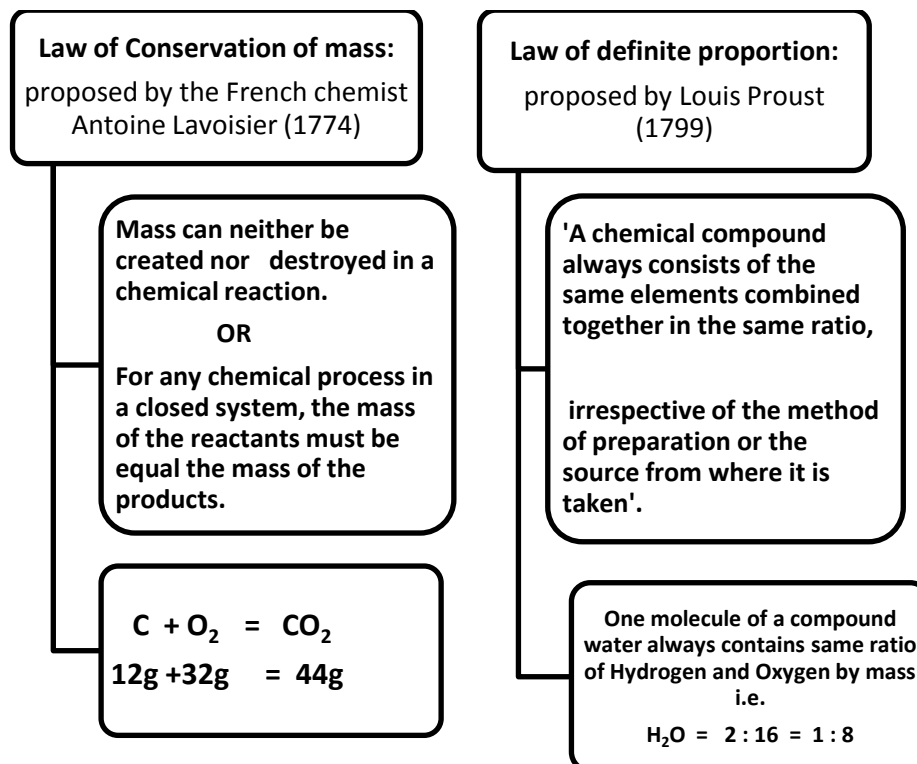
Difference in the different states of matter .

SURVEY ANALYSIS

Conceptual levels of comprehension on the basis of feedback taken from the students

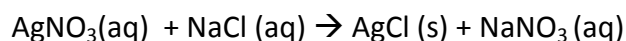


1. Laws of Chemical Combination



Verification of "Law of Conservation of mass"

A solution of sodium chloride and silver nitrate are taken separately in the two limbs of an 'H' shaped tube. The tube is sealed and weighed precisely. The two reactants are made to react by inverting the tube. The following reaction takes place.



The whole tube is kept undisturbed for sometime so that the reaction is complete.

When the tube is weighed again it is observed that:

Weight before the reaction = Weight after the reaction

Limitation of "Law of definite proportion"

This law does not hold good when the compound is obtained by using different isotopes of the combining elements.

- Q.1 Why chemical reactions are in accordance with the Law of conservation of mass?
Q.2 Calculate the ratio of atoms present in 5 g of magnesium and 5 g of iron.
[Atomic mass of Mg=24 u, Fe=56 u]

2. John Daltons Atomic Theory

[for postulates ,refer NCERT text book article 3.1.2 -page no.32]

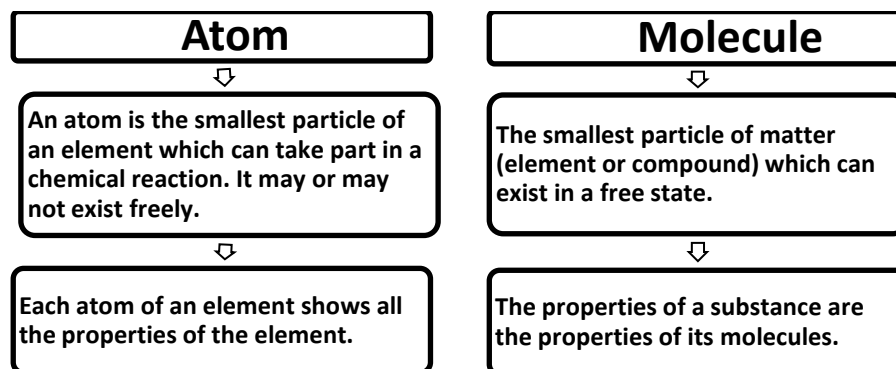
Using his theory, Dalton rationalized the various laws of chemical combination which were in existence at that time. However, **he assumed that the simplest compound of two elements must be binary.**

Q.1 In what respect does Dalton's Atomic theory hold good even today?

Q.2 Which of the following is not the postulate of Dalton's Atomic theory of matter ?

- Each element is made up of extremely small particles called atoms.
- Atoms of a given element are identical in chemical properties but have different physical properties.
- Atoms cannot be created nor destroyed.
- Compounds are formed by the chemical union of atoms of two or more elements in fixed proportion .

3. Atoms ,Molecules, Ions & Chemical Formula



- **MOLECULES OF ELEMENT** : The molecules of an element are constituted by the same type of atoms.
- **MOLECULES OF COMPOUND**: Atoms of different elements join together in definite proportions to form molecules of compounds.(hetero atomic molecules)
- **ATOMICITY** : The number of atoms contained in a molecule of a substance (element or compound) is called its atomicity.

Element	Formula	Atomicity
Ozone	O ₃	3
Phosphorus	P ₄	4
Sulphur	S ₈	8
Oxygen	O ₂	2

➤ Based upon atomicity molecules can be classified as follows.

Monoatomic molecules: Noble gases helium, neon and argon exist as He Ne and Ar respectively.

Diatomic molecules: H₂, O₂, N₂, Cl₂, CO, HCl.

Triatomic molecules: O₃, CO₂, NO₂.

➤ **SYMBOLS**

- The abbreviation used to represent an element is generally the first letter in capital of the English name of element.

Oxygen → O

Nitrogen → N

- When the names of two or more elements begin with the same initial letter, the initial letter followed by the letter appearing later in the name is used to symbolize the element

Barium → Ba

Bismuth → Bi

Symbols of some elements are derived from their Latin names

ELEMENT	LATIN NAME	SYMBOL
Sodium	Natrium	Na
Copper	Cuprum	Cu
Potassium	Kalium	K
Iron	Ferrum	Fe
Mercury	Hydragyrum	Hg
Tungsten	Wolfram	W

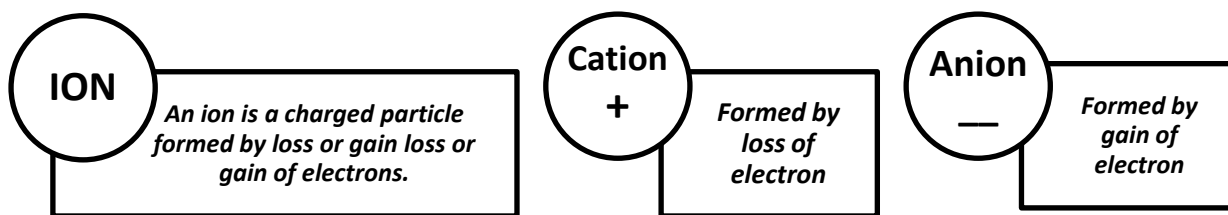
Q.1 Give one example each of molecule of element & molecule of compound.

Q.2 How does an atom differ from molecule ?

Q.3 Name a triatomic gas.

Q.4 Name the element represented by Hg, Pb, Au.

Q.5 What is the difference between an atom of hydrogen and a molecule of hydrogen?



Polyatomic Ion : A group of atoms carrying a charge is as polyatomic ion.

eg: NH_4^+ - Ammonium Ion ; CO_3^{2-} - Carbonate ion

Valency : The number of electrons which an atom can lose , gain or share to form a bond.

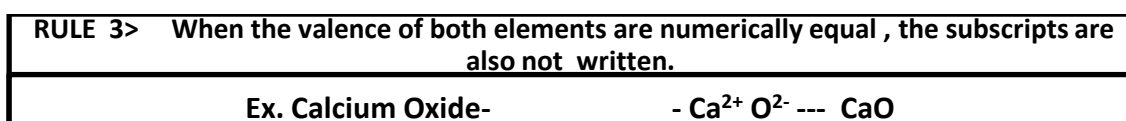
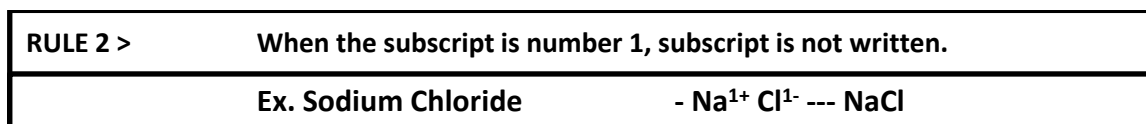
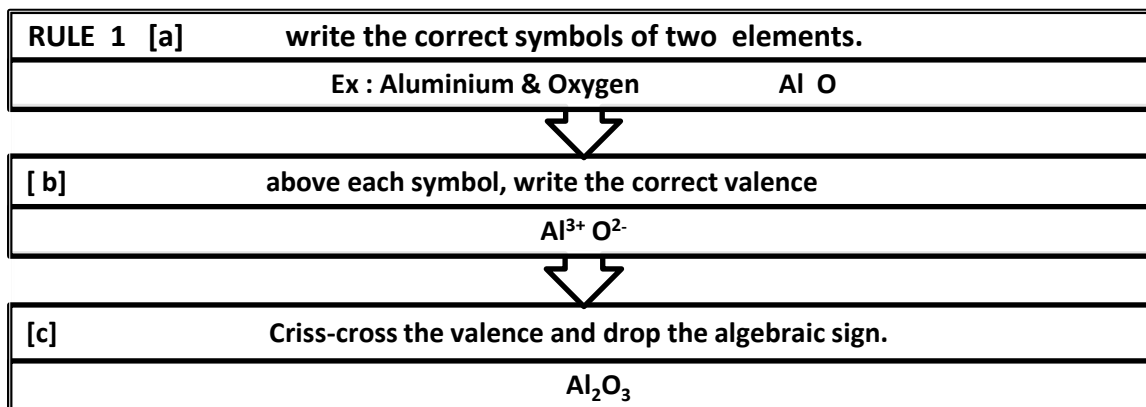
OR

It is the combining capacity of an atom of the element.

[for valency of various cations & anions ,refer NCERT text book table 3.6 , page no. 37]

❖ **Chemical Formula**: A chemical formula is a short method of representing chemical elements and compounds.

Writing a Chemical Formula -CRISS-CROSS rule



RULE 4 > When there are multiple numbers of an individual polyatomic ion , parentheses must be used to separate the polyatomic ion from the subscript.

Ex. Ammonium Sulphate- $\text{NH}_4^{1+} \text{SO}_4^{2-}$ $(\text{NH}_4)_2 \text{SO}_4$

RULE 5 > All subscripts must be reduced to lowest term (except for molecular or covalent compound).

Ex. Tin (IV) Chloride ~ $\text{Sn}^{4+} \text{O}^{2-}$ ----- SnO_2

EXAMPLES

CATION	ANION	FORMULA	NAME
Al^{3+}	SO_4^{2-}	$\text{Al}_2(\text{SO}_4)_3$	Aluminium sulphate
Ca	HCO_3^-	$\text{Ca}(\text{HCO}_3)_2$	Calcium bicarbonate
NH_4^+	Cl^-	NH_4Cl	Ammonium chloride
Na^+	CO_3^{2-}	Na_2CO_3	Sodium carbonate
Mg^{2+}	OH^-	$\text{Mg}(\text{OH})_2$	Magnesium hydroxide
Na^+	PO_4^{3-}	Na_3PO_4	Sodium phosphate

Q.1 What is the difference between an anion & cation ?

Q.2 Write down chemical formula of

i) Hydrogen peroxide

ii) Tin chloride

iii) Barium sulphate

iv) Silver chloride

Q.3 Write chemical names of

i) $\text{Ni}(\text{NO}_3)_2$

ii) CdCO_3

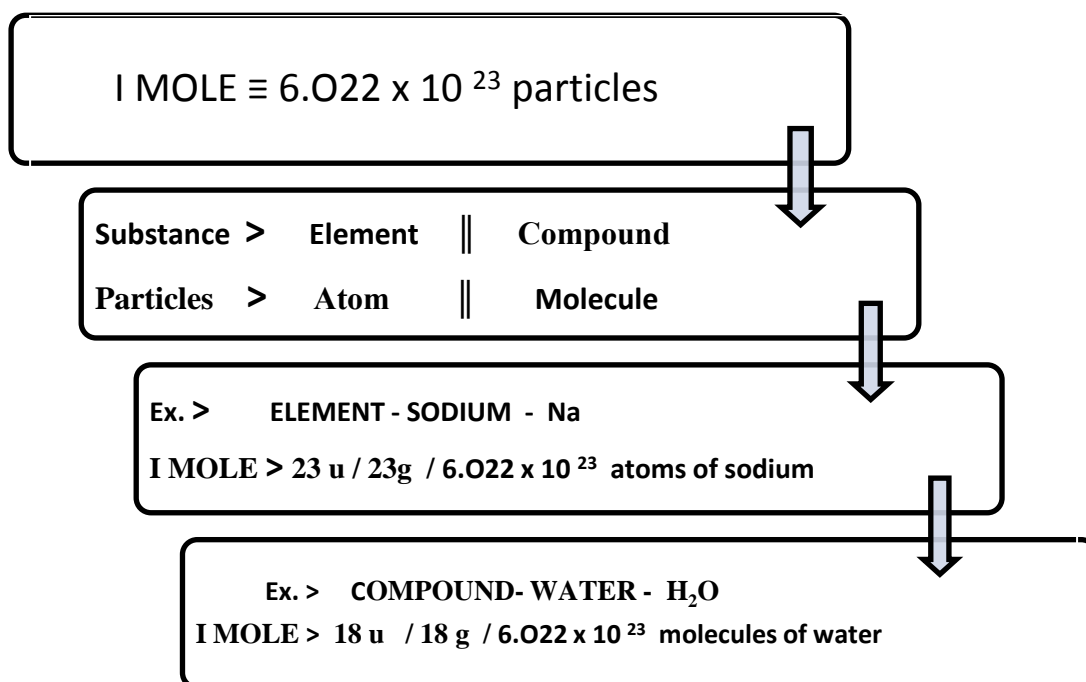
iii) NaOH

iv) NH_4NO_2

4. Mole Concept

The *mole (mol)* is the amount of a substance that contains as many elementary entities as there are atoms in exactly 12.00 grams of ^{12}C

The Avogadro constant is named after the early nineteenth century Italian scientist Amedeo Avogadro.



S.No.	Symbol / formula of atom / molecule	Atomic / molecular mass (u)	1mole (in g)	Avogadro no.	Molar mass (g mol ⁻¹)
1.	O	16 u	16 g	6.022×10^{23} atoms	16 g mol ⁻¹
2.	N ₂	28 u	28 g	6.022×10^{23} molecules	28 g mol ⁻¹
3.	HCl	36.5 u	36.5 g	6.022×10^{23} molecules	36.5 g mol ⁻¹

GRAM MOLECULAR MASS

Gram molecular mass is the mass in grams of one mole of a molecular substance.

Ex: The molecular mass of N₂ is 28, so the gram molecular mass of N₂ is 28 g.

ATOMIC MASS UNIT

An atomic mass unit or amu is one twelfth of the mass of an unbound atom of carbon-12. It is a unit of mass used to express atomic masses and molecular masses.

Also Known As: Unified Atomic Mass Unit (u).

MOLECULAR MASS : A number equal to the sum of the atomic masses of the atoms in a molecule. The molecular mass gives the mass of a molecule relative to that of the ^{12}C atom, which is taken to have a mass of 12.

Examples: The molecular mass of C_2H_6 is approximately 30 or $[(2 \times 12) + (6 \times 1)]$. Therefore the molecule is about 2.5 times as heavy as the ^{12}C atom or about the same mass as the NO atom with a molecular mass of 30 or $(14+16)$.

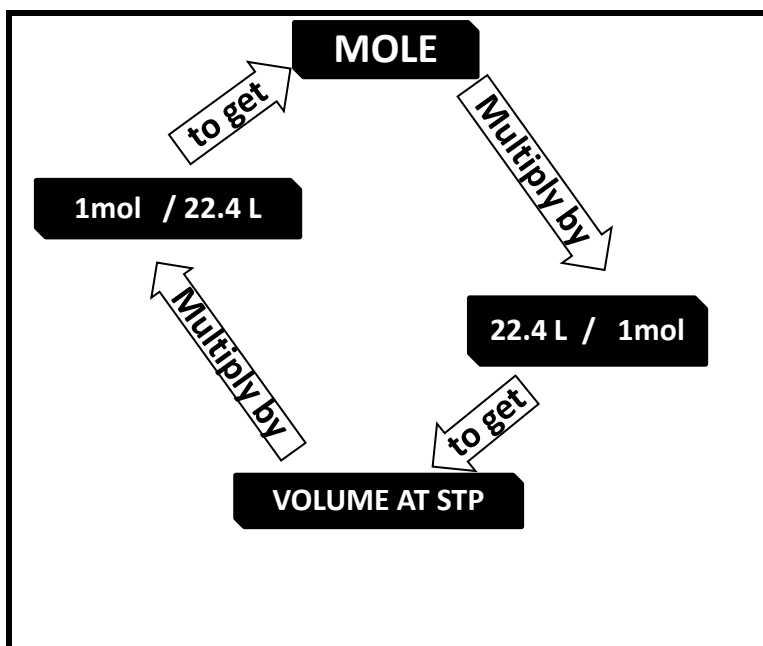
Q.1 What term is used to represent the mass of 1 mole molecules of a substance?

Q.2 What is the gram atomic mass of i) Hydrogen ii) oxygen ?

Q.3 Calculate molar mass of C_2H_2 .

5. Molar Mass & Avogadro Constant

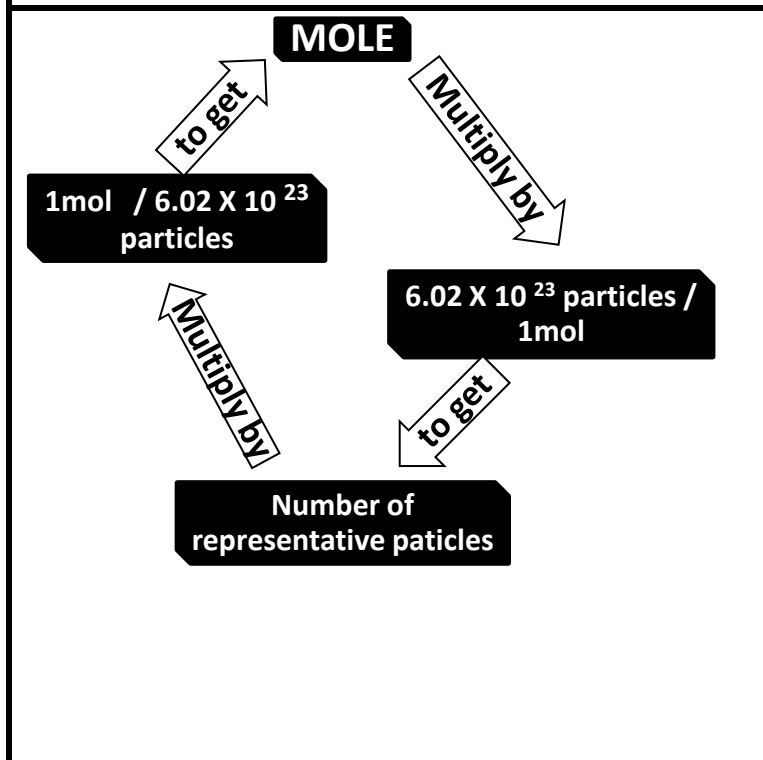
<p>The diagram illustrates the conversion between mass and moles. To find mass from moles, you multiply by the molar mass. To find moles from mass, you divide by the molar mass.</p>	<p>Ex: i) Convert 35 g of Al into mol.</p> <p>A: Molar mass of Al = 27 g $27 \text{ g} = 1 \text{ mol}$ $= 35 \text{ g} \times \frac{1 \text{ mol}}{27 \text{ g}}$ $= 1.3 \text{ mol of Al}$</p> <p>ii) How many grams of SiO_2 are present in 0.8 mol ?</p> <p>A: Molar mass of $\text{SiO}_2 = 60.1 \text{ g}$ $1 \text{ mol} = 60.1 \text{ g}$ $= 0.8 \text{ mol of SiO}_2 \times \frac{60.1 \text{ g of SiO}_2}{1 \text{ mol of SiO}_2}$ $= 48.1 \text{ g SiO}_2$</p>
---	--



Ex . How many mol of CO₂ are present in 55.5 L ?

A: 22.4 L = 1mol

$$\begin{aligned}
 &= 55.5 \text{ L} \times \frac{1 \text{ mol}}{22.4 \text{ L}} \\
 &= 2.48 \text{ mol of CO}_2.
 \end{aligned}$$



Ex Calculate number of molecules in 200 g of N₂O.

Molar mass of N₂O = 44 g

i) to find number of moles:-
44 g = 1 mol

$$\begin{aligned}
 &= 200 \text{ g} \times \frac{1 \text{ mol}}{44.0 \text{ g}} \\
 &= 4.55 \text{ mol of N}_2\text{O}
 \end{aligned}$$

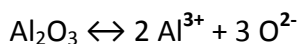
ii) to find number of molecules
1 mol = 6.02 x 10²³ molecules

$$\begin{aligned}
 &= \frac{6.02 \times 10^{23} \text{ molecules N}_2\text{O}}{1 / 4.55}
 \end{aligned}$$

$$= 2.74 \times 10^{24} \text{ molecules N}_2\text{O}$$

Ex. Calculate the number of aluminium ions present in 0.051 g of aluminium oxide.

Ans : Molar mass of $\text{Al}_2\text{O}_3 = 102 \text{ g}$



102 g of Al_2O_3 contains = $2 \times 6.02 \times 10^{23} \text{ Al}^{3+}$ ions

$$\begin{aligned} 0.051 \text{ g of } \text{Al}_2\text{O}_3 \text{ contains} &= \frac{2 \times 6.02 \times 10^{23} \text{ Al}^{3+} \text{ ions}}{102} \times 0.051 \\ &= 2 \times 6.02 \times 10^{20} \text{ Al}^{3+} \text{ ions} \end{aligned}$$

Q.1 Calculate the mass of one atom of sodium?

Q.2 The atomic mass of calcium is 40 u. What will be the number of calcium atoms in 0.4 u of calcium?

Q.3 How many atoms of oxygen are present in 120 g of nitric acid ?

QUESTION BANK [*HOTS]

1 Mark Questions:

1. Who gave law of conservation of mass ?
2. What term is used to represent the mass of 1 mole molecules of a substance?
3. What name is given to the number 6.023×10^{23} ?
4. What is molecular mass?
5. Give Latin names for sodium & mercury.
6. *How many atoms are there in exactly 12 g of carbon ?
7. Define mole.
8. Calculate formula unit mass of CaCl_2 . [At. Mass : Ca = 40 u , Cl = 35.5 u]
9. Name a diatomic gas.
10. How many atoms are present in H_2SO_4 .

2 Marks Questions:

1. Give the chemical symbols for the following elements: Gold, Copper , Potassium & Iron.
2. *What do the following symbols represent - i) 1 H & ii) H₂
3. Neon gas consists of single atoms , what mass of neon contains 6.022 x 10²³ atoms.
4. What elements do the following compounds contain ?
i) Water ii) Lead nitrate
5. State the differences between an atom or a molecule.
6. Molar Mass of water is 18 g mol⁻¹ , what is the mass of 1 mole of water? .
7. *The number of atoms in 1 mole of hydrogen is twice the number of atoms in one mole of helium. Why?
8. Write the chemical formulas for the following:
i) Silver oxide ii) Iron (III) sulphate
9. Calculate molar mass of H₂O₂ & HNO₃.
10. What is the mass of 0.2 moles of oxygen molecules?

