SUPPORT MATERIAL

CLASS IX

SCIENCE

SA-II

TEAM MEMBERS

GROUP LEADER :

SMT. SANGEETA JAY (PRINCIPAL)

R.R.V., S.K.V., B-BLOCK, NAND NAGRI, DELHI

PAWAN KUMAR T.G.T. (N. Sc.)	(B.P.) S.B.V., B-BLOCK NAND NAGRI, DELHI.
KAPIL SHARMA T.G.T. (N. Sc.)	R.P.V.V., D-BLOCK NAND NAGRI, DELHI.
NEELAM TYAGI T.G.T. (N. Sc.)	R.R.V., S.B.V., B-BLOCK NAND NAGRI, DELHI.
ANIL TICKOO T.G.T. (N. Sc.)	R.R.V., S.B.V., B-BLOCK NAND NAGRI, DELHI.
SARITA SHARMA T.G.T. (N. Sc.)	G.G.S.S.S., JANTA FLATS, DELHI.
NEERA GUPTA T.G.T. (N. Sc.)	G.G.S.S.S., JANTA FLATS, DELHI.
UPMA MAHAJAN T.G.T. (N. Sc.)	S.K.V., BABARPUR, DELHI.
PRACHI MAHESWARI T.G.T. (N. Sc.)	S.K.V., BABARPUR, DELHI.

CONTENTS

QUESTION PAPER DESIGN FOR SCIENCE (CODE NO. 086/090)
CLASS-IX (2016-17)

Time : 3 Hours **Max. Marks : 90**

S. No.	Typology of Questions	Very Short Answer (VSA) 1 Mark	Short Answer-I (SAI) 2 Marks	Short Answer-II (SAII) 3 Marks	Long Answer (LA) 5 Marks	Total Marks	% Wei.
1.	**Remembering** (Knowledge based simple recall questions, to know specific facts, terms, concepts, principles or theories, identify, define or recite, information)	3	-	1	1	11	15%
2.	**Understanding** (Comprehension to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase or interpret information)	-	1	4	1	19	25%
3.	**Application** (Use abstract information in concrete situation, to apply knowledge to new situations, use given content to interpret a situation, provide an example, or solve a problem)	-	-	4	1	17	23%
4.	**High Order Thinking Skills** (Analysis & Synthesis : Classify, compare, contrast or differentiate between different pieces of information, organize and/or integrate unique pieces of information from a variety of sources)	-	2	-	1	9	12%

5.	**Inferential and Evaluate** (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	-	-	2 + 1*	2	19	25%
	Total (Theory Based Questions)	**3 × 1 = 3**	**3 × 2 = 6**	**12 × 3 = 36**	**6 × 5 = 30**	**75 (24)**	**100 %**
	Practical Based Questions (PBQs)	**9 × 1 = 9**	**3 × 2 = 6**	**-**	**-**	**15 (12)**	
	Total	**12 × 1 = 12**	**6 × 2 = 12**	**12 × 3 = 36**	**6 × 5 = 30**	**90 (36)**	

Note : The question paper of SA-II will include a section on Open Text Based Assessment (OTBA) of 10 marks. The case studies will be supplied in advance. This material is designed to test the analytical and higher order thinking skills of students.

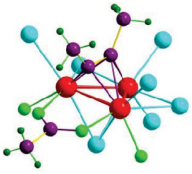
** One question of 3 marks will be included to assess the values inherent in the texts.*