3 Marks Questions:

1. State the main postulates of John Dalton's atomic theory.
2. What are polyatomic ions ? Give two examples.
3. State the following
i) Law of conservation of mass. ii) Law of constant proportion
4. What is the mass of :
i) 1 mol of N atoms. ii) 4 mol of Al atoms.
5. What is meant by the term atomicity ? State the atomicity of i) Phosphorous
ii) Sulphur

5 Marks Questions:

1. i) What is molecular formula ? State with example what information can be derived from a molecular formula .
ii) Write the names of the compounds represented by the following formulas:
a) Mg(NO₃)₂ b) K₂SO₄ c) Ca₃N₂

2.* i) What is gram molecular mass?

ii) Write the formulas & names of the compounds formed between :

a) Ferrous and sulphide ions

b) Aluminium and sulphate ions

c) Potassium and chlorate ions

d) Barium and chloride ions

3. i) Calculate the number of moles for the following:

a) 52 g of He

b) 17 g of H₂O

ii) How many molecules are present in 34 g of ammonia ?

iii) Calculate the mass of 0.5 mole of sugar (C₁₂H₂₂O₁₁).

You are expected to know.....

- Laws of Chemical combination.
- John Dalton's imagination about atom & the limitation of his theory.
- Difference between an atom & molecule.
- Types of ions
- Writing chemical formula of compounds.
- Relationship between Mole , Molar Mass & Avogadro Constant

CHAPTER -4 “STRUCTURE OF ATOM”

CONCEPT DETAILS

KEY CONCEPTS : [*rating as per the significance of concept]

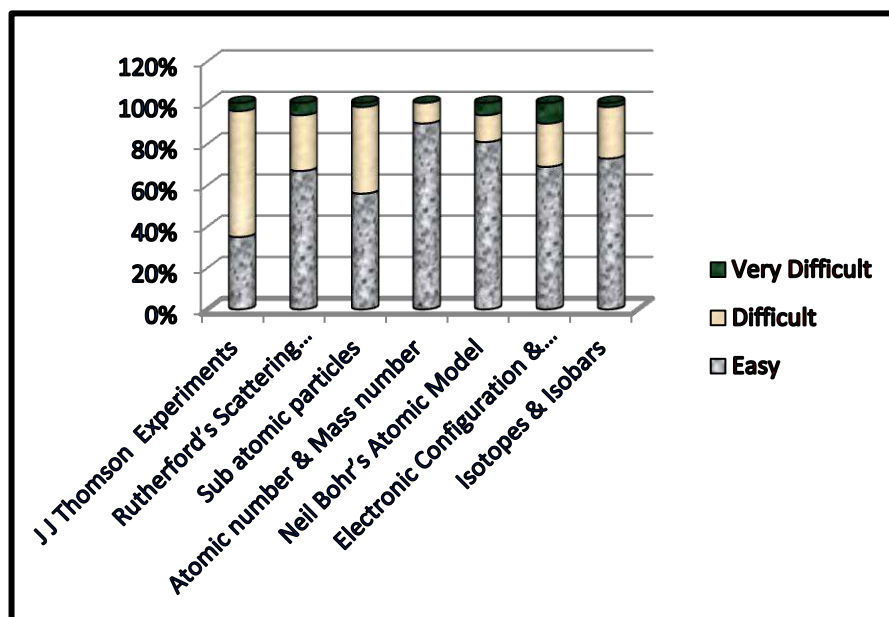
1. Dalton’s Atomic theory	**
2. J J Thomson Experiments	***
3. Rutherford’s Scattering Experiments	*****
4. Sub atomic particles	*****
5. Atomic number & Mass number	*****
6. Neil Bohr’s Atomic Model	***
7. Electronic Configuration & Valency	*****
8. Isotopes & Isobars	****

➤ Pre requisites:



- *Difference between an atom & molecule.*
- *Gram atomic mass & Molar mass.*
- *Dalton’s Atomic theory.*

SURVEY ANALYSIS

Conceptual levels of comprehension on the basis of feedback taken from the students



Contribution to the Atomic theory Timeline



SCIENTIST	PROPOSED MODEL OF ATOM
<p>Democritus</p>  <p>Greek philosopher (400 B.C)</p>	 <p>Democritus (400 B.C.)</p>

❖ *More than 2400 years ago, he named the smallest piece of matter “ATOMOS ,” meaning “not to be cut.”*

To Democritus,

- Atoms were small, hard particles that were all made of the same material but were different shapes and sizes.
- Atoms were infinite in number, always moving and capable of joining together

1. Dalton’s Atomic theory:

SCIENTIST	PROPOSED ATOMIC MODEL
<p>John Dalton</p>  <p>English Chemist [proposed atomic theory in 1803]</p>	 <p>He proposed the Atomic theory of matter based on his experimental observations.</p>

- First recorded evidence that atoms existed.
- Using his theory, Dalton rationalized the various laws of chemical combination


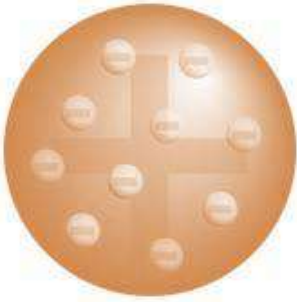
Dalton's theory was based on the premise that the atoms of different elements could be distinguished by differences in their weights.

➤ **Limitations**

- The indivisibility of an atom was proved wrong , for, an atom can be further subdivided into protons, neutrons and electrons.
- The atoms of same element are similar in all respects , but isotopes of same element have different mass.

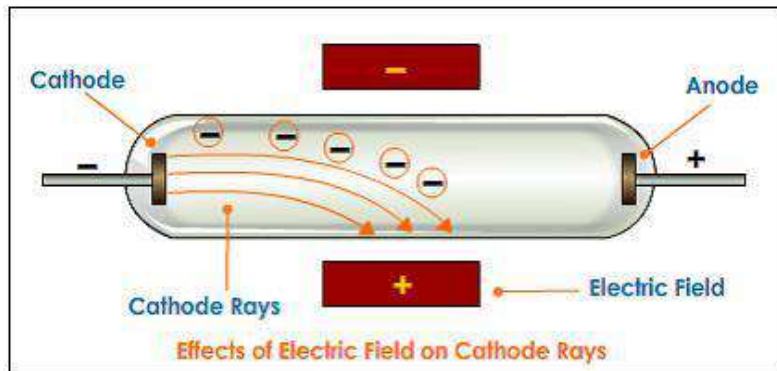
Dalton's theory was based on the premise that the atoms of different elements could be distinguished by differences in their weights.

2. J J Thomson Experiments:

SCIENTIST	PROPOSED ATOMIC MODEL
<p style="text-align: center;">Joseph John Thomson British Physicist and Nobel laureate</p> 	<p style="text-align: center;">PLUM –PUDDING MODEL</p> 

- Discovered electrons in 1897.
 - Showed us that the atom can be split into even smaller parts.
- His discovery was the first step towards a detailed model of the atom .***
- An atom is a uniform sphere of positive charges (due to presence of protons) as well as negative charges (due to presence of electrons).
 - Atom as a whole is electrically neutral because the negative and positive charges are equal in magnitude.

- **An electron is a negatively charged component of an atom which exists outside the nucleus. Each electron carries one unit of negative charge and has a very small mass as compared with that of a neutron or proton.**




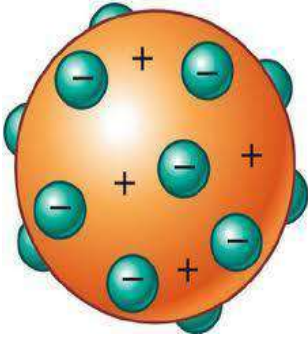
JJ Thomson used cathode ray tubes to demonstrate that the cathode ray responds to both magnetic and electric fields.

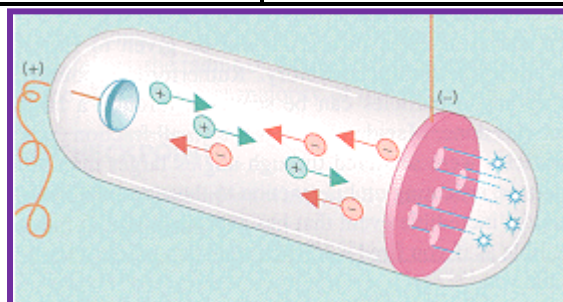
Since the ray was attracted to a positive electric plate placed over the cathode ray tube (beam deflected toward the positive plate) he determined that the ray must be composed of negatively charged particles.

He called these negative particles "electrons."

Limitation: Model failed to explain how protons and electrons were arranged in atom so close to each other.

Eugene Goldstein:

SCIENTIST	PROPOSED ATOMIC MODEL
<p data-bbox="368 1328 646 1391">Eugene Goldstein a German physicist</p> 	



- E. Goldstein in 1886 discovered the presence of new radiations in a gas discharge and called them canal rays. These rays were positively charged radiations which ultimately led to the discovery of another sub-atomic particle.
- Used a Cathode Ray Tube to study "canal rays" which had electrical and magnetic properties opposite of an electron
- Canal Rays: The positively charged radiation produced in the discharge tube at low pressure and high voltage are called canal rays.

Protons:

The canal rays have positively charged sub-atomic, particles known as protons (p).


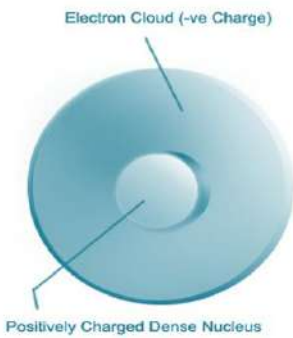
Q.1 What was the model of an atom proposed by Thomson?

Q.2 What is the nature of charge on electrons?

Q.3 What are canal rays ?

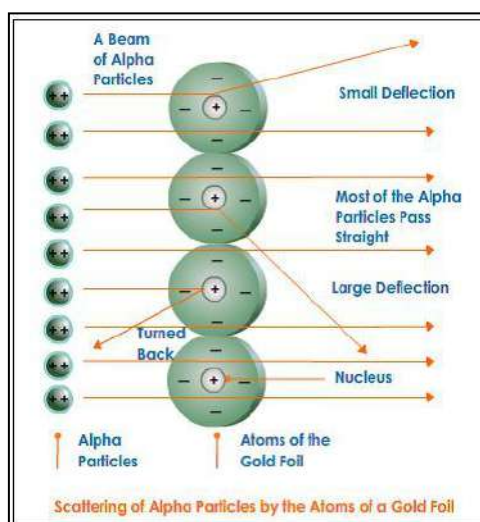
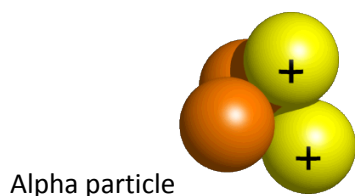
Q.4 State the nature of the constituents of canal rays.

3. Rutherford's Scattering Experiments:

SCIENTIST	PROPOSED ATOMIC MODEL
<p data-bbox="373 1122 675 1155">Sir Earnest Rutherford</p>  <p data-bbox="419 1621 628 1655">Nobel prize 1908</p>	 <p data-bbox="911 1543 1134 1592">Rutherford's Nuclear Model of the Atom</p>

Experiment: Rutherford took a thin gold foil and made alpha particles , [He²⁺] positively charged Helium fall on it.


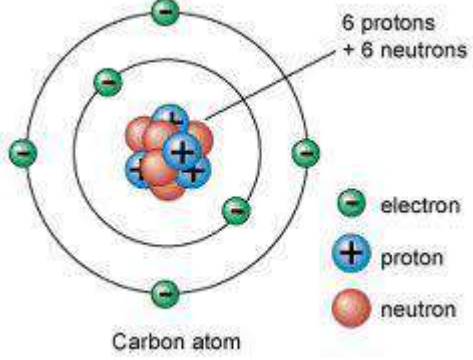
S.No	OBSERVATION	INFERENCE
1.	Most of the a-particles passed through the gold foil without getting deflected.	Most of the space inside the atom is empty.
2.	Very few particles were deflected.	Positive charge of the atom occupies very little space.
3.	A very few alpha particles, 1 in 100000 completely rebound on hitting the gold foil.	Nucleus of an atom is very small as compared to the total size.



- **Limitation:** In Rutherford's atomic model , Nucleus & electrons are held together by electrostatic force of attraction which would lead to the fusion between them. This does not happen in the atom.

$$\text{Atomic radius} \sim 100 \text{ pm} = 1 \times 10^{-10} \text{ m}$$

$$\text{Nuclear radius} \sim 5 \times 10^{-3} \text{ pm} = 5 \times 10^{-15} \text{ m}$$

SCIENTIST	PROPOSED ATOMIC MODEL
<p data-bbox="347 309 555 338">James Chadwick</p>  <p data-bbox="347 741 667 824">English Physicist & Nobel laureate</p>	

- In 1932, James Chadwick proved that the atomic nucleus contained a neutral particle which had been proposed more than a decade earlier by Ernest Rutherford officially discovered the neutron in 1932,
- Chadwick received the Nobel Prize in 1935.

A neutron is a subatomic particle contained in the atomic nucleus. It has no net electric charge, unlike the proton's positive electric charge.

Q.1 Who discovered the nucleus of the atom?

Q.2 What is the charge on alpha particles ?

Q.3 Which observation of Rutherford's scattering experiment established the presence large empty space in atom?

Q.4 What is the nature of charge on nucleus of atom?

Q.5 Who discovered neutron ?

4. Sub Atomic Particles:

Name	Symbol	Location in the atom	Charge	Relative Mass	Actual Mass (g)
Electron	E	Around the nucleus	1-	1/1840	9.11×10^{-28}
Proton	P	In the nucleus	1+	1	1.67×10^{-24}
Neutron	n	In the nucleus	0	1	1.67×10^{-24}

Protons & Neutrons collectively are known as NUCLEONS.

Q.1 Why is the relative mass of an electron is taken as negligible ?

Q.2 Give the actual masses of electron & proton in kg?

Q.3 What are nucleons?

5. Atomic Number & Mass Number:

“Atomic number of an element is defined as the number of unit positive charges on the nucleus (nuclear charge) of the atom of that element or as the number of protons present in the nucleus.”

Atomic number, Z = Number of unit positive charge on the nucleus

= Total number of unit positive charges carried by all protons present in the nucleus.

= Number of protons in the nucleus (p)

= Number of electrons revolving in the orbits (e)

Eg :- Hydrogen – Atomic number = 1 (1 proton)

Helium - Atomic number = 2 (2 protons)

Mass number [A] : It is defined as the sum of the number of protons & neutrons present in the nucleus of an atom.

Mass Number = Mass of protons + Mass of neutrons

Eg :- Carbon – Mass number = 12 (6 protons + 6 neutrons) Mass = 12u

Aluminium – Mass number = 27 (13 protons + 14 neutrons) Mass = 27u

mass number
atomic number **Symbol**

Q.1 The mass number of an element is 18. It contains 7 electrons .What is the number of protons and neutrons in it ?


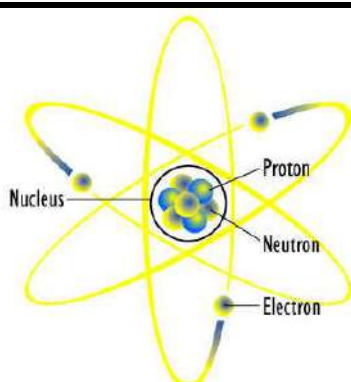
Q.2 An atom contains 3 protons , 3 electrons and 4 neutrons .

i) What is its atomic number ?

ii) What is its mass number?

Q.3 An element is represented by $^{31}_{15}P$. Give the number of electrons and neutrons in it.

6. Niel Bohr Atomic Model:

SCIENTIST	PROPOSED ATOMIC MODEL
<p>Danish physicist</p> 	

Main Postulates of the Bohr Model [refer NCERT Text Book article 4.3 ,page number-49]

Q.1 What happens when an electron jumps from lower to higher energy level?

Q.2 Which energy shell is nearest to the nucleus of an atom?

Q.3 Which energy shell has higher energy L or N ?

7. Electronic configuration & Valency:

Bohr and Bury Scheme - Important Rules

S.No	Electron Shell	$2n^2$ where n = shell number	Maximum Capacity
1	K Shell	$2 \times (1)^2$	2 electrons
2	L Shell	$2 \times (2)^2$	8 electrons
3	M shell	$2 \times (3)^2$	18 electrons
4	N shell	$2 \times (4)^2$	32 electrons

The outermost shell of an atom cannot accommodate more than 8 electrons, even if it has a capacity to accommodate more electrons. This is a very important rule and is also called the OCTET RULE. The presence of 8 electrons in the outermost shell makes the atom very stable.

- Q.1 An atoms has atomic number 13. What would be its configuration.
 Q.2 What is octet rule?
 Q.3 How many electrons M shell can accommodate?
 Q.4 If an atom has complete K and L shell, what would be its atomic number?

8. Isotopes & Isobars:

ISOTOPES	ISOBARS
Chemically same , physically different	Chemically different , physically same
Number of electrons is same	Number of electrons is different .
Cannot be separated by chemical means	Can be separated by chemical means

[for application of isotopes refer NCERT Text Book article 4.6 ,page number-53]

- Q.1 Why atoms of isotopes are chemically same?
 Q.2 Give the representation of three isotopes of carbon which are C-12 , C-13 and C-14.

QUESTION BANK [*HOTS]

1 Mark Questions:

- Write the names of three elementary particles which constitute an atom.
- Name the scientist & his experiment to prove that nucleus of an atom is positively charged.
- Which is heavier , neutron or proton ?
- *How many times a proton is heavier than an electron?
- What was the model of an atom proposed by Thomson ?
- How many electrons at the maximum can be present in the first shell ?
- What type of charge is present on the nucleus of an atom?
- Give the number of protons in $^{35}\text{Cl}_{17}$
- *What are iso bars ?
- Name the particles which determine the mass of an atom.

2 Marks Questions:

- Define the following terms: a) Atomic number b) Mass number
- Write the charges on sub atomic particles.

3. Identify the isotopes out of A , B , C & D ? $^{33}\text{A}_{17}$, $^{40}\text{B}_{20}$, $^{37}\text{C}_{17}$, $^{38}\text{D}_{19}$
- 4.* Give one Achievement and one limitation of J.J Thomson's model of atom?
5. What are valence electrons? Give example.
6. *Which kind of elements have tendency to lose electron ? Give example.
7. How many electrons are present in the valence shell of nitrogen & argon?
8. State the maximum capacity of various shells to accommodate electrons.
9. Give the symbol , relative charge & mass of the three sub atomic particles.
10. From the symbol $^{32}\text{S}_{16}$ state :
 - i) Atomic number of sulphur,
 - ii) Mass number of sulphur
 - iii) Electronic configuration of sulphur.

3. Marks Questions:

1. Why do Helium has Zero valency?
2. An atom contains 3 protons , 3 electrons and 4 neutrons .What is its atomic number , mass number & valency?
3. *How are the isotopes of hydrogen represented ?
4. Write the complete symbol for the atom with the given atomic number [Z] & mass number[A].
 - i) Z= 17 , A = 15 ;
 - ii) Z=4 , A = 9;
 - iii) Z= 92 ; A=233
5. *What would be the electronic configuration of Na^+ , Al^{3+} , O^{2-} , Cl^- .

5 Marks Questions:

- 1.* a) Give the observations as well as inferences of Rutherford's Scattering experiment for determining the structure of an atom.
 - b) On the basis of above experiment write the main features of atomic model.
2. Write the main postulates of Bohr's Model of Atom.

You are expected to know.....

- The scientists who discovered subatomic particles.
- Rutherford established the existence of nucleus.
- Difference between Atomic number and Mass number
- Electronic configuration & its relation with Valency.
- Difference between Isotope and Isobar.

“Fundamental particles in Atom”

Name of Elements	Symbol	Atomic Number	Number of Electrons	Number of Protons	No. of Neutrons	Atomic Mass	Electronic Configuration				Valency
							K	L	M	N	
Hydrogen	H	1	1	1	-	1	-	-	-	1+,-	
Helium	He	2	2	2	2	4	2	-	-	0	
Lithium	Li	3	3	3	4	7	2	1	-	1+	
Beryllium	Be	4	4	4	5	9	2	2	-	2+	
Boron	B	5	5	5	6	11	2	3	-	3+	
Carbon	C	6	6	6	6	12	2	4	-	4+	
Nitrogen	N	7	7	7	7	14	2	5	-	3-	
Oxygen	O	8	8	8	8	16	2	6	-	2-	
Heroine	F	9	9	9	10	19	2	7	-	1-	
Neon	Ne	10	10	10	10	20	2	8	-	0	
Sodium	Na	11	11	11	12	23	2	8	1	1+	
Magnesium	Mg	12	12	12	12	24	2	8	2	2+	
Aluminum	Al	13	13	13	14	27	2	8	3	3+	
Silicon	Si	14	14	14	14	28	2	8	4	4	
Phosphorus	P	15	15	15	16	31	2	8	5	3-	
Sulphur	S	16	16	16	16	32	2	8	6	2-	
Chlorine	Cl	17	17	17	18	35.5	2	8	7	1-	
Argon	Ar	18	18	18	22	40	2	8	8	0	
Potassium	K	19	19	19	20	39	2	8	8	1+	
Calcium	Ca	20	20	20	20	40	2	8	8	2+	

MULTIPLE CHOICE QUESTIONS ON CHEMISTRY PRACTICALS

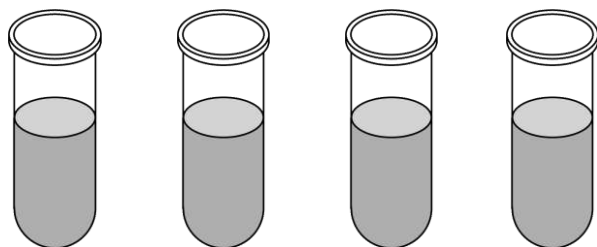
1. To prepare

- a) a true solution of common salt, sugar and alum
- b) a suspension of soil, chalk powder and fine sand in water
- c) a colloidal of starch in water and egg albumin in water and distinguish between these on the basis of i) transparency ii) filtration criterion iii) stability

1. Name the solute in common salt solution :

- a) H_2O
- b) NH_4Cl
- c) $NaOH$
- d) $NaCl$

2 Pick out a colloid from the following :



- (a) Sugar solution
- (b) Salt solution
- (c) Muddy solution
- (d) Milk

3. Which of the following is property of true solution ?

- a) Homogeneous
- b) Heterogeneous
- c) Translucent
- d) None of these

4. The process of separation of insoluble solids from a liquid is called :

- a) Filtration
- b) Decantation
- c) Sedimentation
- d) Evaporation

5. Which of the following mixtures is stable?

- a) Milk in water
- b) Sugar in water
- c) Sand in water
- d) Wheat flour in cold water

6. Egg albumin in water forms :

- a) True solution
- b) Colloidal solution
- c) Suspension
- d) None of these

7. Which of the following represents a correct set of observations for a mixture of common salt and water?

	Transparency	Stability	Filtration
a)	Transparent	Unstable	No residue
b)	Transparent	Stable	No residue
c)	Translucent	Stable	No residue
d)	Opaque	Unstable	Residue

2. To prepare a) a mixture b) a compound

using iron filings and sulphur powder and distinguish between these on the basis of:

i. appearance i.e., homogeneity and heterogeneity

ii. behaviour towards a magnet

iii. behaviour towards carbon disulphide as a solvent.

iv. effect of heat.

1. The colour of sulphur is :

- a) White
- b) Colourless
- c) Green
- d) Yellow

2. FeS is not attracted by magnet because :

- a) It has lost properties of its components.
- b) It is not made up of iron.
- c) It is a mixture
- d) It is black in colour.