WEIGHTAGE OF MARKS UNIT WISE

CLASS IX

Second Term — Marks : 90

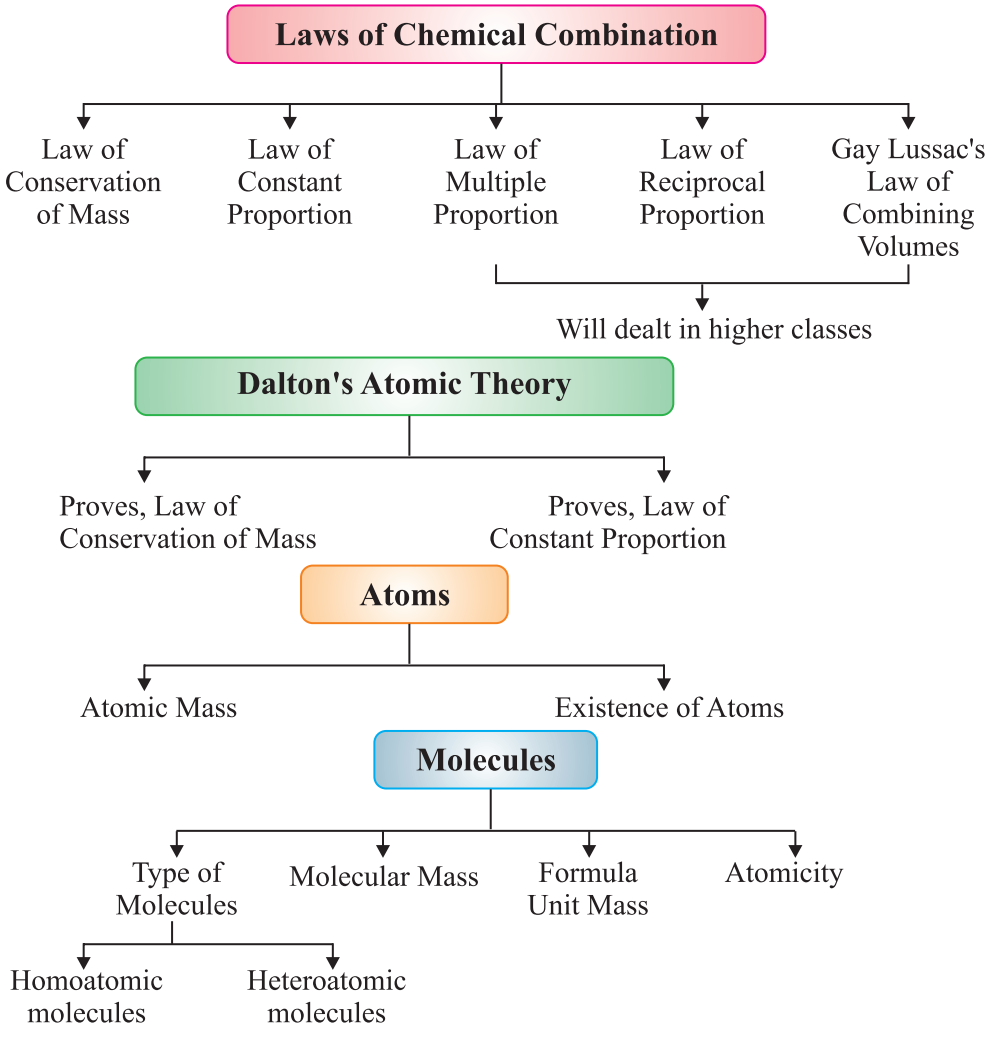
Unit No.	Unit	Marks
I	Matter – Its Nature & Behaviour	18
II	Organisation in Living World	26
III	Motion, Force and Work	36
V	Our Environment	10
	Total	**90**

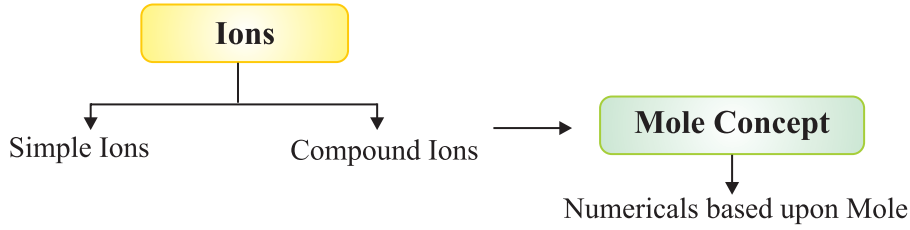


Chapter - 1

Atoms And Molecules

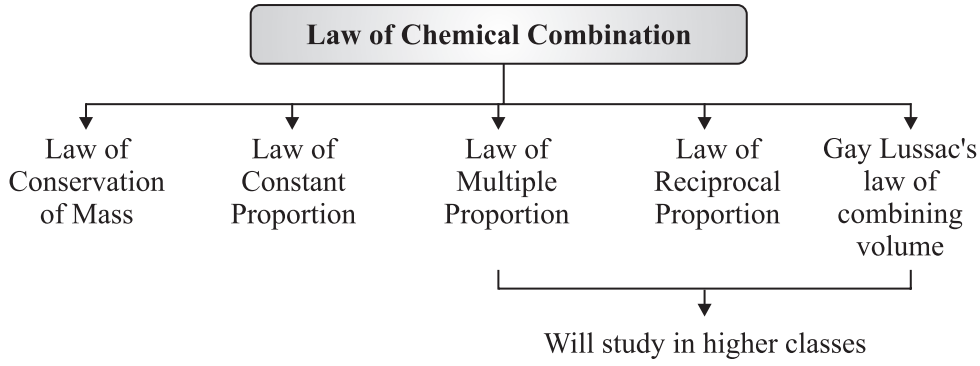
CHAPTER AT A GLANCE





Laws of Chemical Combination

The chemical reaction between two or more substances giving rise to products is governed by certain laws. These laws are called 'Laws of Chemical Combination'.



Law of Conservation of Mass

- According to this law, "Mass can neither be created nor destroyed."
- In a chemical reaction, this law can be understood in the following way :

"During a chemical reaction total mass of reactants will be equal to total mass of products."

- For example, $A + B \rightarrow AB$

Reactant Product

Then, $m_A + m_B = m_{AB}$

where, m_A = Mass of A

m_B = Mass of B

m_{AB} = Mass of AB

$2H_2$ (g)	+	O_2 (g)	→	$2H_2O$ (*l*)
$2 \times 2 = 4$ gm		$2 \times 16 = 32$ gm		$2 \times (2 + 16) = 36$ gm

Example : In a reaction 5.3 gm of sodium carbonate reacted with 6 gm of ethanoic acid. The products were 2.2 gm of CO_2, 0.9 gm of H_2O and 8.2 gm of sodium ethanoate. Show that these observation are all in agreement with law of

conservation of mass.

Sodium carbonate + Ethanoic acid → Sodium ethanoate + CO_2 + H_2O

Solution :

$$\underbrace{\text{Sodium carbonate} + \text{Ethanoic acid}}_{\text{Reactants}} \rightarrow \underbrace{\text{Sodium ethanoate} + CO_2 + H_2O}_{\text{Products}}$$

Now, according to the law of conservation of mass :

Mass of sodium carbonate + Mass of ethanoic acid = Mass of sodium ethanoate + Mass of CO_2 + Mass of H_2O

Putting values of masses from the equation :

5.3 gm + 6.0 gm = 8.2 gm + 2.2 gm + 0.9 gm

Or 11.3 gm = 11.3 gm

Since, LHS = RHS

∴ Law of conservation of mass is in agreement with the given values in equation.

Law of Constant Proportion

According to this law, "A pure chemical compound always contain the same elements combined together in the same proportion by mass irrespective of the fact from where the sample has been taken or from which procedure has it been produced."

For example :

18 gm of H_2O ⇒ 16 gm of oxygen + 2 gm of hydrogen,

i.e., $m_H/m_O = 2/16 = 1/8$

36 gm of H_2O ⇒ 32 gm of oxygen + 4 gm of hydrogen,

i.e., $m_H/m_O = 4/32 = 1/8$

09 gm of H_2O ⇒ 08 gm of oxygen + 1 gm of hydrogen,

i.e., $m_H/m_O = 1/8$

From the above three cases, differently weighing H_2O samples were taken but the ratio of masses of 'H' to mass of 'O' comes out to be '1/8' is same, proving law of constant proportion.

Likewise, if a sample of 'H_2O' was taken from anywhere *i.e.,* from well, pond, lake or anywhere the ratio of masses of 'H' to 'O' will come out to be same as '1/8'.

Example : Hydrogen and oxygen combine in the ratio 1 : 8 by mass to form

water. What mass of oxygen gas would be required to react completely with 3.0 gm of hydrogen gas ?

Solution : $\frac{m_H}{m_O} = \frac{1}{8}$ Given in equation (For H_2O)

But, $m_H = 3.0$ gm (given)

Or $\frac{3}{m_O} = \frac{1}{8}$

Or $m_O = 24$ gm

$\therefore$ Mass of oxygen will be 24 gm.