3. Sulphur is soluble in :

- a) Water
- b) Carbon disulphide
- c) Both (a) and (b)
- d) Neither (a) nor (b)

3. $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$ is an example of :
- a) Displacement reaction
 - b) Decomposition reaction
 - c) Redox reaction
 - d) Double decomposition
4. What happens when iron nails are added to copper sulphate solution :
- a) The solution becomes pale green and reddish brown copper metal gets deposited.
 - b) The solution becomes colourless
 - c) There is no reaction
 - d) Copper displaces iron
5. BaSO_4 is :
- a) White ppt
 - b) Colourless
 - c) Blue solution
 - d) Blue ppt.
6. Magnesium oxide, when placed on moist red litmus paper :
- a) It remains red
 - b) It turns blue
 - c) It becomes white
 - d) It becomes black
7. What is the nature of SO_2 :
- a) Acidic
 - b) Basic
 - c) Neutral
 - d) All of these

4. To separate the components of a mixture of sand, common salt and ammonium chloride (or camphor) by sublimation.

1. Sublimation is the process in which :
- a) Liquid changes into gaseous state
 - b) Solid changes into liquid state
 - c) Solid directly changes into gaseous form
 - d) Solid first converts into liquid, then into vapour form.

2. Which of the following substances sublimes on heating :
- a) Iodine
 - b) Camphor
 - c) Naphthalene
 - d) All of these
3. In a mixture of sand, common salt and ammonium chloride , the substance that sublimes is:
- a) Ammonium chloride
 - b) Sand
 - c) Common salt
 - d) All of these
4. Recovery of salt from salt solution in water can be done by :
- a) Evaporation
 - b) Distillation
 - c) Filtration
 - d) None of these
5. What do you observe in the inner side of the funnel during sublimation of NH_4Cl
- a) Particles of white solid
 - b) Yellow fumes
 - b) Vapours of sodium chloride
 - d) No fumes are deposited
6. Which of the following mixtures cannot be separated by sublimation :
- a) Ammonium chloride & sodium chloride
 - b) Ammonium chloride & sand
 - c) Ammonium chloride & iodine
 - d) Ammonium chloride & copper sulphate
7. A mixture of common salt and ammonium chloride is heated in a china dish covered with an inverted funnel with stem closed with a cotton plug. After the experiment the china dish will contain :
- a) Common salt
 - b) Ammonium chloride
 - c) Both (a) and (b)
 - d) None of these.

5. To determine the melting point of ice and the boiling point of water.

1. Which of the following will help in determining the melting point of ice accurately ?
- a) Ice made from tap water
 - b) Ice made from distilled water
 - c) Ice made mixed with salt
 - d) None of these

2. In determination of melting point of ice , the ice is contaminated with some non-volatile impurity, like common salt, melting point of ice will :

- a) Increase
- b) Decrease
- c) May increase or decrease
- d) Does not change

3. What is the melting point of ice?

- a) 0°C
- b) 100°C
- c) 273 K
- d) Both (a) and (c)

4. Which vessel is used to determine the melting point of ice ?

- a) Beaker
- b) R B Flask
- c) Conical Flask
- d) Measuring Flask

5. At what temperature ice and water both exist together under normal atmospheric pressure ?

- a) Below 273.16 K
- b) Above 273.16 K
- c) At 273.16 K
- d) None of these

6. In determining the boiling point of water , correct reading is obtained when :

- a) Temperature start rising
- b) Water starts boiling
- c) Whole of water evaporates
- d) Temperature becomes constant

7. Water evaporates faster :

- a) In still air
- b) In humid air
- c) In dry air
- d) In windy & dry air

6. To verify the law of conservation of mass in a chemical reaction.

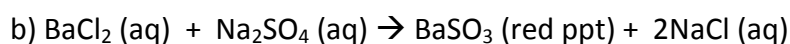
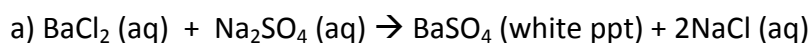
1. What does the law of conservation of mass state?

- a) It states that mass is neither created nor destroyed.
- b) It states that mass can be created or destroyed.
- c) It states that mass cannot be created but can be destroyed.
- d) It states that mass can be created but cannot be destroyed.

2. If you melt 100 g of ice will you get the same mass of water ?

- a) Yes
- b) No
- c) May be
- d) Sometimes

3. State the chemical reaction between Barium Chloride (aqueous) & Sodium Sulphate (aqueous) .



c) Both (a) & (b)

d) None of these

4. Which of the following reaction does not conform to law of conservation of mass ?

- a) Burning of candle
- b) Melting of ice
- c) Fusion reaction occurring in sun
- d) Combustion of fuel

5. In the reaction $2\text{NaN}_2 \rightarrow 2\text{Na} + 3\text{N}_2$, if 850 g of NaN_2 is decomposed to give 265.20 g of Na , how much N_2 is produced ?

- a) 584.80 g
- b) 265.20 g
- c) 850 g
- d) 484.20 g

6. In chemical reactions how does law of conservation of mass contribute in writing chemical equations ?

- a) It does not help.
- b) Equations can be balanced by writing their correct co-efficient
- c) Both (a) and (b)
- d) None of these

7. In accordance with the law of conservation of mass give the co-efficient of O_2 in the equation:



- a) 4
- b) 6
- c) 8
- d) 2

References :

- NCERT text book for class IX
- Foundation science for class IX By- H C Verma
- Self study in Science By-Evergreen Publications
- <http://cbse.meritnation.com/cbse-science/matter-in-our-surroundings/8/113/studymaterials.html> (NCERT Text Book Activities Videos link)
- <http://www.tutorvista.com/content/science/science-i/science-i.php#>
- <http://www.shikshaservices.com/content/getPage/Matter%20in%20our%20surroundings/103>
- <http://www.scribd.com/doc/6842207/Methods-of-separating-mixtures>
- http://www.ehow.com/list_7447055_important-metal-alloys.html
- <http://www.expertsmind.com/chemistry/laws-of-chemical-combination-assignment-help.aspx>
- www.mpinstitute.in
- <http://www.emc.maricopa.edu/faculty/farabee/biobk/biobookchem1.html>

VIDEO LINKS

S.No	TOPIC	LINK
1.	States of Matter	http://www.youtube.com/watch?v=s-KvoVzukHo
2.	States of Matter : SONG	http://www.youtube.com/watch?v=vDZhUkp30tE
3.	Plasma – a state of matter	http://www.youtube.com/watch?v=OsO0NKqmJZI
4.	Inter conversion : States of matter	http://www.youtube.com/watch?v=29REEB_KUZk
5.	Compound & Mixture	http://www.youtube.com/watch?v=cL6I1O1YHH0
6.	Sublimation	http://www.youtube.com/watch?v=4ueTSxC4zr4
7.	Latent heat	http://www.youtube.com/watch?v=Hq8Pw2Kd4oq
8.	True solution , sol & suspension [I]	http://www.youtube.com/watch?v=sQUcKiwxtoE
9.	True solution , sol & suspension [II]	http://www.youtube.com/watch?v=q96ljVMHYLo
10.	Earliest Models - ATOM	http://www.youtube.com/watch?v=BhWqv0STLZs

SECTION : BIOLOGY

Chapter 5: “The Fundamental Unit of Life”

KEY CONCEPTS : [*rating as per the significance of concept]

CONCEPTS	RATING
Study of historical perceptive related to cell discovery	*****
Study of Microscope	**
Study of Hypotonic/Isotonic/Hypertonic solutions relation to osmosis.	****
Cell wall	***
Nucleus	*****
Cytoplasm	***
Cell organelles	*****

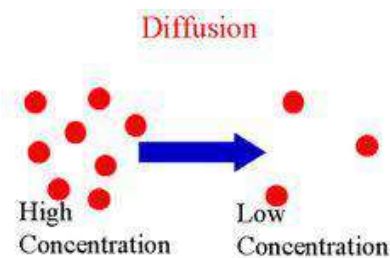
- All the living organisms are made up of fundamental unit of life called” **cell**”.
- The cell is a Latin word for “**a little room**”.
- The scientist Robert Hooke saw a little room in the cork (the bark of a tree) resembled the structure of a honeycomb. The use of the word “Cell” to describe these units is used till this day in Biology as” **Cell Biology**”.
- The **Compound Microscope** consist eye piece,objective lens and condenser to observe a cell after putting a drop of **Safranin** (for plant cell) and methylene blue (for animal cell). (Please refer to Fig. 5.1: Compound Microscope NCERT Book Page-57)
- The scientist **Leeuwenhoek saw free living cells** in the pond water for the first time. (father of microbiology)
- The scientist **Robert Brown discovered the nucleus** in the cell.
- The **cell theory** states that all the plants and animals are composed of cells, it was **proposed by Schleiden and Schwann**.
- The **cell theory** was further expanded by Virchow by suggesting that “**all cells arise from the pre-existing cells**”.
- The cells differ in size, shape, structure (Please refer to Fig. 5.2/5.3: Onion peel/Various cells in Human body, NCERT Book Page-57/58):**Types of cells: Onion cells, Smooth muscle cell, Blood cells, Bone cell, Fat cell, Nerve cell, Ovum, Sperm etc. Each kind of cell performs specific function.**

10. A single cell may constitute a whole organism as in **Amoeba, Chlamydomonas, Paramecium and Bacteria**; these are called as **unicellular organisms**. Whereas in multi-cellular organisms (Human beings) division of labor is seen.

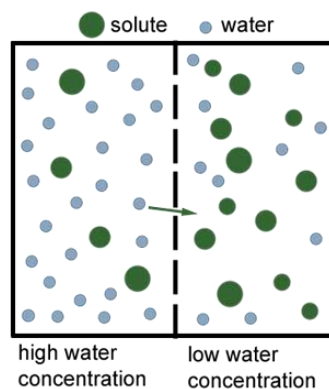
11. **The feature in almost every cell is same: Plasma membrane, nucleus and cytoplasm.**

12. **Plasma membrane:** It is the outermost covering of the cell.

- It is called as **selective permeable membrane** (because it prevents movement of some materials).
- It helps in **diffusion** and osmosis
- Diffusion: movement of substance from high concentration to low concentration.
Eg; exchange of carbon dioxide or oxygen with external environment.



osmosis: it is the passage of water from the region of high water concentration to a region of low water concentration through a selective permeable membrane.

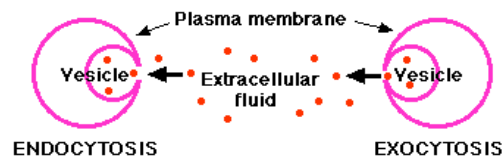


- The cell gains water, if the medium surrounding the cell has a higher water concentration (**Hypotonic solution**) than the cell.
- The cell maintains the same water concentration as the cell (**Isotonic solution**), water crosses the cell membrane in both directions.

c)The cell loses water, if the medium has lower water concentration (**Hypertonic solution**) than the cell.

Note - The cell drinking is endosmosis;

- omission of water is called ex-osmosis.



- The cell engulfs food is called endocytosis and ejects solid is called **exocytosis**. Amoeba acquires food through endocytosis and excretion of solid is called exocytosis.
- The cell wall** is a rigid outer covering composed of cellulose. It provides structural strength to plant cells. When a living cell loses water, there is shrinkage of contents of a cell away from the cell wall. This phenomenon is called as **plasmolysis**. The cell walls permit the cells of plants, fungi and bacteria to withstand very dilute (Hypotonic) external media without bursting.
- The Nucleus:** It is a dark colored, spherical or oval, dot-like structure near the center of a cell called Nucleus. The nucleus plays a central role in cellular activities/ reproduction. The chromatin material gets organized into chromosomes. The chromosomes contain information for inheritance of features from parents to next generations in the form of **DNA**(Deoxyribo Nucleic Acid) and protein molecules. The functional segments of DNA are called genes.
- In some organisms like Bacteria nucleus is not covered by nuclear membrane. Hence it is called as **prokaryote**. (Pro= primitive; karyote = karyon = nucleus.) The organisms with cells having a nuclear membrane are called **eukaryotes**.
- Differences between prokaryotes and eukaryotes**(Please refer to Fig. 5.4: Prokaryotic cell NCERT Book Page-62)

Prokaryotes	Eukaryotes
Size: generally small (1-10 μm)	Size: generally large. (5-500 μm)

Nuclear region: Not well defined and not surrounded by a nuclear membrane & known as nucleoids.	Nuclear region: Well defined and surrounded by a nuclear membrane
Chromosome: Single	Chromosome: More than one chromosome
Membrane-bound cell organelles absent	Membrane-bound cell organelles present
Eg- bacteria, blue green algae	Eg fungi, plant cell and animal cell.

18. **Cell organelles:** Every cell has fluid matrix (other than nucleus) is called cytoplasm. The nucleus and cytoplasm is together called as protoplasm. The protoplasm term was coined by Purkinje. It has important cell organelles: Endoplasmic Reticulum (ER), Golgi apparatus, Lysosomes, Mitochondria, Plastids, and vacuoles.

19. **Endoplasmic Reticulum (ER):** It is a large network of membrane –bound tubules and vesicles.

- There are two types of Endoplasmic Reticulum
- Rough Endoplasmic Reticulum (RER) (It looks rough because Ribosomes are attached to its surface. They are the sites of protein synthesis).
- Smooth Endoplasmic Reticulum (SER) (It looks smooth because Ribosomes are not attached to its surface. They are the sites of fat molecules synthesis).
 1. SER ; help in the functioning of enzymes and hormones to carryout biochemical activities.
 2. SER detoxifies many poisons and drugs from the cell.
- 2. ER serves as channel for the transport of material between various regions of the cytoplasm and the nucleus.
- 3. Proteins and fat molecules produced by ER helps in membrane biogenesis.

20. **Golgi apparatus:** It was first described by a scientist Camillo Golgi. It is a system of membrane bound vesicles called cisterns. It functions include the storage,

modification and package of cell products. The complex sugars are made from simple sugars in the Golgi apparatus. It is also involved in the formation of lysosomes.

21. **Lysosomes:** They contain membrane-bound sacs with powerful digestive enzymes (enzymes are made by RER) to digest the worn-out cell organelles. When the cell gets damaged, lysosomes may burst and the enzymes digest their own cell, hence called as “Suicidal bags of a cell”. It is a waste disposal system of the cell.
22. **Mitochondria:** It is covered by a double membrane. Outer membrane is very porous and the inner membrane is deeply folded. These folds create a large surface area for ATP (Adenosine Triphosphate) molecule synthesis. ATP is the energy currency of a cell; hence the Mitochondria are called as Power House of a Cell. Mitochondria have their own DNA and Ribosomes; therefore they can make their own proteins.
23. **Plastids:** They are present only in plant cells. They are two types.
 1. Chromoplasts (Colored Plastids: Chloroplasts – Green pigmented and useful in Photosynthesis and also contains various other pigments like yellow or orange)
 2. Leucoplasts (White or colorless plastids; stores materials such as oils, proteins, fats etc.) Plastids are also covered by a double membrane. The matrix is called Stroma, seat for enzymatic actions. Plastids have their own DNA and Ribosomes; therefore they can make their own proteins.
24. **Vacuoles:** Storage sacs for solid or liquid contents. They are small in size in animals while plants have large, may occupy 50-90 % of the cell volume. Helps to provide turgidity and rigidity to the cell. Many substances like amino acids, sugars, organic acids and proteins are stored in vacuoles. In Amoeba food vacuole is specialized to play an important role.
25. **Cell:** It is the fundamental structural unit of living organisms, helps in respiration, obtaining nutrition and clearing waste material or forming a new protein.

Differences between Plant cell and Animal Cell

(Please refer to Fig. 5.5 Animal cell & 5.6: Plant cell NCERT Book Page-63&64)

ANIMAL CELL	PLANT CELL
Cell wall absent	Cell wall present
Plasma membrane is the outer layer which provides turgidity to the cell	Cell wall is the outer layer which gives rigidity and turgidity to the cell
Vacuoles are small in size	Vacuoles are big in size
Plastids are absent	Plastids are present
Nucleus lies in the centre.	Nucleus lies on one side

Question Bank

1. All the living organisms are composed of fundamental unit called as..... (Cell)
2. Who discovered the nucleus in the cell.....(Robert Brown)
3. Who saw the free living cells for the first time.....(Leeuwenhoek)
4. Name two unicellular organisms(Amoeba, Chlamydomonas,)
5. Write two differences between prokaryotes and eukaryotes.....(Nuclear region/ Chromosome)
6. What are the two types of ERs (RER/ SER)
7. What are the functions of Golgi Bodies? (It includes the storage, modification and package of cell products. The complex sugars are made from simple sugars in the Golgi apparatus).
8. What are the types of plastids (Chromoplasts& Leucoplasts)
9. Which are the substances stored in vacuoles? (Substances like amino acids, sugars, organic acids and proteins are stored in vacuoles)
10. Draw and label Animal cell & Plant cell(Ref NCERT Book Page-63&64)

QUESTION PAPER:FORMATIVE ASSESSMENT – I (For Practice)

Marks- 40

Time: 90 minutes

* General Instructions

1. Questions 1-5 (1 Mark each)
2. Questions 6-10 (2 Mark each)
3. Questions 11-15 (3Mark each)
4. . Questions 16-17 (5Mark each)

- Q.1 What is ATP, expand the term
- Q.2 Cellulose is a Fat (Mention, True/False).....
- Q.3 Which cell organelle is synthesizing the enzymes for the Golgi Apparatus.....
- Q.4 The flexibility of the cell membrane to engulf food and other material is called Endocytosis (Mention, True / False)
- Q.5 What is the main function of Leucoplasts?
- Q.6 Draw the structure of Ovum.
- Q.7 Why the Plasma membrane is called as Selective Permeable Membrane?
- Q.8 Describe what is an isotonic solution
- Q.9 What is Plasmolysis?
- Q.10 Write any two parts of a Compound microscope.
- Q.11 Distinguish between Prokaryotic and Eukaryotic Cell.
- Q.12 Write about the three properties of Cytoplasm.
- Q.13 What is the significance of Vacuoles
- Q.14 Write a short notes on Mitochondria.
- Q.15 Explain the concept of diffusion.
- Q.16 Draw the structure of a plant Cell and label it.
- Q.17 Write the differences between a plant and animal cell.

-----X-----

Chapter 6: "Tissues"

KEY CONCEPTS : [*rating as per the significance of concept]

CONCEPTS	RATING
Meristems in plants	**
Permanent tissues in plants	****
Animal tissues	*****

1. **Tissue** is a group of cells having similar origin, structure & function. Study of tissues is called **Histology**
2. In unicellular organism (Amoeba) single cell performs all basic functions, whereas in **multi-cellular organisms** (Plants and Animals) shows **division of labor as Plant tissue & Animal tissues**.
3. Plant tissues are two types: Meristems & Permanent tissues.
4. **Meristems:** The Meristems are the tissues having the power of cell division. It is found on those region of the plant which grows.
5. Types of Meristems;
 1. **The Apical meristems** – It is **present** at the growing tip of the stem and roots and increases the length.
 2. **The lateral meristems** - **present** at the lateral side of stem and root (cambium) and increases the girth.
 3. **The intercalary meristems** - **present** at internodes or base of the leaves and increases the length between the nodes.

(Please refer to Fig. 6.2: location of meristems in plant body , NCERT Book Page- 69).

26. **Permanent tissues:** Two types such as Simple permanent tissues & Complex permanent tissues.

a) **Simple permanent tissues:** subdivided as

(i): **Parenchyma:** Tissues provide the support to plants. They are loosely packed and has large intracellular space.

- Parenchyma with chlorophyll which performs photosynthesis is called as chlorenchyma.

- The parenchyma with large air spaces to give buoyancy is called as aerenchyma .Parenchyma also stores food and water.

(ii) **Collenchyma**: Tissue provides mechanical support, thickened at the corners, have very little intercellular space. It allows easy bending of various parts of a plants without breaking

(iii) **Sclerenchyma**: Tissue makes the plant hard and stiff, thickened due to lignin and no intercellular space. Cells of this tissue are dead and commonly seen in the husk of coconut.

(iv) **Guard cells& Epidermal tissue**: the tissue aids in protection and exchange of gases. Guard cells kidney shaped in dicots, dumb bell shaped in monocots to guard the stomata. The epidermal tissues of roots aid in absorption of water and minerals. The epidermal tissues in desert plants have a thick waxy coating of Cutin with waterproof quality. The epidermal tissues form the several layer thick Cork or the Bark of the tree.

(Please refer to Fig. 6.3- 6.6, NCERT Book Page-70-73).

b) **Complex permanent tissues**: The complex tissues are made of more than one type of cells. All these cells coordinate to perform a common function.

They are subdivided as;

Xylem: It consists of tracheids, vessels, xylem parenchyma and xylem fibers. The cells have thick walls,

Function - aids in conduction of water and minerals.

Phloem: It consists of sieve tubes, companion cells, phloem parenchyma, and phloem fibers.

Function - Phloem transports food material to other parts of the plants.

(Please refer to Fig. 6.7, NCERT Book Page-73).

6. **Animal tissues**: Sub divided as ***epithelial tissue, connective tissue, muscular tissue and nervous tissue.***

i. **Epithelial tissue**: It is a protective covering forming a continuous sheet. Simple epithelium is the one which is extremely thin in one layer, whereas stratified epithelium are arranged in pattern of layers.

Depending on shape and function they are classified as:

- a) **Squamous epithelium** in the lining of mouth and esophagus.
- b) **Cuboidal epithelium** in the lining of kidney tubules and salivary glands.
- c) **Columnar epithelium** in the intestine & Columnar epithelium with cilia in the lining of respiratory tract.
- d) **Glandular epithelium** in the Glands aids in a special function as gland cells, which can secrete at the epithelial surface.

(Please refer to Fig. 6.9, NCERT Book Page-75).

ii) Connective Tissue: Five Types, such as;

a) Blood: The Blood is a fluid connective tissue. Blood plasma has RBCs (Red Blood Cells) WBCs (White Blood Cells) and platelets. Blood plasma contains proteins, salts and hormones. Blood flows and transports gases, digested food, hormones and waste materials.

b) Bone: The bone is a connective tissue with hard matrix, composed of calcium and phosphorus. A bone is connected by another bone with another connective tissue called ligaments. A bone is connected by muscle with another connective tissue called tendon.

c) Cartilage: The cartilage is a connective tissue with solid matrix composed of proteins and sugars. It is commonly seen in nose, ear, trachea, and larynx.

d) Areolar Connective Tissue: It is found between the skin and muscles, around the blood vessels. It supports internal organs and aids in repair of tissues.

e) Adipose Connective Tissue: It is filled with fat globules for the storage of fat. It acts as insulator. **(Please refer to Fig. 6.10, NCERT Book Page-76).**

Muscular tissues: They have special contractile proteins responsible for movements. Three types, such as;

Striated muscles/skeletal muscles/voluntary muscles :

They are cylindrical, un-branched and multinucleated. They have dark bands and light bands.

Unstriated muscles/smooth muscles/involuntary muscles:

They are commonly called as Smooth muscles, having no striations (dark bands/ light bands are absent). Commonly found alimentary canal, uterus, Iris of an Eye. They are spindle shaped. Involuntary in nature

Cardiac Muscles: They are commonly called as Heart muscles, cylindrical,

branched and uni-nucleate. Involuntary in nature.(Please refer to Fig. 6.11, NCERT Book Page-77).

Nervous Tissue: The tissue responds to stimuli. The brain, spinal cord and nerves are composed of nervous tissue or neurons. A neuron consists of Cell Body, cytoplasm, Nucleus, Dendrite, Axon, nerve ending. The neuron impulse allow us to move our muscles when we want to respond to stimuli. (Please refer to Fig. 6.12, NCERT Book Page-78).