Or it will be a sample of 27 gm of H_2O where 3 gm of hydrogen is present with 24 gm of oxygen.

Dalton's Atomic Theory

Based upon laws of chemical combination, **Dalton's Atomic Theory** provided an explanation for the **Law of Conservation of Mass** and **Law of Constant Composition.**

Postulates of Dalton's atomic theory are as follows :

- All matter is made up of very tiny particles called 'Atoms'.
- Atom are indivisible particles, which can't be created or destroyed in a chemical reaction. (Proves 'Law of Conservation of Mass')
- Atoms of an element have identical mass and chemical properties.
- Atoms of different elements have different mass and chemical properties.
- Atom combine in the ratio of small whole numbers to form compounds. (Proves 'Law of Constant Proportion')
- The relative number and kinds of atoms are constant in a given compound.

Atom

- According to modern atomic theory, an atom is the smallest particle of an element which takes part in chemical reaction such that during the chemical reaction, the atom maintain its identity, throughout the chemical or physical change.
- Atoms are very small and hence can't be seen even through very powerful microscope.
- Atomic radius of smallest atom in hydrogen is 0.37×10^{-10} m or 0.037 nm.

Such that, $1\ nm = 10^{-9}\ m$

IUPAC (International Union of Pure & Applied Chemistry) Symbols of Atoms of Different Elements

Element	Symbol	Element	Symbol
Aluminium	Al	Iodine	I
Argon	Ar	Iron	Fe
Barium	Ba	Lead	Pb
Calcium	Ca	Nitrogen	N
Carbon	C	Oxygen	O
Chlorine	Cl	Potassium	K
Cobalt	Co	Silicon	Si
Copper	Cu	Silver	Ag
Fluorine	F	Sulphur	S
Gold	Au	Zinc	Zn
Hydrogen	H		

Atomic Mass

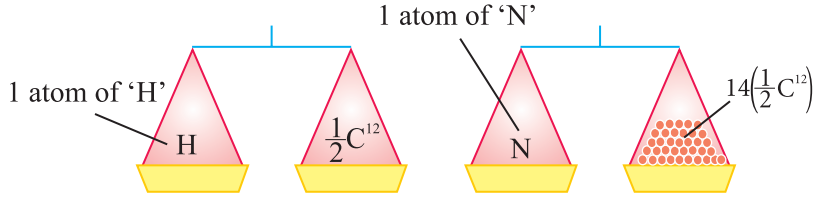
- The mass of an atom of an element is called its atomic mass.
- In 1961, IUPAC have accepted 'atomic mass unit' (u) to express atomic and molecular mass of elements and compounds.

Atomic Mass Unit

The atomic mass unit is defined as the quantity of mass equal to 1/12 of mass of an atom of carbon-12.

$$1 \text{ amu or } u = \frac{1}{12} \times \text{Mass of an atom of } C^{12}$$

$$1\ u = 1.66 \times 10^{-27}\ kg$$



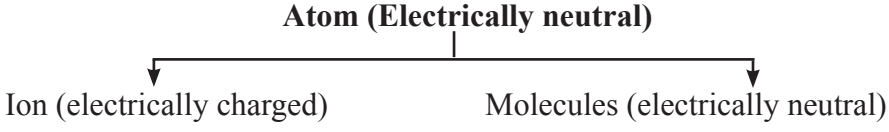
Atomic Mass of H = 1u Atomic Mass of N = 14 u

Likewise,

Element	Atomic Mass
Hydrogen	1 *u*
Carbon	12 *u*
Nitrogen	14 *u*
Oxygen	16 *u*
Sodium	23 *u*
Magnesium	24 *u*
Sulphur	32 *u*
Chlorine	35.5 *u*
Calcium	40 *u*

How do atoms exist ?

- Atoms of most of the elements are very reactive and does not exist in free state.
- Only the atoms of noble gases (such as He, Ne, Ar, Kr, Xe and Rn) are chemically unreactive and can exist in the free state as single atom.
- Atoms of all other elements combine together to form molecules or ions.