Question Bank

1. Define the term tissue..... (A group of cells forms tissue)
2. What is Histology? (Study of different tissues)
3. How many types of meristems are present in plants? (3 : **Apical meristems, Lateral meristem, Intercalary meristem**)
4. Name the Parenchyma with chlorophyll which performs photosynthesis..... (chlorenchyma)
5. Which plant tissue makes the plant hard and stiff and thickened due to lignin with no intercellular spaces(Sclerenchyma)
6. Give the details of epidermal tissue in Plants. (For protection and exchange of gases. Guard cells kidney shaped in dicots, dumb bell shaped in monocots to guard the stomata. The epidermal tissues of roots aid in absorption of water and minerals.)
7. Which elements constitute the Phloem? (Sieve tubes, companion cells, phloem parenchyma, and phloem fibers.)
8. Distinguish between ligament and tendon (A bone to bone connective tissue called ligament. A bone to muscle connective tissue called tendon.)
9. Name the three muscular tissues in the animals.....(Striated muscles ,Un- Striated muscles, Cardiac Muscles)
10. Draw the neuron and label it (Please refer to Fig. 6.12, NCERT Book Page-78).

QUESTION PAPER: FORMATIVE ASSESSMENT – I (For Practice)

Marks- 40

Time: 90 minutes

* General Instructions

1. Questions 1-5 (1 Mark each)
2. Questions 6-10 (2 Mark each)
3. Questions 11-15 (3Mark each)
4. . Questions 16-17 (5Mark each)

Q.1 What is a group of cells that are similar in structure and work called?

Q.2 Which is the hardest connective tissue?

Q.3 What is the name of Blood matrix?

Q.4 By what process permanent tissues are formed?

Q.5 Two bones are connected with ligaments. Mention True/ False.....

Q.6 What are the two main types of tissues found in plants?

Q.7 Draw the structure of Stomata and label it.

Q.8 Write the main functions of parenchyma

Q.9 What are the fluid connective tissues?

Q.10 What is the difference between voluntary and involuntary muscles?

Q.11 Write a short notes on Cardiac muscles.

Q.12 Draw a labeled diagram of areolar tissue.

Q.13 Mention the three elements of Xylem tissue.

Q.14. Write a short notes on Glandular Epithelium.

Q.15. Write three significant points about Sclerenchyma

Q.16 With the help of suitable diagram, describe the Phloem.

Q.17 Draw and label the Nerve Cell.Explain in brief.

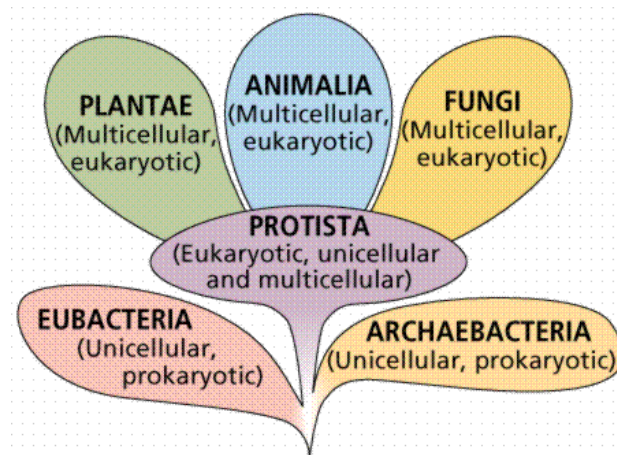
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Chapter 7: “Diversity in Living Organisms”

KEY CONCEPTS : [**rating as per the significance of concept*]

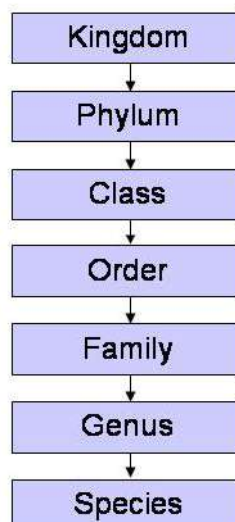
CONCEPTS	RATING
Basis of classification	***
Hierarchy of classification	****
Kingdom Plantae	*****
Kingdom Animalia	*****

1. Each **organism** is different from all other organisms.
2. In this activity, we decide which **characteristics** (we can run, but the Banyan tree can't run is a characteristic) are important in forming the desired **category**.
3. **Greek thinker Aristotle classified animals according to whether they lived on land, in water or in air.** This classification is a landmark in ideology, but has limitations. For example, animals that live in the sea include Corals, Whales, Octopus, Starfish, and Shark. In fact they are different from each other.
4. **Classification and Evolution:** organisms are classified based on body design, hierarchy in developing, relation to evolution. **Charles Darwin** first described the idea of evolution in 1859 in his book “ **The Origin of Species**”
5. The Biologists, such as Haeckel, Whittaker & Carl Woese tried to classify all living organisms into broad Kingdoms. **The Whittaker proposed five kingdoms: Monera, Protista, Fungi, Plantae and Animalia.** Carl Woese introduced by dividing Monera into Archaeobacteria and Eubacteria.



6. Hierarchy of Classification :

Linnaeus's System of Classification



7. **Monera:** They have **unicellular, Prokaryotic organisms** (do not have defined nucleus or organelles). The cell wall may or may not present. The mode of nutrition is **autotrophic** (synthesizing food on their own) **(or)heterotrophic** (getting food from environment). **Ex. Bacteria, Anabaena.** (Please refer to Fig. 7.1 Monera NCERT Book Page-83)
8. **Protista:** They have **unicellular eukaryotic organisms** (do have well defined nucleus or organelles). The body is covered by **cilia, flagella for locomotion**. The mode of nutrition is **autotrophicorheterotrophic**. **Ex. Diatoms, protozoans.**(Please refer to Fig. 7.2 NCERT Book Page-84)

9. **Fungi:** These are multi-cellular **eukaryotic organisms with cell wall, made up of Chitin**. They do not perform Photosynthesis (**heterotrophic**), **Saprophytic** (derive nutrition from decaying material). Ex. Aspergillus, Penicillium, Mushroom, Rhizopus. The fungi living with algae forms **Lichen (Symbiotic Association)** .(Please refer to Fig. 7.3 NCERT Book Page-84).
10. **Plantae:** These are multi-cellular eukaryotic organisms with cell wall, made up of Cellulose. Able to perform photosynthesis (**autotrophic**). Ex. **Rice, wheat**.
11. **Animalia:** **These are multi-cellular eukaryotic organisms without cell wall**. They are not able to perform photosynthesis (**heterotrophic**). Ex **Human beings, Peacock**.

(Please refer to Fig. 7.4 NCERT Book Page-85).

DETAILS OF KINGDOM PLANTAE

1. The kingdom Plantae is further classified as **Thallophyta, Bryophyta, Pteridophyta, Gymnosperms, Angiosperms** .

2.**Thallophyta:** The plants do not have well defined body design, commonly called as” **Algae**”, mostly aquatic. Ex. **Spirogyra, Ulothrix**. (*Please refer to Fig. 7.5 NCERT Book Page-86*).

3. **Bryophyta:** These are commonly called as the “**Amphibians of Kingdom**”. The plant body is differentiated into **roots like, stem like and leaf like structures**. No specialized tissues for the conduction of water and food.Ex. **Marchantia, Funaria**. (Please refer to Fig. 7.6 NCERT Book Page-86).

4.**Pteridophyta:** These are commonly called as the “**First vascular land plants** ”. The plant body is differentiated into root, stem and leaf. Specialized tissues for the conduction of water and food are developed in these plants. The reproductive organs are inconspicuous. Ex. **Marsilea, Fern**. (Please refer to Fig. 7.7 NCERT Book Page-87).

Special Note: The reproductive organs are inconspicuous in Thallophyta, Bryophyta, Pteridophyta are can't develop seeds. They are together called as” **Cryptogamae (Non-Flowering Plants)**”. The plants with well differentiated reproductive organs and that

ultimately **make seeds** are called” **Phanerogams (Flowering Plants)**”. This group is further classified **Gymnosperms** (Bear naked Seeds) &**Angiosperms** (Bears seeds inside Fruit).

5. **Gymnosperms:** These are commonly called as “**Naked seed bearing plants**”. They are usually perennial, evergreen and woody. Ex. Pinus, Cycas (Please refer to Fig. 7.8 NCERT Book Page-87).

6. **Angiosperms:** These are commonly called as “**Enclosed seed bearing plants**”. Plants with seeds having a single cotyledon are called as” **Monocotyledons or Monocots**”. Plants with seeds having two cotyledons are called as “**Dicots**”. Ex. Ipomoea, Paphiopedium. *(Please refer to Fig 7.9 & 7.10 NCERT Book Page-87 ;Fig. 7.11 Page-88).*

DETAILS OF KINGDOM ANIMALIA

These are Eukaryote, multicellular and hetero-tropic.

They are further classified as **Non- Chordates**(Porifera, Coelenterata, Platyhelminthes , Nematoda, Annelida, Arthropoda, Mollusca, Echinodermata) and **Chordates** { Protochordata, Vertebrata (Pisces, Amphibians, Reptilia, Aves, Mammalia)} .

I.Non- Chordates

1. **Porifera:** The word Porifera” **means organisms with holes**”. The **canal system** helps in circulating water, food, oxygen. They are non-motile with cellular level of organization and mainly **marine** organisms with hard outer coat called as **Skeleton**. They are commonly called as **Sponges**. Ex. Spongilla, Sycon(**Please refer Fig. 7.12, NCERT Text Book Page- 89**)

2. **Coelenterata:** The word Coelenterata” **means organisms with body cavity called Coelenteron**” . They are radially symmetrical, **Diploblastic** (two layers of cells), commonly called as **Cnidarians** (Stinging cells for protection are present in the body). Ex. Hydra, Sea Anemone (**Please refer Fig. 7.13, NCERT Text Book Page- 89**).

3. **Platyhelminthes:** The word **Platyhelminthes** **means organisms with flatworms (dorsocentrally flattened)**”.They are bilaterally symmetrical **Triploblastic** (three layers of

cells), **either free-living or parasitic. No true Coelom is present - Acoelomates.** Ex. Planaria(Free living) , Tape worm(Parasitic)(**Please refer Fig. 7.14, NCERT Text Book Page- 90).**

4. Nematoda: The word **Nematoda** “means **organisms with roundworms**”. They are bilaterally symmetrical **Triploblastic** (three layers of cells), **familiar with parasitic worms.** The **false Coelom is called as Pseudocoelome.** Ex. **Ascaris, Wuchereria (Filarial worm causes elephantiasis).**(**Please refer Fig. 7.15, NCERT Text Book Page- 90).**

5. Annelida: The word **Annelida** “ means **organisms with metameric-segmented**”. They are bilaterally symmetrical Triploblastic(three layers of cells) with closed circulatory system, **familiar with earth worms.** The **Coelom is called as true Coelom.** Ex. **Neris, Earth worm, Leech** (**Please refer Fig. 7.16, NCERT Text Book Page- 90).**

6. Arthropoda: The word **Arthropoda** “means **organisms with jointed legs**” They are bilaterally symmetrical Triploblastic(three layers of cells), **familiar with cockroaches.** The **Coelom is blood filled called as Haemo Coelom.** Ex. **Prawn, Scorpion, Housefly** (**Please refer Fig. 7.17, NCERT Text Book Page- 91).**

7. Mollusca: The word **Mollusca** “means **organisms with soft body**” They are bilaterally symmetrical, Triploblastic(three layers of cells), **familiar with Octopus, Pila.** Foot is for moving, kidney like organ for excretion, with open circulatory system. Ex. **Unio, chiton**(**Please refer Fig. 7.18, NCERT Text Book Page- 91).**

8. Echinodermata: The word **Echinodermata** “means **organisms with spiny skinned**”. **Exoskeleton is with calcium carbonate.** They are radially symmetrical **Triploblastic** (three layers of cells) with coelomic cavity, **familiar with Star fish.** They are **exclusively free-living marine animals.** Ex. **Sea Cucumber, Feather Star** (**Please refer Fig. 7.19, NCERT Text Book Page- 91).**

II. Chordates: They are further classified as two major groups such as **Protochordata & Vertebrata**

(A). Protochordata: **Notochord present in at least larval forms, but very rudimentary.** It is a rod like supporting structure, runs along with nervous tissue from the gut of animal. They

are bilaterally symmetrical, triploblastic (three layers of cells) with a Coelom, **familiar with Amphioxus**. Ex. **Balanoglossus** (Please refer Fig. 7.20, NCERT Text Book Page- 92).

(B). Vertebrata: Notochord is replaced by vertebral column and internal skeleton. They are bilaterally symmetrical, triploblastic, coelomic and segmented having paired gill pouches. Vertebrates are grouped into five classes.

1. Pisces: These are commonly called as “fishes”, exclusively aquatic. Body is streamlined and a tail for locomotion. Gills for respiration, heart is two chambered, cold blooded, skin is covered with scales, plates. They are cold-blooded animals. Skeleton of bone (Rohu) / cartilage(Shark). They lay eggs. Ex. Lion Fish, Dog Fish (Please refer Fig. 7.21, NCERT Text Book Page- 92).

2. Amphibians: These are commonly called as “Amphibians” because they can live on land and in water”. Body is streamlined and a webbed foot/ foot for locomotion. Gills or lungs or skin for respiration, heart is three chambered, cold blooded, skin is lack of scales, plates. They are cold-blooded animals. They lay eggs. Ex. Rana, Hyla (Please refer Fig. 7.22, NCERT Text Book Page- 93).

3. Reptilia: These are commonly called as “Reptilians”. A lung for respiration, heart is three chambered (Crocodile heart is four chambered), skin have scales. They are cold-blooded animals. They lay eggs. Ex. Snakes, Turtles (Please refer Fig. 7.23, NCERT Text Book Page- 93).

4. Aves :These are commonly called as “Birds”. A lung for respiration, heart is four chambered, fore limbs are modified for flight, skin has feathers. They are warm-blooded animals. They lay eggs. Ex. Ostrich (Flightless Bird), Pigeon, Sparrow (Please refer Fig. 7.24, NCERT Text Book Page- 94).

5. Mammalia: These are commonly called as “animals with mammary glands for producing milk to nourish their young ones”. A lung for respiration, heart is four chambered, skin has hairs, sweat or oil glands. They are warm-blooded animals. They lay eggs (Platypus, Echidna), give birth to young ones poorly developed (Kangaroo) & give birth to developed

young ones (Human beings). Ex. Lion, Whale, Bat (*Please refer Fig. 7.25, NCERT Text Book Page- 94& Fig.7.26, classification of Animals, Page- 95*).

DETAILS OF NOMENCLATURE

NOMENCLATURE: The system of **scientific naming or nomenclature** was **introduced by Carolus Linnaeus**. It is **unique to identify in the world**. We limit ourselves to writing **the names of the Genus and Species** of that particular organism. The world over, it has been agreed that both these names will be used in **Latin forms**. When **printed** is given in **italics** and when **written by hand**, the Genus and Species name have to be **underlined separately**.
Ex. Ostrich (Common name): ***Struthiocamelus***(scientific name with two parts namely the Genus and Species).

QUESTION BANK

1. What is the book written by Charles Darwin?..... (The Origin of Species)
2. Who proposed the five kingdoms such as, Monera, Protista, Fungi, Plantae and Animalia? (Whittaker)
3. Monera members are unicellular, Prokaryotic organisms, mention TRUE/ FALSE (TRUE)
4. The Diatoms belongs to the kingdom..... (Protista)
5. The Anabaena belongs to the kingdom(Monera)
- 6..... are commonly called as the “Amphibians of Plant Kingdom”. (Bryophyta)
7. The warm-blooded animals with fore limbs modified for flight, skin has feathers are called as..... (Aves/Birds)
8. Write the four salient features of Reptiles.
9. Compare the Pisces and Amphibians.

10..Write the five salient features of Mammalia, give two examples.

QUESTION PAPER:FORMATIVE ASSESSMENT – I (For Practice)

Marks- 40

Time: 90 minutes

* General Instructions

1. Questions 1-5 (1 Mark each)
2. Questions 6-10 (2 Mark each)
3. Questions 11-15 (3Mark each)
4. . Questions 16-17 (5Mark each)

- Q.1 Anabaena is member of the Phylum.....
- Q.2 Aspergillum is a member of the Phylum.....
- Q.3 Define the term Autotrophic mode of nutrition.....
- Q.4 The fungus living with algae is called as
- Q.5 Name the scientist who has divided the Monera into two sub-groups.....
- Q.6 Draw and label Paramecium.
- Q.7 Distinguish the meaning of terms Gymnosperms and Angiosperms.
- Q.8 What is Pseudocoelome? Give one example of it.
- Q.9 What is Haemocoelome? Give one example of it.
- Q.10 Write two salient features of mammalian group.
- Q.11 What is the basis of nomenclature of organisms, give the scientific name of Ostrich.
- Q.12 Give three salient features of Amphibia.
- Q.13 Mention three features of Chordates.
- Q.14. Draw and label Balanoglossus.
- Q.15 Give two salient features of Aves and mention one example of a flightless bird.
- Q.16 Write about the Hierarchy of Classification- Groups and mention basic unit of classification.
- Q.17 Give the salient features of Bryophytes and draw the diagram of Funaria.

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Chapter 13: “Why do we fall ill?”

KEY CONCEPTS : [*rating as per the significance of concept]

CONCEPTS	RATING
Significance of Health	**
Disease and Its causes	***
Infectious diseases	*****
Principles of prevention of diseases	****

1. **“Health”** is a state of being well enough to function well physically, mentally, and socially.

2. **“Disease”** (disturbed ease) means being uncomfortable. One or more systems of the body will change, give rise to **“Symptoms”** (Cough, loose motions, pus formation, headache, fever, breathlessness, vomiting, fits, unconsciousness, inflammation , swelling and general effects - a Doctor look for the basis of symptoms). Diseases are basically two types- Acute Disease & Chronic Disease

3. **Acute Disease:** The disease which lasts for only a short period of time is called Acute Disease Ex. Common Cold.

4. **Chronic Disease:** The disease which lasts for long period of time is called Chronic Disease Ex. Tuberculosis.

Acute Disease	Chronic Disease
They are short duration disease	They are long lasting disease
Patient recovers completely after the cure	Patient does not recover completely
There is no loss of weight or feeling of tiredness afterward	There is often loss of weight of feeling of tiredness
There is short duration loss of work and efficiency	There is a prolonged loss of work and efficiency

5. **Causes of Diseases :** Most of the diseases have many causes, rather than one single cause, like unclean water, nourishment, genetic differences, genetic abnormalities e.g. Based on the causes diseases are of two types: Non-Infectious Diseases and Infectious Diseases.

6. Non-Infectious Diseases: Not caused by infectious agents, mostly internal and non-infectious cause. Ex. Cancer

7. Infectious Diseases: Caused by infectious agents.

SN	Type Of Disease	Example
1	Bacterial diseases	- Typhoid, Cholera, Tuberculosis, Acne, Anthrax,
2	Viral diseases	- Common Cold, Influenza, Dengue fever, AIDS, Japanese encephalitis or brain fever
3	Fungal diseases	Skin diseases
4	Protozoan diseases	-Malaria (Plasmodium), Kalaazar (Leishmania), Sleeping sickness(Trypanosomes)
5	Worm diseases	- Ascariasis (Round worm), Elephantiasis(Wuchereria)

(Please refer Fig. 13.1 (a-e), NCERT Text Book Page- 181).

a)The infectious diseases spread by agents are called as **Communicable Diseases**.

SN	Type of Disease	Example
1	Air born Diseases	- Pneumonia, common cold, Tuberculosis;
2	Water born diseases	- Cholera, hepatitis
3	Sexual Diseases	- HIV, Syphilis.
4	Animal born Disease	- Rabbits. *(Vector- the animal carrying infectious agent from a sick person to another potential host without getting affected Ex. Mosquito carrying Malaria Parasite).

(Please refer Fig. 13.2 & 13.3, NCERT Text Book Page- 183).

9. Principles of Treatment:

- 1. Antibiotics-** many bacteria make a cell wall to protect themselves, the antibiotic (Penicillin) blocks the bacterial process that builds cell wall and blocks the biochemical pathways. Antibiotics do not work against viral infections. Antiviral medicine is harder than making Antibacterial medicine because Virus has only few biochemical mechanisms of their own. Other medicines bring down fever, reduce pain or loose motions. We can take bed rest to conserve energy.

10 Principles of Prevention : Following three limitation are normally confronted while treating an infectious disease:

- Once someone has disease, their body functions are damaged and may never recover completely.
- Treatment will take time, which means that someone suffering from a disease is likely to be bedridden for some time even if we can give proper treatment.
- The person suffering from an infectious disease can serve as the source from where the infection may spread to other people.

General ways of preventing infectious disease :

- Air-borne – We can prevent exposure by providing living condition that are not overcrowded.
- Water-borne – prevent by providing safe drinking water. This is done by treating the water to kill any microbial contamination.
- Vector-borne – We can provide clean environment, which would not allow mosquito breeding.

11. Immunity: Even in cells there is repair mechanism called” **Immunity**”. Immune cells manage to kill off the infectious agents. **Smallpox disease** is eliminated by developing memory cells for particular infection by mimics the microbes, called” **Vaccine**”. The **basis of Immunization**- if you had smallpox once, there was no chance of suffering from it again. Proper nutrition is essential to maintain body immunity. There are vaccines against tetanus, diphtheria, whooping cough, measles, polio and many other diseases.

12. Prevention of disease is better than cure. Hygiene is the basic key to maintain good health.

QUESTION BANK:

1. Define Health..... (It is a state of being well enough to function well physically, mentally, and socially)
2. Name any two Symptoms of diseases..... (Cough& loose motions)
3. The disease which last for only a short period of time is called.....(Acute Disease)
4. State whether Tuberculosis is aChronic Disease or Acute Disease..... (Chronic Disease)
5. Mention the causal organism for Sleeping sickness (Trypanosoma)
- 6.Cholera is a waterborne disease, mention TRUE/ FALSE (TRUE)
7. Antibiotics do not work against viral infections, mention TRUE/ FALSE (TRUE)
8. Write short notes on Immunity

(Even in cells there is repair mechanism called "Immunity". Immune cells manage to kill off the infectious agents.)

9. Explain with an example the term Vaccine. (Smallpox disease is eliminated by developing memory cells for particular infection by mimics the microbes, called "Vaccine").

10. State reasons to support "Prevention of disease is better than cure".

QUESTION PAPER:FORMATIVE ASSESSMENT – I (For Practice)

Marks- 40

Time: 90 minutes

* General Instructions

1. Questions 1-5 (1 Mark each)
2. Questions 6-10 (2 Mark each)
3. Questions 11-15 (3Mark each)
4. . Questions 16-17 (5Mark each)

Q.1 Define Health

Q.2 Mention any two symptoms of diseases.

Q.3 Typhoid is a bacterial disease. Mention True/ False.....

Q.4 Sleeping sickness is caused by.....

Q.5 Elephantiasis is caused by.....

Q.6. Mention two Air born diseases1.....2.....

Q.7 Mention two Sexually Transmitted Diseaes1.....2.....

Q.8 Mention two Viral Diseaes1.....2.....

Q.9 What is called vector. Give one example.

Q.10 Give two examples of Chronic diseases.

Q.11 Distinguish between Infectious and Non-infectious diseases.

Q.12 Write a short notes on Small Pox.

Q.13 What is immunity? Write short notes on it.

Q.14 What is Vaccination? Give the details, how it works in human body.

Q.15 Write three reasons for Cancers.

Q.16 What are the basic five principles of treatment for diseases.

Q.17 How Hygiene could help you to maintain good health and mention five situations to take care about health.

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Chapter 14: "Natural resources"

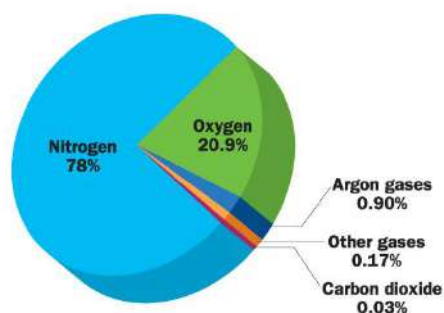
KEY CONCEPTS : [*rating as per the significance of concept]

CONCEPTS	RATING
Breath of air	**
A wonder liquid	***
Biogeochemical cycles	*****

1. The " **Biosphere**" is the life supporting zone of the earth with three sub-zones called as **lithosphere** (rock part), **atmosphere** (air part) and **hydrosphere** (water part).

Breath of air

2. Composition of Air



3. The interactions between different components of **the Biosphere** to maintain **the balance between the biotic and a biotic component** makes "**Biogeochemical cycle**". Ex. **Water Cycle, Nitrogen Cycle, Carbon cycle, Oxygen Cycle,**

4. **Role of atmosphere in climate control** : atmosphere act as protective blanket for the earth. Since atmosphere is a bad conductor of heat, it keeps the average temperature of the earth constant. At night, it slows down the escape of heat into outer space.

5. **The movement of air** : the atmosphere gets heated from the radiation that is reflected back by the land or water bodies. As a result of heating, convection currents are set up in the air. Since land gets heated faster than water, the air over land gets heated faster than air above water bodies.

6. In coastal regions, during the day, the air above the land gets heated faster and starts rising. So a region of low pressure is created and air over sea moves into this area of low pressure. The movement of air from one region to the other region causes **Wind**.

7. During the day, the direction of wind would be from the sea to the land and at night, both land and sea starts to cool. Since water cools down slower than the land, the air above water would be warmer than air above land, thus the direction of wind would be from the land to the sea.

8. **Air pollution** : it is an undesirable change in the physical, chemical or biological characteristics. It is caused due to an increase in the content of harmful substances (pollutant) such as oxides of nitrogen and sulphur, etc.

9. Harmful effect of air pollution :

- It affects the respiratory system causing breathing difficulties eg; bronchitis, asthma, lung cancer, tuberculosis, etc.
- Burning of fossil fuels like coal and petroleum releases oxides of nitrogen and sulphur. Inhalation of these gases is dangerous.
- Combustion of fossil fuel also increases the amount of suspended particles in air. The presence of high levels of all these pollutants, reduce visibility in cold weather where water also condenses out of air forming **smog**.
- **Acid rain** formed from the gases like sulphur dioxide and nitrogen oxides present in polluted air. It causes damage to living and non- living thing.

3. The Water Cycle:

a) The process in which water evaporates and falls on the land as rain and later flows back into the sea via rivers is known as the "**Water Cycle**". Water flows through rocks containing soluble minerals, some of them get dissolved in the water. Thus the rivers carry many nutrients from the land to sea and these are used by the marine organisms.

b) When the water vapors condense as water droplets and grow big and heavy, they fall down in the form of "**rain**". It ranges from 5 cm to 200 cm of rain fall in a year in our

country. In large parts of India, rains are mostly brought by the south-west or north-east monsoons. Depressions in the Bay of Bengal may also cause rains in some areas.

c) **Water is a wonder liquid** because all cellular processes take place in a water medium; substances are transported in a dissolved form; terrestrial forms require fresh water to maintain the equilibrium of salts; major resource to determine the life on the earth.

d) The dissolved fertilizers (NPK fertilizers), pesticides (DDT), sewage (Disease causing Organisms), waste from factories (Mercury) and water released from the dams can affect the life forms on the earth. The dissolved Oxygen is being used by the animals and plants that live in water, would adversely affect the aquatic organisms. The change in temperature would be dangerous for the eggs and larvae of the various animals particularly susceptible to temperature changes. It leads to "**water pollution**".

(Please refer Fig. 14.5, NCERT Text Book Page- 197).

4. Nitrogen Cycle:

a) The nitrogen gas makes up 78% of our atmosphere. It is essential for the synthesis of proteins, DNA, RNA, urea, alkaloids and Vitamins.

b) The simple molecular nitrogen from the atmosphere is converted into more complex molecules in the living beings and back again to atmosphere is called "**Nitrogen Cycle**".

i) Nitrogen fixation by Lightening: During lightning, the molecular nitrogen is converted into oxides of nitrogen and dissolves in water to give nitric and nitrous acids and fall on lands along with rains. These are then utilized by various life forms.

ii) Nitrogen fixation by Bacteria: The molecular nitrogen is converted into nitrates and nitrites, by free living bacteria or the bacteria present in the root nodules of legumes.

iii) The conversion of molecular nitrogen into nitrates and nitrites is called as "**Nitrification**". Plants generally convert them into amino acids. The conversion of nitrates and nitrites into Ammonia is called as "**Ammonification**". The conversion of Ammonia into molecular Nitrogen is called as "**Denitrification**". **Thereby nitrates and nitrites are converted into**

molecular or elemental nitrogen in the nature. (Please refer Fig. 14.6, NCERT Text Book Page- 198).

5. The Carbon cycle:

i) The **Carbon dioxide** gas makes up 0.039 % of our atmosphere. Carbon occurs in the elemental form as **diamonds and graphite** in earth. Carbon is essential **for the synthesis of proteins, carbohydrates, fats, nucleic acids and Vitamins** in living organisms.

ii) The **Carbon dioxide Fixation**: Green plants convert Carbon dioxide into glucose in the presence of sunlight through Photosynthesis. The glucose molecules are converted into other biologically important molecules. And many marine animals use carbonates dissolved in sea water to make shells, exoskeletons.

iii) **The combustion**: The Carbon dioxide in the atmosphere is added by the process of combustion, where fuels are burnt to provide energy for various needs like heating, cooking, transportation, and industrial process.

iv) **The Greenhouse Effect**: The percentage of Carbon dioxide in the atmosphere is said to have doubled since the industrial revolution when human beings started burning fossil fuels on a very large scale. The Carbon dioxide is a greenhouse gas. The increase in the Carbon dioxide content would cause more heat to be retained by the atmosphere and **lead to Global Warming**. It is called " **Greenhouse Effect**"

v) The **carbon cycle is repeated through different physical and biological activities**. (Please refer Fig. 14.7, NCERT Text Book Page- 199).

6 .Oxygen Cycle:

i) The Oxygen gas makes up 21 % of our atmosphere. Oxygen is essential component **of proteins, carbohydrates, fats, nucleic acids** in living organisms.

ii) Oxygen from our atmosphere is used up in three processes, namely combustion, respiration and in the formation of oxides of nitrogen. Oxygen is returned to the atmosphere in only one major process, that is, Photosynthesis, it is called as **Oxygen Cycle**.

iii) The **air is heated faster than water**; the air over land would also be heated faster than the air over water bodies. The movement of air from one region to the other creates winds, during the day the direction of the wind would be from the sea to land. At night, both land and sea start to cool.

iv) The oxides of nitrogen and sulphur gases dissolve in rain to gives rise to “**Acid rains**”. The smog is a visible indication of **Air Pollution**. The **pollutants** bring respiratory, cardiac problems and **allergies**. The organisms called **Lichens** are found on the bark of trees, they are indicators of pollution free environment. Three atoms of Oxygen (O₃) is called as **Ozone**. The Ozone is poisonous but absorbs harmful radiations from the Sun. The Ozone layer around the earth, if, dwindles further may cause Health hazards including Cancers . Recently discovered the **Ozone hole; in the region of Antarctica. (Please refer Fig. 14.8 & 14.9, NCERT Text Book Page- 200).**

QUESTION BANK

1. What are the three sub-zones in the Biosphere? **{Lithosphere (rock part), atmosphere (air part)and hydrosphere (water part)}**.
2. The process in which water evaporates and falls on the land as rain and later flows back into the sea via rivers is known(Water Cycle).
3. In large parts of India, rains are mostly brought by..... monsoons.(the south-west or north-east monsoons).
4. Why water is a wonder liquid? Justify (A major resource to determine life on the earth)
5. What are the four major water Pollutants?{ (NPK fertilizers, pesticides (DDT), sewage (Disease causing Organisms), waste from factories (Mercury)}
6. Write a short notes on Nitrogen fixation by Bacteria.{The molecular nitrogen is converted into nitrates and nitrites, by free living bacteria or the bacteria present in the root nodules of legumes}.
7. What is Greenhouse Effect? {The Carbon dioxide is a greenhouse gas. The increase in the Carbon dioxide content would cause more heat to be retained by the atmosphere and lead to Global Warming. It is called” Greenhouse Effect”}
8. What is the percentage of Oxygen gas in our atmosphere? {21 %}

9. Which organisms are found on the bark of trees as indicators of pollution free environment? { Lichens}
10. Write about the Ozone hole in the Antarctica. {The Ozone layer around the earth is dwindling further to damage and cause Health hazards including Cancers. Recently discovered Ozone hole in the Antarctica.}

QUESTION PAPER:FORMATIVE ASSESSMENT – I (For Practice)

Marks- 40

Time: 90 minutes

* General Instructions

1. Questions 1-5 (1 Mark each) 2. Questions 6-10 (2 Mark each)
 3. Questions 11-15 (3Mark each) 4. . Questions 16-17 (5Mark each)

- Q.1 What is called Lithosphere, define it.
- Q.2 Water covers 75% of the Earth’s surface. Mention True/ false.....
- Q.3 What is the percentage of Carbon dioxide on Venus.....
- Q.4 What is the range of temperature on the Moon.....
- Q.5 Define the term Pollutant.....
- Q.6 What are the two ways to fix Carbon dioxide on earth.
- Q.7 Mention any two important features of Water.
- Q.8 How the Depressions effect our environment?
- Q.9 Define the term Soil Pollution. Give one reason for it.
- Q.10 How changes of temperature effect living organisms in water?
- Q.11 What is Humus? Mention its importance in two points.
- Q.12 What is deforestation? Give two reasons for it.
- Q.13. Define Global Warming, mention two causes for it.
- Q.14 What is Ozone Depletion? Give two reasons for it.
- Q.15 Draw the schematic diagram of Water Cycle in the nature.
- Q.16. Write any five salient features of Nitrogen Cycle with a suitable diagram.
- Q.17 Write about Industrial Pollution and mention five effects in the environment.

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Chapter 15: “Improvement in food resources”

KEY CONCEPTS : [*rating as per the significance of concept]

CONCEPTS	RATING
Improvement in crop yield	***
Crop variety improvement	****
Crop production management	*****
Crop protection management	***
Animal Husbandry	****

1. **Food Resources:** Cereals (Wheat, rice, maize, millets and sorghum) provide us carbohydrates; Pulses (Grams, pea and lentil) provide us proteins; Oil seeds (Soya bean, ground nut, sesame, and castor) provide us fats; Vegetables, spices and fruits provide us a range of minerals, nucleic acids and vitamins. In addition to these food crops, fodder crops like *berseem, oats or sudan grass* are raised as food for the livestock are called as fodder crops.

2. **The Kharif crops:** The crops grown in rainy season are called as *Kharif crops* (*Paddy, Soya bean, pigeon pea and maize*). They are grown from June to October.

3. **The Rabi crops:** The crops grown in winter season are called **Rabi crops** (Wheat, gram, peas, and mustard). They are grown November to April.

Compare **Kharif crops and Rabi crops:**

SN	Crop	Season	Example
1	Kharif crops	June to October (Rainy Season)	<i>Paddy, Soya bean, and maize</i>
2	Rabi crops	November to April (winter season)	Wheat, gram, peas, and mustard

4. **The Green Revolution:** Food supplies are generally as proteins, carbohydrates, fats, minerals, nucleic acids and vitamins in all living organisms. Indian population is growing enormously. Green Revolution is the need of the hour to increase food-grain production.

5. **Sustainable Practices:** For sustained livelihood, one should undertake mixed farming, intercropping, and integrated farming practices, for example, combining agriculture with livestock/ poultry/ fisheries/bee-keeping. The major group of activities for improving crop yield can be classified as: **Crop varietal improvement, Crop production improvement, Crop protection improvement**

6. **The Crop varietal improvement:**

a) **Hybridization:** It refers to crossing between genetically dissimilar plants; It is all to get higher yield, improved quality, biotic and abiotic resistance, change in maturity duration, wider adaptability and desirable agronomic characteristics.

SN	Type	Context
1	Intervarietal Hybridization	between different varieties
2	Interspecific Hybridization	between different species
3	Intergeneric Hybridization	between different genera
4	Genetically Modified Crops (GMC).	Another way of improving the crop is by introducing a gene that would provide the desired characteristic.

7. **The Crop production improvement:** They include "no cost production", "low cost production" or "high cost production" practices.

a) **Nutrients(Sixteen elements are required for growth are called as essential elements Carbon, oxygen, hydrogen+ Macronutrients & Micronutrients. They increase the yield):**

SN	Macronutrient	Micronutrient
1	Six elements are required in larger quantity	Other seven elements are required in small quantity
2	Ex. Nitrogen, phosphorus, calcium, potassium, magnesium, sulphur	Ex. Iron, manganese, boron, zinc, copper, molybdenum, chlorine

b) Manure & Fertilizers:

SN	Manure	Fertilizers
1	Manure is prepared by the decomposition of animal excreta and plant waste is called as Humus. It decides the texture of the soil. Compost: Farm waste, cow dung etc. Vermi compost: Compost prepared by using earthworms.	Fertilizers are commercially produced plant nutrients. Excess fertilizers destroy the soil fertility. Organic farming: No use of chemicals fertilizers, herbicides, pesticides etc.(Culturing blue green algae, neem leaves, healthy cropping systems.
2	It is cheap and prepared in rural homes and fields	It is costly and is prepared in factories
3	It is voluminous and bulky	It is compact and concentrated
4	It is inconvenient to store, transport, handle.	It is easy to store, transport, handle.
5.	It is not nutrient specific.	It is nutrient specific and can provide specifically nitrogen, phosphorus etc.
	Add great humus to the soil	Does not add humus to the soil.

3. **Irrigation:** India has variety of water resources: Wells, canals, river lift system, tanks, rainwater harvesting, water shedding management to increase in ground water levels and to check the water flowing away to the sea. Planning to reduce soil erosion.

4. **Cropping patterns:**

SN	Mixed cropping	Inter-cropping	Crop rotation
1	Two or more crops grown simultaneously on the same piece of land	Two or more crops grown simultaneously on the same piece of land in a definite pattern	Growing different crops on a piece of land in a pre-planned succession
2	Ex. Wheat+ Gram; Wheat+ Mustard; Wheat+ gram; Groundnut+ sunflower.	Soyabean + maize/bajra+Cowpea ((Please refer Fig. 15.2, NCERT Text Book Page- 208).	Two or three crops can be grown in a year depending upon the duration.

3	A type of insurance against failure of one of the crops.	A few rows of one crop alternate with a few rows of a second crop. Crops are selected such that their nutrient requirements are different. This ensures the maximum utilization of the nutrients supplied and prevents pests and diseases spreading in the crop field.	The availability of moisture and irrigation facilities decides the choice of the crop to be cultivated.
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8. Crop protection improvement/ management: Field crops are infested by large number of weeds, insects pests, diseases & storage of grains

SN	Weeds	Insect pests	Diseases	Storage of grains
1	Weeds are unwanted plants in the crop field	Insect pest is nuisance in the crop field	Disease is caused by pathogens in the field	Different factors are responsible.
2	Weeds take up nutrients and reduce the growth	Insect pest affect the health of crop and reduce the yield.	Diseases alter the physiology of crops and reduce the yield	Different factors reduce the quality of stored grains
3	Ex. Xanthium, Parthenium	Ex. Caterpillars, dragonfly	Ex. Bacteria, Virus	Biotic factors: insects, rodents, fungi Abiotic factors: moisture & temperature
4	Removal of weeds at an early stage is recommended. Spray weedicides	Spread of chemicals such as pesticides	Spread of chemicals to kill pathogens	Systematic management of ware house.

9. Animal Husbandry: It is a scientific management of animal livestock, includes feeding, breeding and diseases control. Animal-based farming includes cattle farming, Poultry farming, fish farming, and bee Keeping.

SN	Content	Cattle farming	Poultry farming	Fish farming	Bee Keeping.
1	Purpose	Milk (milch animals) and	Meat, chicken, egg	Cheep source of animal protein.	Honey, wax, medicinal

		draught labor (draught animals) in agriculture.	production	Fish production is aquaculture. Growing of marine fishes is called mariculture.	preparations. Additional income to the farmer.
2	Cross breeding: To get desired qualities	Exotic-quality of lactation Indigenous breeds-quality of disease resistance	Exotic & Indigenous breeds	Both Exotic & Indigenous fishes are used	Exotic- high honey collection capacity & stingless. Indigenous bees- are used
3	Desirable maintenance	Good ventilation in sheds Roughage/ concentrates Protection from parasites & skin diseases Vaccination	Good ventilation in sheds Roughage/ concentrates Protection from parasites & skin diseases Vaccination	Fish farming/ locating large schools of fish/ use of satellites and echo-sounds In Composite fish culture seed is wild, mixed with other species. Hormonal stimulation to bring desired quality in fish production.	Value or quality depends upon the pasturage or the flowers available for the taste of honey.
4	Example	Exotic or foreign breeds (Jersey, brown Swiss) Local breeds (Red sindhi, Sahiwal)	Exotic- Leghorn Indigenous breeds- Aseel	Fresh water (Macrobrachium) & Marine(Peneaus) prawns Fresh water fishes Marine fishes(Bombay duck, sardines) Common	Apis cerana indica dorsata A. florea

QUESTION BANK

1. Give two examples of Cereals (Wheat, rice)
2. *Define the Kharif crop and give two examples (The crops grown in rainy season are called as Kharif crops Ex. Paddy, Soya bean).*
3. Write about the importance of Green Revolution (Indian population is growing enormously. Green Revolution is the need of the hour to increase food-grain production.)
4. Define the term Hybridization(Crossing between genetically dissimilar plants)
5. What is the importance of Genetically Modified Crops? (It is another way of improving the crop is by introducing a gene that would provide the desired characteristic.)
6. Define the term mixed cropping and give two examples. (Two or more crops grown simultaneously on the same piece of landEx. Wheat+ Gram; Wheat+ Mustard)
7. Distinguish between weeds, insects pests(Weeds are unwanted plants in the crop field Insect pest is nuisance in the crop field)
8. What is Animal Husbandry? It is a scientific management of animal livestock, includes feeding, breeding and diseases control. Animal-based farming includes cattle farming, Poultry farming, fish farming, and bee keeping.
9. Distinguish between aquaculture and mariculture. (Fish production is aquaculture. Growing of marine fishes is called mariculture.)
10. What is the importance of Bee Culture? (It is useful for honey, wax, medicinal preparations. And also for additional income to the farmer.)

QUESTION PAPER:FORMATIVE ASSESSMENT – I (For Practice)

Marks- 40

Time: 90 minutes

* General Instructions

1. Questions 1-5 (1 Mark each)
2. Questions 6-10 (2 Mark each)
3. Questions 11-15 (3Mark each)
4. . Questions 16-17 (5Mark each)

- Q.1 Maize and Millets are Pulses. Mention True/False.....
- Q.2 What is the Scientific name of Honey Bee.....
- Q.2 What led us to improve food grain production?
- Q.3 Which revolution led to the availability of milk for efficient use?
- Q.4 What is the process of injecting semen of desired bull into the vagina of cows is called?
- Q.5 Name any one exotic breed usually used for variety of improvement programmes.
- Q.6 What is the significance of GMC
- Q.7 Mention the significance of Irrigation in developing agriculture.
- Q.8. What is Pest and give one example.
- Q.9 What is Weed and give one example.
- Q.10 Give two examples for Inter-cropping.
- Q.11 Distinguish between Kharif and Rabi Crops
- Q.12 What is called Sustainable Practice in improvement in food resources.
- Q.13. Mention three techniques of Hybridization used to achieve desirable agronomic characteristics.
- Q.14.Distinguish between Macro Nutrients and Micro Nutrients
- Q.15 Distinguish between Compost and Vermi Compost.
- Q.16 Distinguish between Cattle farming and Poultry farming.
- Q.17 Distinguish between Fish farming and Bee keeping.

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SECTION : PHYSICS

Chapter 8 : “Motion”

KEY CONCEPTS [*rating as per the significance of concept]

1	Motion	****
2	Graphical Representation of Motion & Graphs	***
3	Equation of motion	****
4	Uniform Circular Motion	**

1 **Motion** (Uniform Motion And Non Uniform Motion, Acceleration and Velocity)

- A particle is a point-like object, has mass but infinitesimal size
- The object’s position is its location with respect to a chosen reference point, In the diagram, the road sign the reference point
- Motion occurs when an object changes its position.

Both **Distance** and **Time** are important in describing motion.

- Sometimes you know motion has occurred even if you didn’t see it happen. (mail truck)
- Relative motion: when two objects are moving in a plane (either in same direction or opposite) each have relative motion with respect to second. e.g. a person sitting in a train and watching a tree, in this case tree is stable but is assumed to be moving but with respect to train.

Distance vs. Displacement

- **Distance:** How far an object has moved. It has only magnitude without direction. (total)
- **Displacement:** How far and in what direction an object has moved from its start position. i.e. the direct distance between two points.

Speed

- Speed = the distance an object travels in a given amount of time
- $\text{Speed} = \frac{\text{distance}}{\text{time}}$
- SI unit of speed is m/s

Types of Speed

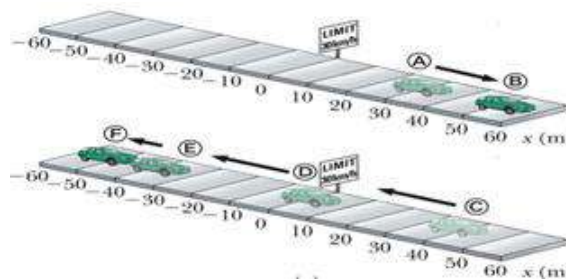
- Constant speed: speed doesn't change (set your car on cruise control)
- Changing speed: Riding a bike for 5 km. Take off and increase speed, slow down up hill, speed up down hill, stop for stop sign. The trip took you 15 min (.25 h)
- Average speed: $\frac{\text{total distance}}{\text{total time}}$
- Instantaneous speed: speed at any given time.

Velocity

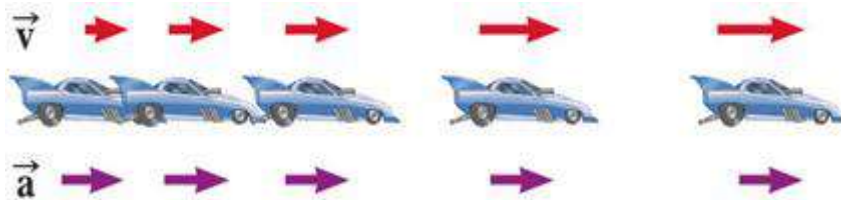
- Velocity: includes speed and DIRECTION
- Storm is moving at 20km/hr.
- Should you be seeking shelter?
- Suppose two trains are going with the same speed in opposite direction so they are having different velocities.
- Race car going around an oval track might have constant speed, but different velocities at each point.

Acceleration

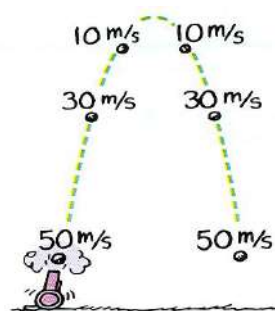
- Any change in velocity over a period of time is called acceleration.
- The sign (+ or -) of indicates its direction. + sign shows the acceleration and - sign shows de-acceleration.
- Uniform (constant) acceleration equation
 - $a = v/t$



- Images of car are equally spaced.
- The car is moving with constant positive velocity (shown by red arrows maintaining the same size) .
- The **acceleration equals to zero**



- Images of car become farther apart as time increases
- **Velocity and acceleration are in the same direction**
- Acceleration is uniform (Arrows below the car maintain the same length)
- Velocity is increasing (Arrows above the car are getting longer)
- This shows positive acceleration and positive velocity



The instant speed at points of equal elevations is the same.