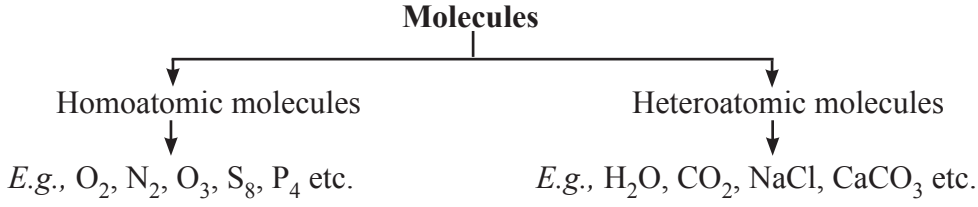
Molecule

- A molecule is a group of two or more atoms which are chemically bonded with each other.
- A molecule is the smallest particle of matter (except element) which is capable of an independent existence and show all properties of that substance.

E.g., 'H_2O' is the smallest particle of water which shows all the properties of water.

- A molecule may have atom of same or different elements, depending upon this, molecule can be categorized into two categories :

Homoatomic molecules (containing atom of same element) and **Heteroatomic molecules** or **compounds** (containing atoms of different elements)



Atomicity

The number of atoms present in one molecule of an element is called its atomicity.

	Name	Formula	Atomicity	
1.	Argon	Ar	Monoatomic (1)	Noble gases
2.	Helium	He	Monoatomic (1)	
3.	Oxygen	O_2	Diatomic (2)	Constitutes monoatomic molecules
4.	Hydrogen	H_2	Diatomic (2)	
5.	Phosphorus	P_4	Tetratomic (4)	
6.	Sulphur	S_8	Polyatomic (8)	

Chemical formulae

It is the symbolic representation of the composition of a compound.

Characteristics of chemical formulae

- The valencies or charges on ion must balance.
- When a compound is formed of metal and non-metal, symbol of metal comes first. *E.g.,* CaO, NaCl, CuO.
- When polyatomic ions are used, the ions are enclosed in brackets before writing the number to show the ratio. *E.g.,* $Ca(OH)_2$, $(NH_4)_2SO_4$

Molecular Mass

It is the sum of atomic masses of all the atoms in a molecule of that substance.

E.g., Molecular mass of H_2O = 2 × Atomic mass of Hydrogen + 1 × Atomic mass of Oxygen

So, Molecular mass of $H_2O = 2 \times 1 + 1 \times 16 = 18\ u$

Formula Unit Mass

It is the sum of atomic mass of ions and atoms present in formula for a compound.

E.g., In NaCl, Na = 23 a.m.u. Cl = 35.5 a.m.u.

So, Formula unit mass = 1 × 23 + 1 × 35.5 = 58.5 *u*

Rules for writing chemical formulae

(i) We first write symbols of elements which form compound.

(ii) Below the symbol of each element, we should write their valency.

(iii) Now cross over the valencies of combining atoms.

(iv) With first atom, we write the valency of second atom (as a subscript).

(v) With second atom, we write the valency of first atom (subscript).

Examples :

(i) Symbol : H S

Valencies : 1 2 H_2S_1 or H_2S (Hydrogen sulphide)

(ii) Symbol : C O

Valencies : 4 2 C_2O_4 or CO_2 (Carbon dioxide)

[Take 2 common and divide the formula by 2]

(iii)For Hydrochloric acid (Hydrogen chloride)

H Cl

1 1 H_2Cl_1 or HCl

(iv)For Carbon tetrachloride

C Cl

4 1 C_1Cl_4 or CCl_4

(v) For Magnesium chloride

Mg Cl

2 1 $MgCl_2$

(vi)For aluminium oxide

Al O

3 2 Al_2O_3

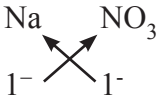
(vii)For Calcium oxide

Ca O

2 2 Ca_2O_2 or CaO

[Take 2 common and divide the formula by 2]

(viii)For Sodium nitrate (For ions)



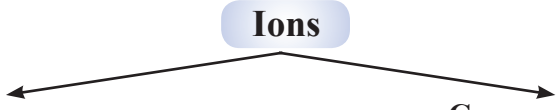
$NaNO_3$

Ions

An ion may be defined as an atom or group of atoms having positive or negative charge.