The velocities are different because they are in opposite

Free Fall & Air Resistance



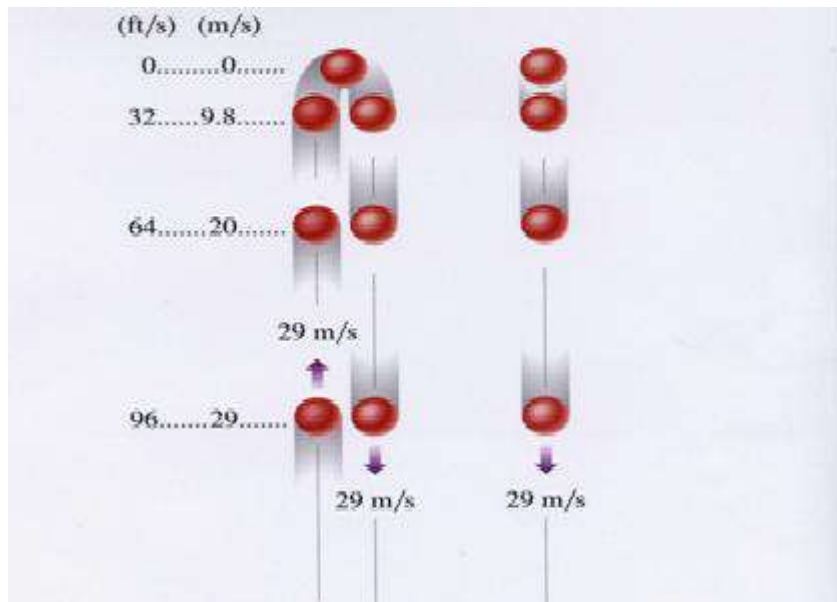
Galileo Galilei Italian physicist and astronomer

Formulated laws of motion for objects in free fall

- A ***freely falling object*** is any object moving freely under the influence of gravity alone.
- It does not depend upon the initial motion of the object
- Dropped – released from rest
- Thrown downward
- Thrown upward
- The acceleration of an object in free fall is directed downward, regardless of the initial motion
- The magnitude of free fall acceleration (gravitational acceleration) is $g = 9.80 \text{ m/s}^2$
- g decreases with increasing altitude
- g varies with latitude, height and depth from earth surface.
- 9.80 m/s^2 is the average at the Earth's surface
- The italicized g will be used for the acceleration due to gravity
- Not to be confused with g for grams



- With negligible air resistance, falling objects can be considered freely falling. objects of different shapes accelerate differently (stone vs feather)
- Speed both upward and downward



- The path is symmetrical.
- Acceleration is constant.
- The magnitude of the velocities is the same at equal heights.
- Images become closer together as time increases
- Acceleration and velocity are in opposite directions when ball goes upward.
- Acceleration is uniform (violet arrows maintain the same length)
- Velocity is decreasing in upward motion (red arrows are getting shorter)
- Positive velocity and negative acceleration
- Velocity becomes zero at maximum height.
- Time duration flight in going upward and coming back is always same.

Test Yourself :

1. What is SI Unit of displacement?
2. Name the quantity which represents rate of change of velocity.
3. A particle describes a semicircle of radius 14m. What are its distance and displacement covered?

2 Graphical Representation Of Motion & Graphs (**Refer to article 8.4 of NCERT text book.**)

Test Yourself :

1. What does slope of Position – Time graph represent?
2. If velocity –time graph is parallel to time axis, what type of motion does it represent?

3 Equation of motion

(1) When object is moving in straight line-

- $v = v_o + at$
- $x = x_o + v_o t + \frac{1}{2} at^2$
- $v^2 = v_o^2 + 2a(\Delta x)$
- Average acceleration describes how fast the velocity is changing with respect to time.

$$a_{ave} = \frac{\Delta v}{\Delta t} = \frac{\Delta \left(\frac{\Delta x}{\Delta t} \right)}{\Delta t}$$

- where:

a_{ave} = average acceleration

Δv = change in velocity

Δx = displacement

Δt = elapsed time

(2) when object is coming vertically downward-

- $v = v_o + gt$
- $h = v_o t + \frac{1}{2} gt^2$
- $v^2 = v_o^2 + 2ah$

(3) when object is coming vertically upward-

$$v = v_o - gt$$

$$h = v_o t - \frac{1}{2} gt^2$$

$$v^2 = v_o^2 - 2gh$$

- The SI unit of velocity is the m/s.

Average acceleration is + or – depending on direction.

- Instantaneous Acceleration

$$a = \lim_{t \rightarrow 0} \left(\frac{\Delta v}{\Delta t} \right)$$

- Instantaneous acceleration is the limit of $\Delta v/\Delta t$ as Δt approaches zero.
- Instantaneous acceleration is zero where slope is constant
- Instantaneous acceleration is positive where curve is concave up
- Instantaneous acceleration is negative where curve is concave down

Test Yourself :

1. Give the equation for uniform motion.
2. When a car stops after applying brakes, what is the final velocity?

4 Uniform Circular Motion

In this kind of motion the object moves on circle with fix speed but the direction is changed by the time so the velocity of the change so its called acceleration motion. This acceleration is called centrifugal acceleration. It is directed toward the centre.

Test Yourself:

1. What remains constant in uniform circular motion?
2. What changes continuously in uniform circular motion?

QUESTION BANK

One Mark questions

1. Can displacement be zero even when distance is not zero?
2. Can the distance travelled by an object be smaller than magnitude of its displacement?
3. A particle is moving with uniform velocity. What is its acceleration?
4. How can you get speed of an object from its distance – time graph?
5. How can you get distance of an object from its speed – time graph?
6. A brick & an elephant are in free fall. What is common in their motion?
7. When an object is thrown vertically upwards. What is its velocity at the highest point?
8. Can velocity & acceleration point in opposite directions?
9. Define acceleration.
10. What is non uniform motion?

Two Marks questions

1. Differentiate scalars & vectors?
2. What is retardation? How does it affect the speed?
3. Can speed of a body vary with its velocity constant? Explain.
4. Why is circular motion with constant speed called accelerated motion?
5. State the difference between distance & displacement.

6. What is the difference between speed & velocity?
7. What does a speedometer & odometer indicate?

Three Marks questions

1. If an object is thrown vertically upwards with speed 49 ms^{-1} . How long does it take to complete upward journey? What maximum height does it achieve?
2. An object starting from rest covers 20 metres in first 2 seconds & 160 metres in next 4 seconds. What is its velocity after 7 seconds from the start?

Five Marks questions

1. Derive all the three equations of motion for uniform acceleration using graphical method.
2. A car is moving at a rate of 72 km/h and applies brakes which provide a retardation of 5 ms^{-2} .
 - (i) How much time does the car take to stop.
 - (ii) How much distance does the car cover before coming to rest?
 - (iii) What would be the stopping distance needed if speed of the car is doubled?

CHAPTER -9 “Force & Laws Of Motion”

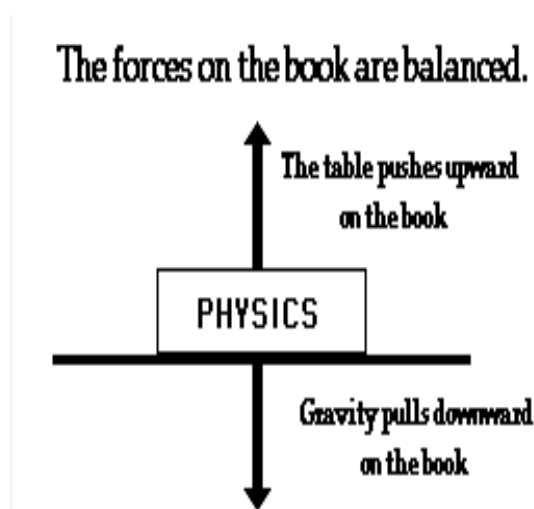
KEY CONCEPTS [*rating as per the significance of concept]

1	Balanced and Unbalanced Forces	***
2	Laws of Motion	*****
3	Inertia and Mass	*****
4	Conservation of Momentum	****

1 **Balanced and Unbalanced Forces**

Balanced Forces The net force is when two or more forces are applied on the same object and at the same time. The applied forces combined are called the net force. = 0 25 N 25 N

Balanced Forces The force I apply in one direction plus the force you apply in the opposite direction are added together. $25\text{ N} - 25\text{ N} = 0$ Because the forces are equal and balanced...just like a balanced scale...this is an example of balanced forces. **Unbalanced Forces** What does it mean to have something unbalanced? Unequal, not the same, different How could we have unbalanced forces?



Unbalanced Forces A force is applied in one direction and either another smaller or larger force is applied in the opposite direction or no force is applied at all in the opposite direction.

Unbalanced Forces If I have a chair and I push on one side of it with a force

of 50 N and you push on the other side, with a force of 25 N, will the chair move? Which way will it move? The direction in which the most force is applied. What is the net force? 50 N - 25 N.

Unbalanced Forces $50\text{N} - 25\text{N} = 25\text{N}$ These forces are unequal so the forces are considered unbalanced forces. $50\text{N} - 25\text{N} = 25\text{N}$

Unbalanced Forces If I push the chair in one direction with 25 N force and you push the chair in same direction with 25 N force, will the chair move? Why? Because the applied net force is UNBALANCED!

Unbalanced Forces $25\text{N} + 25\text{N} = 50\text{N}$ The result would be the chair moving in the direction it was pushed with a combined force of 50 N.

Test Yourself

1. An object of 5 kg is acted upon by two forces, 70 N each in opposite directions. What is its acceleration?
2. Why does an object accelerate during free fall?

2

Laws of Motion

Newton's First Law

1st Law – An object at rest will stay at rest, and an object in motion will stay in motion at constant velocity, unless acted upon by an unbalanced force.

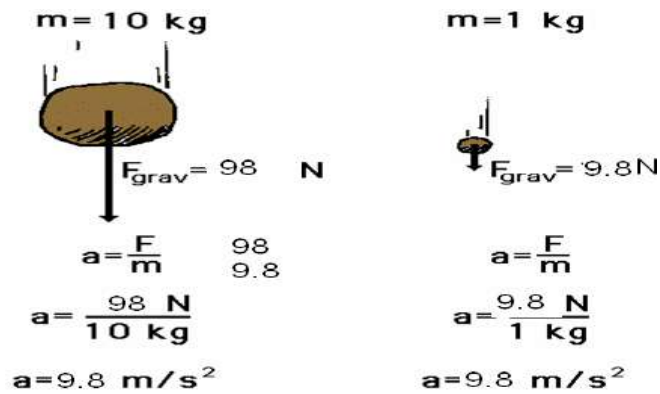
An object at rest will stay at rest, and an object in motion will stay in motion at constant velocity, unless acted upon by an unbalanced force.

Newton's Second Law

"If the net force on an object is not zero, the object will accelerate. The direction of the acceleration is the same as the direction of the net force. The magnitude of the acceleration is directly proportional to the net force applied, and inversely proportional to the mass of the object."

Mathematical symbols provide a convenient shorthand for all of this:

$$a = \frac{F_{\text{net}}}{m} \quad \text{or} \quad F_{\text{net}} = ma$$



The Effect of Mass

A force applied to an automobile will **not** have the same effect as the same force applied to a pencil. An automobile resists accelerating much more than a pencil does, because it has more inertia, or mass.

The acceleration of an object depends not only on how hard you push on it, but also on how much the object resists being pushed.

What is the effect of mass on acceleration? This, too, turns out to be quite simple (I wonder why...). For the same force, an object with twice the mass will have half the acceleration. If it had three times the mass, the same force will produce one-third the acceleration. Four times the mass gives one-fourth of the acceleration, and so on.

This type of relationship between quantities (double one, get half the other) is called an *inverse proportion* or *inverse variation*. In other words, then:

Newton's Second Law of Motion The acceleration of an object is dependent upon both force and mass. Thus, if the colliding objects have unequal mass, they will have unequal accelerations as a result of the contact force which results during the collision.

Newton's Third Law

Newton's Third Law is stated as:

For every action there is an equal and opposite reaction.

"*action...reaction*" means that forces always occur in pairs. (Forces are interactions between objects, like conversations are interactions between people.)

Single, isolated forces never happen. The two forces involved are called the "action force" and the "reaction force."

These names are unfortunate for a couple of reasons :

Either force in an interaction can be the "action" force or the "reaction" force

The action and reaction forces exist at the same time.

"equal" means

Both forces are exactly the same size. They are equal in magnitude.

Both forces exist at exactly the same time. They both start at exactly the same instant, and they both stop at exactly the same instant. They are equal in time.

"opposite" means that the two forces always act in opposite directions - exactly 180° apart.

Newton's third law of motion In every interaction, there is a pair of forces acting on the two interacting objects. The size of the force on the first object equals the size of the force on the second object. The direction of the force on the first object is opposite to the direction of the force on the second object. Forces always come in pairs - equal and opposite action-reaction force pairs.

Newton's third law of motion applied to collisions between two objects. In a collision between two objects, both objects experience forces which are equal in magnitude and opposite in direction. Such forces cause one object to speed up (gain momentum) and the other object to slow down (lose momentum). According to Newton's third law, the forces on the two objects are equal in magnitude.

Test Yourself

1. *Can action reaction balance each other?*
2. *What does a force do?*

3 Inertia and Mass

Inertia is the tendency of an object to resist any change in its motion. An object will continue to move at the same speed in the same direction

unless acted upon by an unbalanced force. Inertia & Mass

Inertia & Mass of a bowling ball rolled down the road would eventually come to a stop. Friction is an unbalanced force that causes the ball to stop or slow down. Without friction, the ball would keep going.

Inertia & Mass of a bowling ball and a tennis ball have the same inertia.

Inertia & Mass If you had a tennis racket and I threw tennis ball at you, what would happen? If you had a tennis racket and I threw a bowling ball at you, what would happen? Why could you change the motion of the tennis ball but not the motion of the bowling ball?

Mass is the amount of matter in an object. A bowling ball has more mass than a tennis ball. The greater the mass of an object the greater its inertia.

Mass is the measurement of inertia.

Test Yourself

1. *Why do we fall forward if we alight from a moving bus?*

2. *Why does an athlete run for some distance before long jump?*

4 Conservation of Momentum

Law of Conservation of Momentum

In a closed system, the vector sum of the momenta before and after an impact must be equal.

Before After

$$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$$

Internal and External Forces

QUESTION BANK

One Mark questions

1. Define momentum.
2. State first law of motion.
3. What is inertia?
4. Can action and reaction balance each other?
5. How does one climb up a rope?
6. Why cannot we walk in space?

7. What does rate of change of momentum represent?
8. Why do we continuously paddle to keep the cycle moving?
9. Why does a scooter tend to skid while executing a sharp turn?
10. Which one would have more inertia : 10 kg mass & 5 kg mass?

Two Marks questions

1. Explain the functioning of shockers in cars.
2. How much force is needed to pull an object of mass 40 kg in vertically upward direction with acceleration of 2.2 m / s^2 .
3. Why does a fan keep moving for sometime when switched off?
4. What do you mean by conservation of momentum?
5. Inflated balloon lying on the surface of a floor moves forward when pricked with a pin. Why?

Three Marks questions

1. An iron sphere of mass 10 kg is dropped from a height of 80 cm, if ' g ' = 10 m / s^2 . Calculate the momentum transferred to the ground by the body.
2. What would be the force required to stop a car of mass 1000 kg and a loaded truck of mass 10,000 kg in 2 seconds each moving with velocity 5 m / s .
3. Deduce law of conservation of momentum using third law of motion.

Five Mark questions

1. Name and define three different types of inertia & give an example of each.

CHAPTER 10- "GRAVITATION"

KEY CONCEPTS [*rating as per the significance of concept]

1	Gravitation	***
2	Universal Law Of Gravitation	****
3	Free Fall	**
4	To Calculate The Value Of G	****
5	Mass & Weight	***
6	Weight Of The Object On Moon	***
7	Thrust & Pressure	***
8	Pressure In Fluids	***
9	Buoyancy	****
10	Why Objects Float Or Sink When Placed On The Surface Of Water?	***
11	Archimedes's Principle	*****
12	Relative Density	***

Gravity is one of the most basic forces in the universe. It plays a fundamental role not only in the structure of our solar system but also in the way objects behave on Earth. In this section, we will talk about gravity on a small scale. We will discuss topics such as weight, free fall, and ballistics. We will learn the physics of phenomena we experience daily and take for granted

1.Gravitation

Gravitation is the force of attraction between two objects in the universe.

Gravitation may be the attraction of objects by the earth.

This force is proportional to the product of masses of the objects and inversely proportional to the square of the distance between them. It is independent of medium.

$$\text{Gravitational force} = \frac{GMm}{r^2}$$

Eg :- If a body is dropped from a certain height, it falls downwards due to earth's gravity.

If a body is thrown upwards, it reaches a certain height and then falls downwards due to the earth's gravity.

- Gravitation may be the attraction between objects in outer space.

Eg :- Attraction between the earth and moon.

Attraction between the sun and planets.

GRAVITY

- A natural force that pulls all objects toward the center of the earth
- keeps the moon orbiting
- It holds stars together . . .
- And binds galaxies together for billions of yearsPrevents Planets from losing their atmospheres.

Test yourself:

1. When we move from the poles to the equator. Hence, the value of g decreases. Why?
2. What is the difference between gravity and gravitation?

2. Universal law of gravitation: - "Inverse square law" - All bits of matter attract all other bits of matter.....

- The universal law of gravitation states that, 'Every object in the universe attracts every other object with a force which is directly proportional to product of the masses and inversely proportional to the square of the distance between them.'



- The SI unit of G is $\text{N m}^2 \text{kg}^{-2}$ and its value is $6.673 \times 10^{-11} \text{N m}^2 \text{kg}^{-2}$
- The strength of the gravitational attraction between two objects depends on two factors:

- How big the objects are (how much mass they have) and
- How far apart they are.

Test Yourself

1. What is the difference between gravity and gravitation?
2. What does it mean to say that the Force of gravity is proportional to the masses of the bodies, and inversely proportional to the distance between them?

3. Free Fall

- With negligible air resistance, falling objects can be considered freely falling. objects of different shapes accelerate differently (stone vs feather)



Test Yourself

1. A coin and a feather are dropped from the roof of a building. Which one will fall to the ground first

4 .To calculate the value of” g “(acceleration due to gravity)

- The acceleration due to gravity is denoted by *g*.
- The unit of *g* is same as the unit of acceleration ms^{-2}
- From the second law of motion, force is the product of mass and acceleration.

$$F = ma$$

- For free fall, force is the product of mass and acceleration due to gravity.

$$F = mg \text{ or } mg = \frac{GMm}{r^2}$$

$$\text{or } g = \frac{GM}{r^2}$$

where M is the mass of the

Earth and d is the distance between the object and the earth.

- For objects near or on the surface of the earth d is equal to the radius of the earth R
- $F = mg$ or $mg = \frac{GMm}{r^2}$
- or $g = \frac{GM}{r^2}$

Test Yourself

1. Calculate the value of g on the surface of earth.
2. What is the difference between "weight" and "mass"?

5. Mass and Weight:

- Mass is a fundamental, universal property. You have the same amount of mass no matter where you are in the Universe.
- Weight is not fundamental its value depends on circumstances in the Universe. Weight is a force. It is the resultant gravitational force exerted on a body with mass m by all the other bodies on the Universe.

$$\text{Weight} = F_g = G m M_e / R^2 = mg$$

where M_e is the mass of the Earth and R is the radius of the Earth.

Test Yourself

1. An astronaut has 80 kg mass on earth (a) what is his weight on earth? (b) What will be his mass and weight on mars where $g=3.7 \text{ m/s}^2$.
2. When you put an object on a spring balance, do you get the mass of an object or its weight?

6. Weight Of The Object On Moon

- The mass of the moon is less than the mass of the earth. So the moon exerts lesser force on the objects than the earth.
- The weight of an object on the moon is one sixth ($1/6^{\text{th}}$) of its weight on the earth.
- The weight of an object on the earth is the force with which the earth attracts the object and the weight of an object on the moon is the force with which the moon attracts the object.

Celestial body	Mass (kg)	Radius (m)
Earth	5.98 x 10 ²⁴	6.37 x 10 ⁶
Moon	7.36 x 10 ²²	1.74 x 10 ⁶

Test Yourself

1. What will be the weight of the body on the moon whose mass is 12 kg?

7. Thrust & Pressure

- Thrust is the force acting on an object perpendicular to the surface.
- Pressure is the force acting on unit area of a surface

$$\text{Pressure} = \frac{\text{Thrust}}{\text{Area}}$$

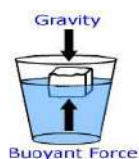
- The SI unit of thrust is N/m² or N m⁻². It is called Pascal (Pa).

8. Pressure In Fluids

- Fluids exert pressure in all directions
- Pressure exerted on fluids is transmitted equally in all directions.

9. Buoyancy

When an object is immersed in a fluid it experiences an upward force called buoyant force. This property is called buoyancy or upthrust.

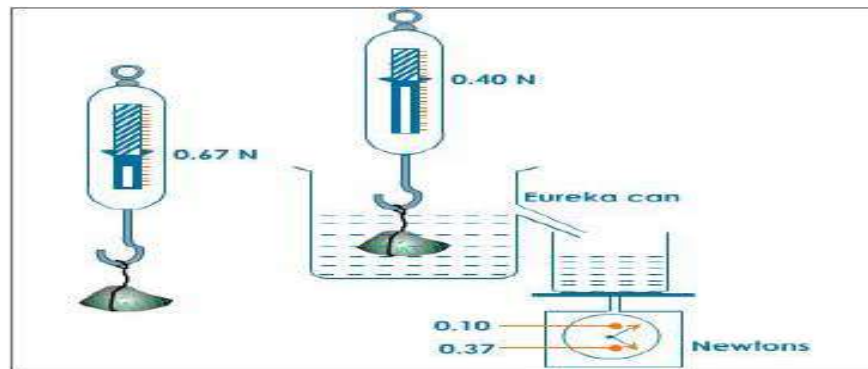


10. Why objects float or sink when placed on the surface of water?

- Take some water in a beaker. Take a piece of cork and an iron nail of the same mass. Place them on the water. The cork floats and the nail sinks.
- If the density of an object is less than the density of a liquid, it will float on the liquid and if the density of an object is more than the density of a liquid, it will sink in the liquid.

11. Archimedes Principle

- Archimedes' principle states that, When a body is partially or fully immersed in a fluid it experiences an upward force that is equal to the weight of the fluid displaced by it.'



12 .Relative density

- The relative density of a substance is the ratio of the density of a substance to the density of water. It is a ratio of similar quantities and has no unit.

QUESTION BANK

One Mark questions

1. Explain what Centrifugal force is.
2. What do you mean by the weight of the body on moon.
3. Give the value of G with proper units.
4. Give the value of g with proper units.
5. What is measured by physical balance?

Two Marks questions

1. At what height above the earth's surface would the value of acceleration due to gravity be half of what it is on the surface? Take radius of earth to be R.
- 2 . A body of 90 kg f on the surface of earth. How much will it weigh on the surface of moon whose mass is $\frac{1}{9}$ and radius is $\frac{1}{2}$ of that of earth?
3. A piece of paper takes much longer to fall than a stone through the same distance. Explain the reason.
4. Consider a heavenly body which has a mass twice that of the earth and radius thrice that of the earth .What will be the weight of the book on this heavenly body, if its

weight on earth is 900 N?

Three Marks questions

1. Why gravitational force is usually unnoticeable?
2. Prove that acceleration due to gravity is independent of mass of the body.
3. How can the average density of the earth can be determined?
4. What is buoyancy and buoyant force? Upon what factors do they depend

Five Marks questions

1. Find the percentage change in the weight of a body when it is taken from equator to poles. The polar radius is 6,357 Km and equatorial radius is 6,378 Km.
2. The density of ice is 918kgm^{-3} and that of sea water is $1,030\text{kgm}^{-3}$. An iceberg floats with a portion 224 liters outside water. Find the volume of iceberg.
3. What are the laws of flotation? Give some illustrations.

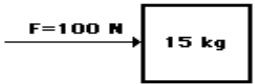
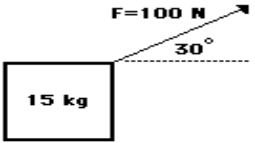
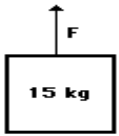
CHAPTER 11 “Work & Energy”

KEY CONCEPTS [*rating as per the significance of concept]

1	Work Done By A Constant Force	***
2	Energy And Its Forms(Kinetic Energy & Potential Energy) Are Various Energy Forms Inter convertible?	*****
3	Potential Energy Of An Object At A Height	*****
4	Law Of Conservation Of Energy	****
5	Rate Of Doing Work & Commercial Unit Of Energy	****

1. Work Done By A Constant Force

- *Work is a scalar quantity equal to the product of the displacement x and the component of the force F_x in the direction of the displacement..*
- Work is defined as a force acting upon an object to cause a displacement
- Mathematically, work can be expressed by the following equation.
- $W = F \times d \cos \theta$ ($\cos 0^\circ = 1$)
- where F = force, d = displacement, and the angle (θ) is defined as the angle between the force and the displacement vector
- Three things are necessary for the performance of work:
- There must be an applied force F .
- There must be a displacement x .
- The force must have a component along the displacement

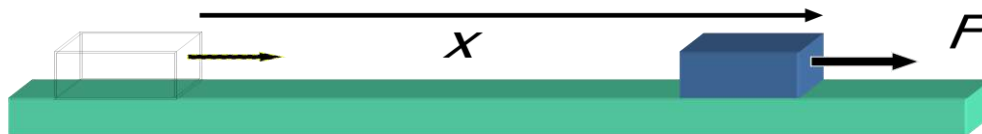
Diagram A	Diagram B	Diagram C
		
<p>A 100 N force is applied to move a 15 kg object a horizontal distance of 5 meters at constant speed.</p>	<p>A 100 N force is applied at an angle of 30° to the horizontal to move a 15 kg object at a constant speed for a horizontal distance of 5 m.</p>	<p>An upward force is applied to lift a 15 kg object to a height of 5 meters at constant speed.</p>

Negative Work



The friction force f opposes the displacement

Positive Work



Force F contributes to displacement x .

Test Yourself:

1. Calculate Work when $F = 40 \text{ N}$ and $x = 4 \text{ m}$.
2. Calculate Work when $F = -10 \text{ N}$ and $x = 4 \text{ m}$.
3. A lawn mower is pushed a horizontal distance of 20 m by a force of 200 N directed at an angle of 30° with the ground. What is the work of this force?
4. A student lifts a 50 pound (lb) ball 4 feet (ft) in 5 seconds (s) . How many joules of work has the student completed?

2. Energy And Its Forms



James Joule

The metric system unit of energy is the joule (J), after James Joule.

- Mechanical energy is the energy which is possessed by an object due to its motion or its stored energy of position

Forms of Energy

- **Kinetic energy** : is the energy of motion

Energy which a body possesses because of its motion, which occurs anywhere from an atomic level to that of a whole organism



Examples of Kinetic Energy: This is not an all-inclusive list.

- Electrical – The movement of atoms
- Electromagnetic or Radiant – The movement of waves
- Thermal or Heat – The movement of molecules
- Motion – The movement of objects
- Sound – The movement through waves

Engineers generally refer to thermal/heat energy as “internal energy” and use “kinetic energy” strictly in reference to motion.

Potential Energy (Stored energy or gravitational energy)

- The capacity to do work by virtue of position or configuration
- an object can store energy as the result of its position or elastic source
- Potential Energy is maximum at the maximum HEIGHT



Energy transformation involves the conversion of one form of energy into another form.

Examples of energy transformation include:

- **Chemical** – Food is consumed and converted into motion for playing sports or taking a test.
- **Radiant** – Sunlight is consumed by plants and converted into energy for growth.
- **Electrical** – Energy transferred to an oven is converted to thermal energy for heating our food.

Now you know the basic forms of energy. The next question is “What are the energy sources?”

There are renewable and nonrenewable sources of energy. A renewable energy source is a form of energy that is constantly and rapidly replenished by natural processes.

Examples of **renewable energy sources** include:

- Biomass – The use of a living or once living organism as fuel
- Hydropower – The energy produced from the movement of water
- Geothermal – The use of heat from within the Earth or from the atmosphere near oceans to warm houses or other buildings
- Wind – The use of wind to generate electricity

Solar – The use of the sun as a source of heat; for instance, to heat a room within a house, etc.

Energy Conversion

Examples

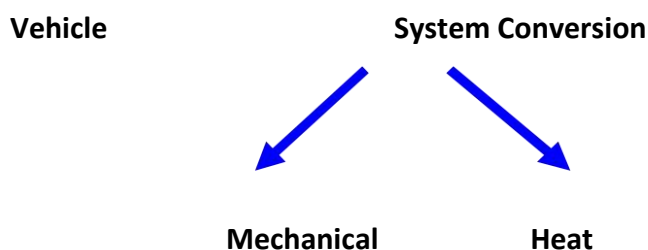
Fossil fuels Chemical → Heat → Mechanical → Electrical

Solar cells Sunlight → Electrical

Wind turbines Kinetic → Mechanical → Electrical

Hydroelectric Gravitational potential → Mechanical → Electrical

Nuclear Nuclear → Heat → Mechanical → Electrical



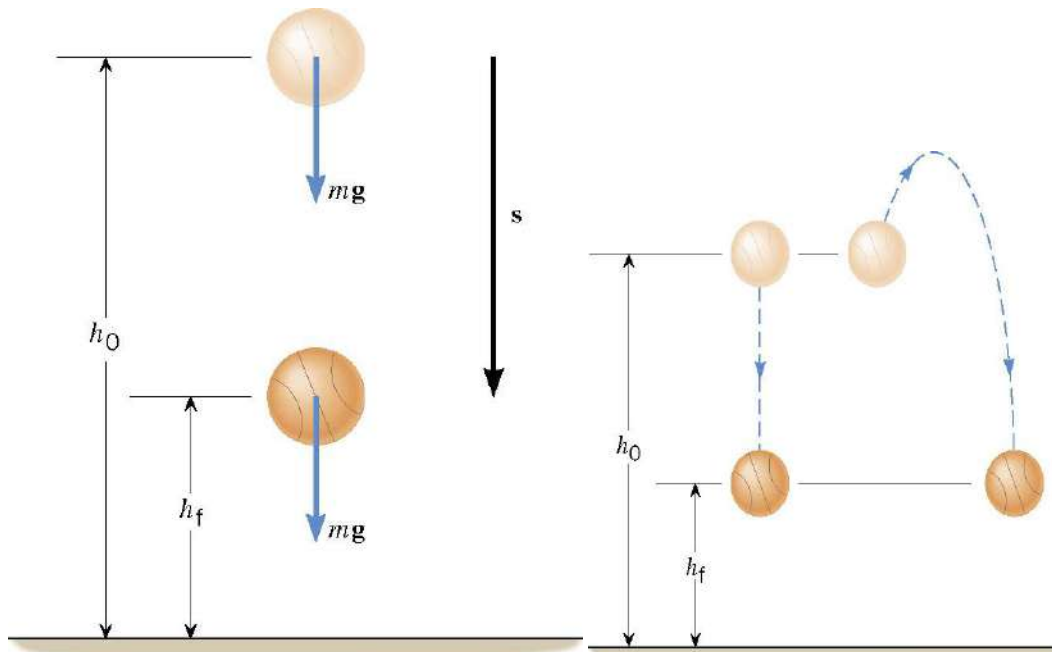
Test Yourself

1. How much potential energy is lost by a 5Kg object to kinetic energy due a decrease in height of 4.5 m.

3. Potential energy of an object at a height

An object increases its energy when raised through a height.

The potential energy of an object at a height depends on the ground level or the zero level



4. Law Of Conservation Of Energy

The principle of Conservation of Mechanical Energy

The total mechanical energy ($E=KE+PE$) of an object remains constant as the object moves, provided that the net work done by external non-conservative forces is zero, $W_{nc}=0$

Total mechanical energy: the sum of kinetic energy and gravitational potential energy

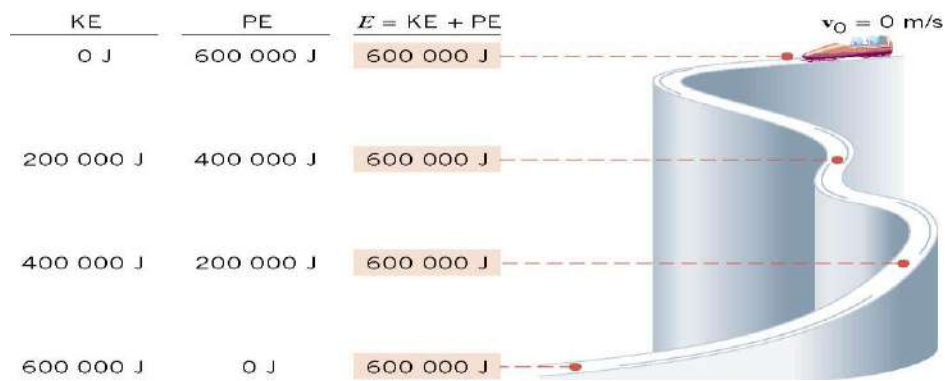
$$E = KE + PE$$

$$W_{nc} = (KE_f - KE_0) + (PE_f - PE_0)$$

$$W_{nc} = (KE_f + PE_f) - (KE_0 + PE_0)$$

$$W_{nc} = E_f - E_0$$

$$E_f = (KE_f + PE_f) \quad E_0 = KE_0 + PE_0$$



5. Rate of Doing Work & Commercial Unit Of Energy

POWER

Rate at which work is performed or energy is expended

$$P = \frac{W}{t}$$

Watt is the base unit of Power

One watt is equal to 1 joule of work per second

Types of Power

- Electrical Power

Uses electrical energy to do work

- Mechanical Power

Uses mechanical energy to do work (linear, rotary)

- Fluid Power

Uses energy transferred by liquids (hydraulic) and gases (pneumatic)

- Power is the rate that we use energy.
- Power = Work or Energy / Time
- $P = W/t = F \times d/t = F v$
- The unit joule is too small .The bigger unit of energy called kilowatt hour (kW h)

1 kW h is the energy used in one hour

at the rate of 1000 J s⁻¹ (or 1 kW).

$$1 \text{ kW h} = 1 \text{ kW} \cdot 1 \text{ h}$$

$$= 1000 \text{ W} \cdot 3600 \text{ s}$$

$$= 3600000 \text{ J}$$

$$1 \text{ kW h} = 3.6 \times 10^6 \text{ J.}$$

Test Yourself

1. *A 5 Kg Cart is pushed by a 30 N force against friction for a distance of 10m in 5 seconds. Determine the Power needed to move the cart.*
2. *A student lifts a 50.0 pound (lb) ball 4.00 feet (ft) in 5 .00seconds (s). How many watts of power are used to lift the ball?*

Important Points for Work Problems:

- Always draw a free-body diagram, choosing the positive x-axis in the same direction as the displacement.
- Work is negative if a component of the force is opposite displacement direction
- Work done by any force that is at right angles with displacement will be zero (0).
- For resultant work, you can add the works of each force, or multiply the resultant force times the net displacement.
- Energy is the ability to move
- Potential is stored energy (Statics)
- Dependant on height
- Kinetic is moving energy (Dynamics)
- Dependant on velocity
- Springs store energy dependant on distance and constant

QUESTION BANK

One mark questions

1. Does work have a direction?
2. Does the kinetic energy of an object depend on its direction of motion?
3. Can matter be converted into energy?
4. Give an example of conversion of chemical energy into heat energy.

Two marks questions

1. Two persons do the same amount of work. The first person does it in 10 s and the second, in 20 s. Find the ratio of the power used by the person to that by the second person.
2. A body of mass 25 g has a momentum of 0.40 kgm/s. Find its kinetic energy.
3. Define work and write its units.
4. By what factor does the kinetic energy of an object depend on its direction of motion?

Three marks questions

1. How much time will it take to perform 440 J of work at a rate of 11 W.
2. A body of mass 3.0 kg and a body B of mass 10 kg are dropped simultaneously from a height of 14.9 m. Calculate their Momenta, their Potential energies and kinetic energies when they are 10 m above the ground.
3. A man does 200 J of work in 10 seconds and a boy does 100 J of work in 4 seconds. Who is delivering more power? Find the Ratio of power delivered by the man to that by the boy.

Five marks questions

1. Show that the work done by a force is given by the product of the force and the projection of the displacement along the force.
2. Find the expression for gravitational potential energy of a body of mass m at height h .
3. Why does a person standing for a long time get tired when he does not appear to do any work?
4. How can you justify that a body kept at a greater height has larger energy?

CHAPTER 12 – “Sound”

KEY CONCEPTS [*rating as per the significance of concept]

1	Production of Sound	****
2	Propagation of Sound	*****
3	Reflection of Sound	*****
4	Echo	****
5	Uses Of Multiple Reflection Of Sound	***
6	Range of Hearing	***
7	Applications of Ultrasound	**
8	SONAR	**
9	Structure of Human Ear	****

1. Production of Sound

Sound is produced due to the vibration of objects. Vibration is the rapid to and fro motion of an object.

Vibrating objects are the source of all sounds Irregular, chaotic vibrations produce noise Regular, controlled vibration can produce music All sound is a combination of pure frequencies

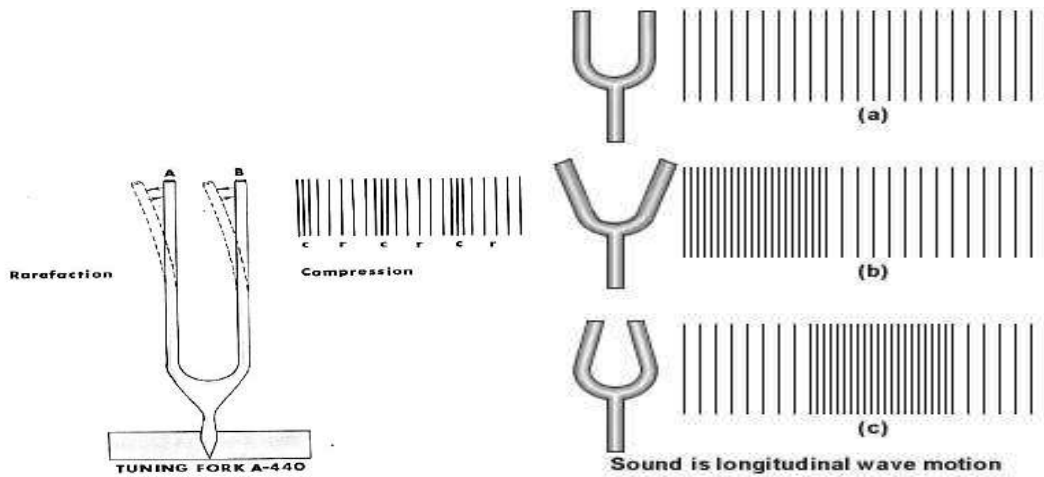
A stretched rubber band when plucked vibrates and produces sound.

2. Propagation of Sound

When an object vibrates, the particles around the medium vibrate. The particle in contact with the vibrating object is first displaced from its equilibrium position

The disturbance produced by the vibrating body travels through the medium but the particles do not move forward themselves.

A wave is a disturbance which moves through a medium by the vibration of the particles of the medium. So sound is considered as a wave. Sound waves Require medium for transmission. **Sound waves are called mechanical waves.** When a vibrating object moves forward, it pushes and compresses the air in front of it forming a region of high pressure called compression (C). When the vibrating object moves backward, it forms a region of low pressure called rarefaction (R).



A vibrating object producing a series of compressions (C) and rarefaction (R)

In these waves the particles move back and forth parallel to the direction of propagation of the disturbance. **Such waves are called longitudinal waves.**

There is another kind of waves called transverse waves. In these waves the particles oscillate up and down perpendicular to the propagation of the direction of disturbance.

Sound propagates in a medium as a series of compressions (C) and rarefactions (R).

Compressions are the regions of high pressure and density where the particles are crowded and are represented by the upper portion of the curve called crest.

Rarefactions are the regions of low pressure and density where the particles are spread out and are represented by the lower portion of the curve called trough

Characteristics of a sound wave

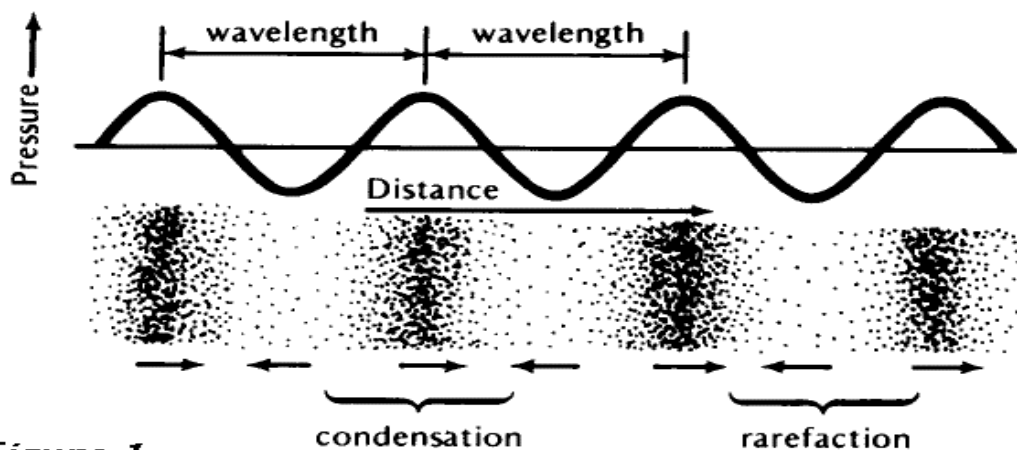


Figure 1

Frequency of sound wave

The number of oscillations per unit time is called the frequency of the sound wave.

It is represented by the symbol ν (Greek letter nu). Its SI unit is hertz (Hz)

Time period of sound wave

Frequency and time are represented as follows:-

V for one oscillation

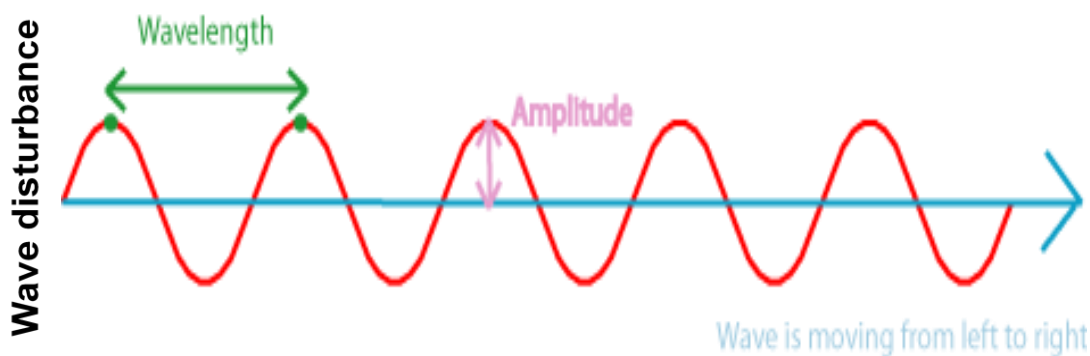
$$T = \frac{1}{V} \quad \text{or} \quad V = \frac{1}{T}$$

Amplitude of sound wave

The amplitude of sound wave is the height of the crest or trough.

It is represented by the letter A.

The SI unit is the same as that of density or pressure.



Wavelength and Amplitude

The wavelength is the distance between the "crests" of two waves that are next to each other.

The amplitude is how high the crests are.

Pitch and loudness of sound

The pitch of sound (shrillness or flatness) depends on the frequency of vibration.

If the frequency is high, the sound has high pitch and if the frequency is low, the sound has low pitch

Speed of sound

The speed of sound is more in solids, less in liquids and least in gases.

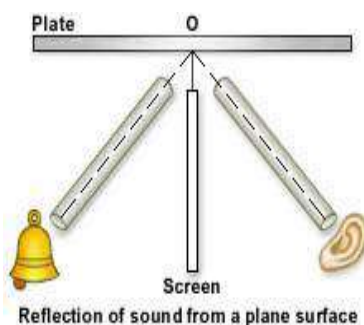
The speed of sound also depends on the temperature of the medium. If the temperature of the medium is more, the speed of sound is more

3. Reflection of Sound

Sound gets reflected at the surface of a solid or liquid and follows the laws of reflection.

- i) The angle of incidence is equal to the angle of reflection.

ii) The incident ray, the reflected ray and normal at the point of incidence all lie in the same plane.



4. Echo

If we shout or clap near a reflecting surface like tall building or a mountain, we hear the same sound again. This sound which we hear is called echo. It is caused due to the reflection of sound.

To hear an echo clearly, the time interval between the original sound and the echo must be at least 0.1 s.

Since the speed of sound in air is 344 m/s, the distance travelled by sound in 0.1 s = $344 \text{ m/s} \times 0.1 \text{ s} = 34.4 \text{ m}$

So to hear an echo clearly, the minimum distance of the reflecting surface should be half this distance that is 17.2 m.

Reverberation

Echoes may be heard more than once due to repeated or multiple reflections of sound from several reflecting surfaces. This causes persistence of sound called reverberation.

In big halls or auditoriums to reduce reverberation, the roofs and walls are covered by sound absorbing materials like compressed fibre boards, rough plaster or draperies.

5. Uses Of Multiple Reflection Of Sound

Megaphones, horns, musical instruments like trumpets, etc. are designed to send sound by multiple reflection in a particular direction without spreading in all directions.

ii) Doctors listen to sounds from the human body through a stethoscope. The sound of heartbeat reaches the doctor's ears by multiple reflection.

iii) Generally the ceilings of cinema halls and auditoriums are curved so that sound after multiple reflection reaches all parts of the hall.

Sometimes a curved sound board is placed behind the stage so that sound after multiple reflection spreads evenly across the hall.

6. Range of Hearing

Human beings can hear sound frequencies between 20 Hz and 20000 Hz.

Sound whose frequency is less than 20 Hz is called infrasonic sound

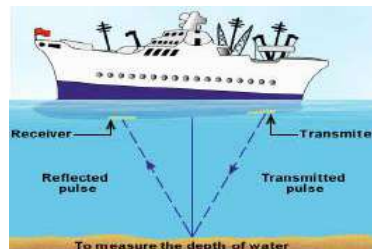
Sound whose frequency is more than 20000 Hz is called ultrasonic sound

7. Uses of ultrasonic sound

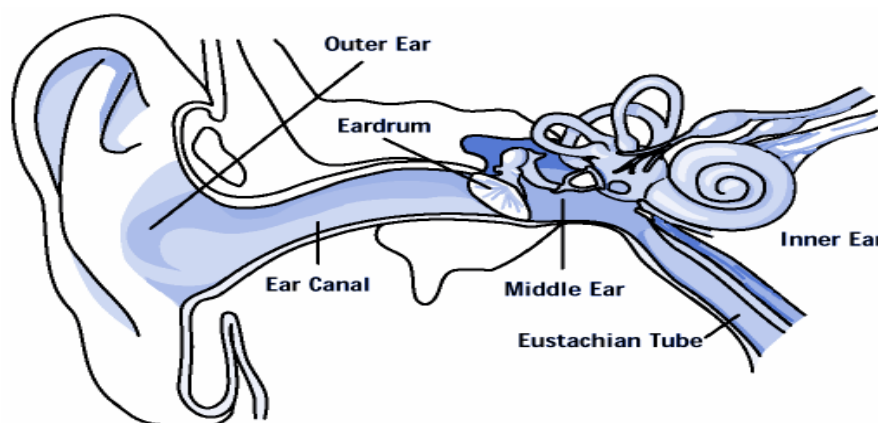
Ultrasonic sound is used to clean objects like electronic components, used to detect cracks in metal blocks, used in ultrasound scanners for getting images of internal organs of the human body used to break small stones formed in the kidneys into fine grains.

8 Sonar

It is a device which uses ultrasonic waves to measure distance, direction and speed of underwater objects. The distance of the object can be calculated by knowing the speed of sound in water and the time taken between the transmission and reception of ultrasound



9. Structure of the human ear



The sound waves pass through the ear canal to a thin membrane called eardrum. The eardrum vibrates. The vibrations are amplified by the three bones of the middle ear called

hammer, anvil and stirrup. Middle ear then transmits the sound waves to the inner ear. The brain then interprets the signals as sound.

QUESTION BANK

One mark questions

1. What do you understand by sound waves?
2. Give an example to show that sound travels at a finite speed.
3. Is sound wave longitudinal or transfer.
4. Name two quantities that vary periodically at a place in air as a sound wave travels through it .
5. An airplane produces a sound wave with frequency of 5 KHz and wavelength 30 m. In how much time would the sound wave cover the distance of 4 Km?
6. With the help of a diagram show how longitudinal waves like sound waves travel in air.
7. With the help of a diagram show how longitudinal waves like sound waves travel in air.
8. Can we hear the ringing of a mobile phone placed in a vacuum chamber?
9. Can two astronauts talk on moon a they does on the surface of the earth?

Two marks questions

1. Explain how echoes are used by bats to judge the distance of an obstacle?
2. State the special properties of ultrasound that make it useful to us .In general, how these properties are utilized.
3. Why is soft furnishing avoided in concert halls?
4. Draw a diagram depicting low pitched sound and high pitched sound and write main difference between the two?
5. Distinguish between longitudinal and transverse waves. Give one example each.
6. An explosion takes place at the moon. After what time would it be heard at the earth?

Three marks questions

1. Two sources A and B vibrate with the same amplitude. They produce sounds of frequencies 1 kHz and 30 kHz respectively. Which of the two waves will have greater power?
2. Find the time period of the source of a sound wave whose frequency is 400Hz.
3. A sound wave travels at a speed of 340m/s. If its wavelength is 2 cm, what is the frequency of the wave? Will it be in the audible range?
4. The grandparents and parents of a two year girl are playing with her in a room. A sound source produces a 28—kHz sound. who in the room is most likely to hear the sound?

Five marks questions

1. Sound cannot travel in vacuum. Describe an experiment to demonstrate this.
2. With the help of a diagram describe how compression and rarefaction pulses are produced in air near a source of sound.
3. Explain briefly how a flaw in a metal component can be detected using ultrasound?
4. Explain the working and application of SONAR.
5. A monkey drops a coconut from the top of a tree. He hears the sound of the coconut hitting the ground 2.057 seconds after dropping it .If the monkey was 19.6 metres above the ground, what is the speed of sound in air?(take $g = 9.8\text{m/s}^2$).
6. Draw a neat diagram of human ear. Explain the function of various parts.

What have you learnt

Longitudinal waves: Those in which the direction of vibration is the same as their direction of propagation. So the movement of the particles of the medium is either in the same or in the opposite direction to the motion of the wave. Exemple: sound waves, what changes in this case is the pressure of the medium (air, water or whatever it be).

Transverse waves: The oscillations occur perpendicularly to the direction of energy transfer.

Exemple: a wave in a tense string. Here the varying magnitude is the distance from the equilibrium horizontal position

A general property of waves is that their speed relative to medium depends on the properties of medium but is independent of the motion of the source of waves. If the observer is in motion with respect to the medium, the velocity of wave propagation relative to the observer will be different. A remarkable exception is encountered in the case of light

PROPERTIES

Frequency

- Wavelength
- Period
- Amplitude
- Intensity
- Speed
- Direction

Perception of Sound

For humans, hearing is limited to frequencies between about 20 Hz and 20000 Hz, with the upper limit generally decreasing with age.

KEY LEARNING:

Vibration - repetitive back and forth motion

Periodic motion - a motion that repeats itself

Mechanical waves require medium for propagation

Waves move through medium but medium remains in place

Longitudinal waves-Vibration direction parallel to wave propagation direction Particles in medium move closer together/farther apart .Example: sound waves

Gases and liquids - support only longitudinal waves

Transverse waves-

Vibration direction perpendicular to wave propagation direction .Example: plucked string

Solids - support both longitudinal and transverse waves Sound waves Require medium for transmission

1. Sound is a wave motion, produced by a vibrating source.
2. A medium is necessary for the propagation of sound waves.
3. Sound is a longitudinal wave in which the particles of medium move along the direction of motion of wave.
4. The part or region of a longitudinal wave in which the density of the particles of the medium is higher than the normal density is known as compression.
5. The part or region of a longitudinal wave in which the density of the particles of the medium is lesser than the normal density is called a rarefaction.
6. The point of maximum positive displacement on a transverse wave is known as crest.
7. The point of maximum negative displacement on a transverse wave is known as trough.
8. A wave of short duration which is confined to a small portion of a medium at any given time is known as a pulse.
9. The maximum displacement of particles of the medium from their mean positions during the propagation of a wave is known as amplitude of the wave.
10. The distance traveled by a wave in one second is called wave velocity. It depends upon the nature of the medium through which it passes.
11. The speed of sound depends primarily on the nature and the temperature of the transmitting medium.
12. Sound travels faster in solids than in air. The speed of sound in solids is much more than the speed of sound in liquids or gases.
13. The distance between two consecutive compressions or two consecutive rarefactions is called the wavelength.
14. Frequency is defined as the number of oscillations per second.
15. The time taken by the wave for one complete oscillation of the density or pressure of the medium is called the time period, T .
16. How the brain interprets the frequency of an emitted sound is called the pitch of sound.
17. Loudness is the degree of sensation of sound produced.
18. Sound properties such as pitch, loudness and quality are determined by the corresponding wave properties.
19. Sound gets reflected and follows the same law as the reflection of light.
20. The persistence of sound due to repeated reflection and its gradual fading away is called reverberation of sound.

21. Echo is a repetition of sound due to the reflection of original sound by a large and hard obstacle.
22. The audible range of hearing for average human beings is in the frequency range of 20 Hz – 20 kHz.
23. The amount of sound energy passing each second through unit area is called the intensity of sound.
24. Sound of frequency less than 20 Hz is known as infrasound and greater than 20 kHz is known as ultrasound.
25. Ultrasound has many medical and industrial applications.
26. SONAR stands for Sound Navigation and Ranging and it works on the principle of reflection of sound waves.
27. The SONAR technique is used to determine the depth of the sea and to locate under water hills, valleys, submarines, icebergs sunken ships etc.

Explorations

- NCERT text book for class IX
- Foundation science for class IX By- H C Verma
- Self study in Science By-Evergreen Publications
- <http://www.fi.edu/pieces/cych/apollo%2010/story/hoi/ball3.html>
- http://www.fi.edu/pieces/cych/apollo_10/story/hoi/ball.html
- McGraw-Hill dictionary of engineering. (2nd ed.). New York, NY: McGraw-Hill.
- Microsoft, Inc. (2008). *Clip art*. Retrieved January 10, 2008, from <http://office.microsoft.com/en-us/clipart/default.aspx>
- National Aeronautics and Space Administration (NASA). (1997). *Daedalus*. Retrieved April 2, 2008, from <http://www.dfrc.nasa.gov/Gallery/Photo/Daedalus/>
- U.S. Department of Energy. (2008). *Scientific forms of energy*. Retrieved March 23, 2008, from <http://www.eia.doe.gov/kids/energyfacts/science/formsofenergy.html>
- http://webphysics.davidson.edu/physlet_resources/bu_semester1/c2_twocars_graphs.html
- <http://www.physicsclassroom.com/mmedia/kinema/fs.html>
- <http://www.physicsclassroom.com/mmedia/kinema/plv.html>
- <http://www.physicsclassroom.com/mmedia/kinema/rocket.html>
- <http://www.physicsclassroom.com/mmedia/kinema/stl.html>
- <http://video.google.com/videoplay?docid=-2960800254662978674&q=%2B%22terminal+velocity%22&total=96&start=0&num=10&so=0&type=search&plindex=0>

ZIET CHANDIGARH
KENDRIYA VIDYALAYA SANGATHAN
BLUE PRINT
SUBJECT – SCIENCE CLASS - IX
Summative Assessment – I (SA 1 – Term I)

Time: 3 hours

M.M.: 90

S.N o	Form of questions → Chapters ↓	MM	VSA	SA- I	SA-II	LA	MCQ	TOTAL
1.	FOOD a) Improvement in food resources	13	----	----	2(6)	1(5)	2(2)	5(13)
2.	Matter - its Nature & Behaviour a) Ch.1-Matter in our surroundings b) Ch.2-Is matter around us pure	29	1(1)	----	1(3)	1(5)	5(5)	16(29)
			----	1(2)	1(3)	1(5)	5(5)	
3.	Organisation in the living world a) Ch.5 –Fundamental unit of life b) Ch.6 – Tissues	18	1(1)	1(2)	1(3)	-----	2(2)	10(18)
			----	1(2)	2(6)	-----	2(2)	
4.	Motion , Force & Work a) Ch.8- Motion b) Ch.9-Force and Law of motion c) Ch.10- Gravitation	30	----	----	1(3)	1(5)	6(6)	11(30)
			1(1)	----	2(6)	1(5)	2(2)	
			----	1(2)	2(6)	----	----	
	TOTAL	90	3(3)	4(8)	12(36)	5(25)	18(18)	42(90)

ZIET CHANDIGARH
KENDRIYA VIDYALAYA SANGATHAN
SCIENCE (THEORY)
Summative Assessment – I (SA 1 - Term I)
CLASS : IX

MAX. Marks: 90

TIMES: 3 Hrs.

General Instructions:

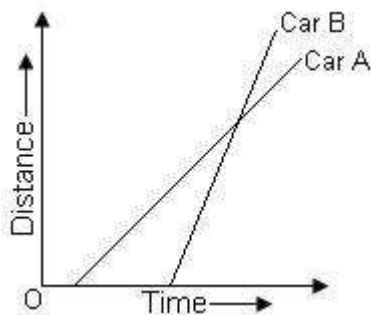
- a. *The question paper comprises of two sections A and B, you are to attempt both the sections.*
- b. *All questions are compulsory.*
- c. *There is no overall choice. However internal choice has been provided in all the three questions of five marks category. Only one option in each question is to be attempted.*
- d. *Questions from **1 to 3** in section A are one mark questions these are to be answered in one word or a sentence.*
- e. *Questions from **4 to 7** in section A are Two marks questions. These are to be answered in about 30 word each.*
- f. *Questions from **8 to 19** in section A are Three marks questions These are to be answered in about 50 word each.*
- g. *Questions from **20 to 24** in section A carry five marks questions. These are to be answered in 70 words each.*
- h. *Questions from **25 to 42** in section B are multiple choice questions based on practical skills. Each question is one mark question. You are to select one most appropriate response out of the four provided to you.*

SECTION – A

1.	A substance has a definite volume but no definite shape. State whether this substance is a solid, liquid or a gas.	1
----	--	---

2.	What is the resultant force of a number of balanced forces acting on body?	1																																				
3.	Name the plastids which have chlorophyll .	1																																				
4.	State the difference between homogeneous & heterogeneous mixture . Give one example of each.	2																																				
5.	What is the relation between the mass and the weight of the body ? What are the differences between the two ?	2																																				
6.	State two differences between a mitochondria and plastid.	2																																				
7.	Mention the significance of meristems in plants.	2																																				
8.	Give reasons : a) A sponge can be pressed easily; still it is called a solid. b) Water vapours have more energy than water at same temperature. c) Naphthalene balls disappear with time without leaving any solid.	3																																				
9.	What is meant by concentration of a solution. Calculate the concentration of a solution which contains 12 g of urea in 160 g of solution.	3																																				
10.	Consider the following details. Can you interpret the type of motion shown by car A and car B? Show calculations. Car-A <table border="1" data-bbox="263 1205 1326 1294"><tr><td>Time in Seconds</td><td>0</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td><td>30</td><td>35</td></tr><tr><td>Distance covered in metres</td><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td></tr></table> Car-B <table border="1" data-bbox="263 1384 1326 1473"><tr><td>Time in Seconds</td><td>0</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td><td>30</td><td>35</td></tr><tr><td>Distance covered in metres</td><td>0</td><td>5</td><td>15</td><td>20</td><td>30</td><td>60</td><td>65</td><td>75</td></tr></table>	Time in Seconds	0	5	10	15	20	25	30	35	Distance covered in metres	0	10	20	30	40	50	60	70	Time in Seconds	0	5	10	15	20	25	30	35	Distance covered in metres	0	5	15	20	30	60	65	75	3
Time in Seconds	0	5	10	15	20	25	30	35																														
Distance covered in metres	0	10	20	30	40	50	60	70																														
Time in Seconds	0	5	10	15	20	25	30	35																														
Distance covered in metres	0	5	15	20	30	60	65	75																														
11.	Which of the following has more inertia & Why ? a) A rubber ball and a stone of the same size . b) A bicycle and a train.	3																																				
12.	Two similar trucks are moving with a same velocity on a road. One of them is loaded while the other is empty. Which of the two will require a larger force to stop it?	3																																				
13.	Consider two bodies A and B. The body B is heavier than A. Which of the bodies is attracted with a greater force by earth? Which of the two will fall with greater acceleration? Explain.	3																																				
14.	Show that if a body is taken to a height H above the earth's surface acceleration due	3																																				

	to gravity is decreased by the factor $R^2 / (R+H)^2$, Where R is the radius of the earth.	
15.	State the ways in which phloem is functionally different from Xylem.	3
16.	Draw a neat diagram of a section of Phloem and label four parts.	3
17.	Give one important functional difference amongst the muscle tissues and draw a labeled diagram of the muscle tissue which never shows fatigue.	3
18.	Which cell organelle would you associate with elimination of old and worn out cells & Why?	3
19.	Which two factors bring about loss of food grains during storage? Give one example each. State any two control measures to be taken before grains are stored.	3
20.	<p>a) Account for the following:</p> <p>i) Hydrogen is considered an element.</p> <p>ii) Water is regarded as compound.</p> <p>b) What is the physical state of water at i) 250°C ii) 100°C ?</p> <p style="text-align: center;">OR</p> <p>a) What is meant by evaporation? What are the factors on which the rate of evaporation depend upon?</p> <p>b) How does evaporation cause cooling?</p>	5
21.	<p>a) Name the process you would use to :</p> <p>i) recover sugar from an aqueous sugar solution.</p> <p>ii) separate mixture of salt solution and sand.</p> <p>b) Which of the following will show "Tyndal Effect" & why ?</p> <p>i) Salt Solution ii) Milk</p> <p>iii) Copper Sulphate Solution iv) Starch Solution</p> <p style="text-align: center;">OR</p> <p>a) How are sol, solution and suspension different from each other?</p> <p>b) Which of the following is chemical change? Justify.</p> <p>i) Rusting of iron ii) Mixing of iron fillings and sand</p> <p>iii) Cooking of food iv) Freezing of water</p>	5
22.	The graph below represents the distance-time graph of two cars A and B. Which car is moving with a greater speed when both are moving and why?	5



OR

Define uniform acceleration . Derive the following equations considering uniform acceleration:

a) $s = ut + \frac{1}{2} at^2$

b) $v^2 = u^2 + 2as$

23.	<p>Identify whether it is balanced or unbalanced force that causes the following different types of movement.</p> <p>(i) A person resting in an armchair.</p> <p>(ii) A cyclist braking.</p> <p>(iii) A lorry travelling at a constant speed on a straight road.</p> <p>(iv) A car that has a deceleration of 10 m/s^2.</p> <p>OR</p> <p>Explain hoe Newton’s second law can be used to define the unit of force. Define the SI unit of force.</p>	5
24.	<p>How crop variety improvement methods come to the rescue of farmers facing repeated crop failure? Describe three factors for which they could do crop improvement.</p> <p>Which is the most common method of obtaining improved variety of crops? Explain briefly.</p> <p>OR</p> <p>A poultry farmer wants to increase his broiler production. Explain three management practices followed to enhance the yield</p> <p>In what way is the daily food requirement of broiler different from those of egg layers.</p>	5

ZIET CHANDIGARH
KENDRIYA VIDYALAYA SANGATHAN

BLUE PRINT

SUBJECT – SCIENCE CLASS - IX

Summative Assessment –II (SA 2 - Term II)

Time: 3 hours

M.M.: 90

S.No	Form of questions → Chapters ↓	Marks	VSA	SA- I	SA-II	LA	MCQ	TOTAL
1.	Matter - its Nature & Behaviour a) Ch.3- Atom & Molecules b) Ch.4- Structure of atom	17	1(1)	-----	1(3) 2(6)	1(5) -----	2(2) -----	5(11) 2(6)
2.	Organisation in the living world a) Ch.7 - Diversity in living organisms b) Ch.13 – Why do we fall ill ?	25	1(1)	1(2) 1(2)	2(6) 1(3)	1(5) -----	6(6) -----	11(20) 2(5)
3.	Motion , Force & work a) Ch.10 Gravitation (Floatation) b) Ch.11 Work c) Ch.12 Sound	36	-----	1(2) 1(2) -----	1(3) 2(6) 1(3)	----- 1(5) 1(5)	6(6) ----- 4(4)	8(11) 4(13) 6(12)
4.	Our Environment a) Ch.14 Natural Resources	12	1(1)	-----	2(6)	1(5)	-----	4(12)
	TOTAL	90	3(3)	4(8)	12(36)	5(25)	18(18)	42(90)

ZIET CHANDIGARH
KENDRIYA VIDYALAYA SANGATHAN
SUBJECT – SCIENCE CLASS - IX

Summative Assessment –II (SA 2 - Term II)

MAX. Marks: 90

TIMES: 3 Hrs.

General Instructions:

- a. *The question paper comprises of two sections A and B, you are to attempt both the sections.*
- b. *All questions are compulsory.*
- c. *There is no overall choice. However internal choice has been provided in all the three questions of five marks category. Only one option in each question is to be attempted.*
- d. *Questions from **1 to 3** in section A are one mark questions these are to be answered in one word or a sentence.*
- e. *Questions from **4 to 7** in section A are Two marks questions. These are to be answered in about 30 word each.*
- f. *Questions from **8 to 19** in section A are Three marks questions These are to be answered in about 50 word each.*
- g. *Questions from **20 to 24** in section A carry five marks questions. These are to be answered in 70 words each.*
- h. *Questions from **25 to 42** in section B are multiple choice questions based on practical skills. Each question is one mark question. You are to select one most appropriate response out of the four provided to you.*

SECTION – A

1.	Give an example of tri atomic gas.	1
2.	The growth in plants is limited to certain regions. What is the reason?	1
3.	How the frequency of wave is related to its time period?	1
4.	State the factors on which work done depends.	2
5.	What are the main points of the Cell Theory proposed by Sclieden and Schwan?	2

6.	A car with a speed of 25m/s weighing 900 Kg stops at a distance of 40 metres. Calculate the force exerted and the and work done by the brakes.	2
7.	What is Relative Density ? If an object is immersed wholly in a liquid causing upthrust equal to the weight of the body, then what will be the relation between the Relative densities of liquid and the object.	2
8.	What is Symbiosis? Name a symbiotic life form. Mention the specific organisms which display the symbiotic relationship in this life form.	3
9.	Write the formulas & names of the compounds formed between : a) Sodium and carbonate ions b) Aluminium and sulphate ions c) Barium and chloride ions	3
10.	a) Calculate molar mass of S ₈ . b) Convert into mole : i) 12 gram of oxygen gas ii) 32 gram of oxygen molecule	3
11.	Write three significant features of Bohr's Model of atom.	3
12.	Suppose a man is trying to push a wall. But the wall doesn't move. What is the amount of work done? Calculate the amount of work done in lifting a body of mass 3 Kg through a distance of 11 metres.	3
13.	Explain the salient features of Phylum Mollusca.	3
14.	a) What are Concentrates in animal feed ? b) Name two Internal Parasites that cause diseases in animals.	3
15.	a) Describe an activity to demonstrate the process of Osmosis. b) How does carbon dioxide move in and out of cells?	3
16.	Give three differences, between Angiosperms and Gymnosperms.	3
17.	Calculate the wavelength of a sound wave whose frequency is 220 Hz and speed is 440 m /s in a given medium.	3
18.	Explain the principle behind the wind up toys. A cat and a mouse are running with the same speed. If the weight of the cat is 20 times that of mouse, what is the ratio of their kinetic energy?	3
19.	State Archimedes Principle. Why does an object float or sink in water ?	3

20.	<p>a) State the Law of conservation of mass & Law of definite proportion with the help of one example each.</p> <p>b) What are polyatomic ions? Give two examples.</p> <p style="text-align: center;">OR</p> <p>a) State any two differences between an atom and molecule.</p> <p>b) How ${}^{22}_{10}\text{Z}$ and ${}^{20}_{10}\text{Z}$ related to each other and why? If abundance of ${}^{22}_{10}\text{Z}$ and ${}^{20}_{10}\text{Z}$ is 90% & 10% respectively then calculate the average atomic mass of Z?</p>	5
21.	<p>Which part of the ear contains the actual hearing organ? Draw the structure of the ear and label it.</p> <p style="text-align: center;">OR</p> <p>Show that the reflector must be situated at a least distance from the observer for formation of distinct echo. What is the value of this distance at room temperature? Why ceilings of concert halls and conference halls are made curved?</p>	5
22.	<p>a) What is transformation of energy? Explain with any two suitable examples.</p> <p>b) What must be the velocity of a moving body of mass 2 kg so that its K.E. is 25 J?</p> <p>c) Represent graphically constant force acting on a body producing a displacement along the direction of motion on a force-displacement graph. What is the significance of force-displacement graph?</p> <p style="text-align: center;">OR</p> <p>a) Define potential energy. Give two examples.</p> <p>b) Two bodies of different masses m_1 and m_2 ($m_1 > m_2$) have same kinetic energy. They are stopped by applying same retarding force. Which body will stop first?</p>	5
23.	<p>a) Why do we classify organisms? Write its any four advantages.</p> <p>b) Why is there a need for systematic naming of living organisms? Write four conventions that are followed while writing scientific names of the species.</p> <p style="text-align: center;">OR</p> <p>a) What are the basis of putting plants and animals in two different categories? Write one main difference between fungi and plantae.</p> <p>b) Classify the following in their respective phylum / class; Jellyfish, Earthworm, Cockroach, Rat.</p>	5

30.	The frequency ,wavelength and speed of a sound wave are related as : a) $v = \lambda \times f$ b) $\lambda = v \times f$ c) $v = \lambda / f$ d) $v = \lambda \times f$	1
31.	If a flower has 6 petals which type of a plant would it be ? a) Dicot b) Monocot c) Both (a) and (b) d) None of these	1
32.	If the density of air in the lab ,at a point through which a sound wave is passing is maximum at an instant , the pressure at that point will be : a) Minimum b) Same as the density of air c) Equal to the atmospheric pressure d) Maximum	1
33.	Amphibians of the plant kingdom are : a) Thallophyta b) Pteridophyta c) Bryophyta d) None of these	1
34.	Choose the option which includes the feature that helps the fish to change its direction a) caudal fin and pelvic fin b) Dorsal fin and anal fin c) Dorsal fin only d) Caudal fin only	1
35.	You are shown two slides of plant tissues; Parenchyma and Sclerenchyma. You can identify the Sclerenchyma by the: a) location of nucleus b) thickness of the cell wall c) size of the cell d) position of vacuoles	1
36.	A sound wave consists of : a) A number of compression pulses one after the other b) A number of rarefaction pulses one after the other. c) Compression and rarefaction pulses one after the other. d) A compression and rarefaction pulse separated by a distance equal to one wavelength.	1

37.	Wave produced along a compressed spring are : a) Longitudinal wave b) Transverse wave c) Seismic wave d) Electromagnetic wave	1
38.	Water meniscus in a graduated cylinder is of concave shape. While finding the volume, the correct reading will correspond to : a) upper end of meniscus b) lower end of meniscus c) the midpoint of meniscus d) anywhere on the meniscus	1
39.	The buoyant force on a body acts in a : a) vertically downward direction b) vertically upward direction c) Horizontal direction d) direction between the horizontal and vertical	
40.	While taking readings on the spring balance what are the things you should take into account ? a) Zero error b) Least count c) Both (a) and (b) d) None of these	1
41.	A body floats in a liquid if the buoyant force is: a) Zero b) Greater than its weight c) Less than its weight d) equal to its weight	1
42.	Two bodies of unequal masses are dropped from the table. At any instant , they have equal: a) Momentum b) acceleration c) Potential energy d) Kinetic energy	1