Some positively charged ions : Na^+, K^+, Ca^{2+}, Al^{3+}

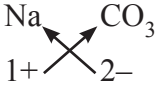
Some negatively charged ions : Cl^- (chloride ion), S^{2-} (sulphide ion), OH^- (hydroxide ion), SO_4^{2-} (sulphate ion)



Simple ions	Compound ions
Mg^{2+} (Magnesium ion)	NH_4^+ (Ammonium ion)
Na^+ (Sodium ion)	CO_3^{2-} (Carbonate ion)
Cl^- (Chloride ion)	SO_4^{2-} (Sulphate ion)
Al^{3+} (Aluminium ion)	OH^- (Hydroxide ion)

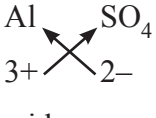
Chemical Formulae of Ionic Compounds (Polyatomic)

(i) Sodium carbonate



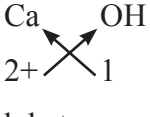
Na_2CO_3

(ii) Aluminium sulphate



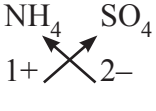
$Al_2(SO_4)_3$

(iii) Calcium hydroxide



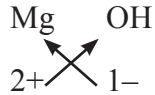
$Ca(OH)_2$

(iv)Ammonium sulphate



$(NH_4)_2SO_4$

(v) Magnesium hydroxide



$Mg(OH)_2$

Molar Mass

The molar mass of a substance is the mass of 1 mole of that substance.

It is equal to the 6.022×10^{23} atoms of that element/substance.

Example :

(a) Atomic mass of hydrogen (H) is 1 *u*. Its molar mass is 1 g/mol.

(b) Atomic mass of nitrogen is 14 *u*. So, molar mass of nitrogen (N) is 14 g/mol.

(c) Molar mass of S_8 = Mass of S × 8 = 32 × 8 = 256 g/mol

(d) Molar mass of HCl = Mass of H + Mass of Cl

= 1 = 35.5 = 36.5 g/mol

Mole concept

A group of 6.022×10^{23} particles (atoms, molecules or ions) of a substance is called a mole of that substance.

1 mole of atoms = 6.022×10^{23} atoms

1 mole of molecules = 6.022×10^{23} molecules

Example, 1 mole of oxygen = 6.022×10^{23} oxygen atoms

6.022×10^{23} is Avogadro Number (L).

- 1 mole of atoms of an element has a mass equal to gram atomic mass of the element.

Important Formulae

(i) Number of moles $(n) = \dfrac{\text{Given mass}}{\text{Molar mass}} = \dfrac{m}{M}$

(ii) Number of moles $(n) = \dfrac{\text{Given number of particles}}{\text{Avogadro's number}}$

$$n = \frac{N}{N_0}$$

(iii) $\dfrac{m}{M} = \dfrac{N}{N_0}$ $\qquad m = \dfrac{M \times N}{N_0}$

(iv) Percentage of any atom in given compound $= \frac{\text{Mass of element} \times 100}{\text{Mass of compound}}$

Example. *Calculate no. of iron atoms in a piece of iron weighing 2.8 gm (At. mass = 54 u).*

Solution : 1 mole of iron = 56 gm (Gram atomic mass of iron)

1 mole of iron element contains 6.022×10^{23} atoms of iron.

So, 56 gm of iron $= 6.022 \times 10^{23}$ atoms

2.8 gm of iron $= \frac{6.022 \times 10^{23}}{56} \times 2.8$

$= 3.011 \times 10^{22}$ atoms

Example. *Mass of one molecule of a substance is 5.32×10^{-23} g. What is its molecular mass ?*

Solution : Mass of 1 molecule of substance

$= 5.32 \times 10^{-23}$ g

Mass of 6.022×10^{23} molecules of substance

$= 5.32 \times 10^{-23} \times 6.022 \times 10^{23}$

$= 32$ g

Example. *Calculate the mass of 0.5 mole of N_2 gas.*

Solution : 1 mole of N_2 = Gram molecular mass of N_2

Or 1 mole of N_2 = 28 gm

$\therefore$ 0.5 mole of N_2 gas $= 0.5 \times 28$

$= 14$ gm of N_2

Example. *Calculate the total number of O_2 molecules present in 8 gm of O_2.*

Solution : Gram molecular mass of O_2

$= 6.022 \times 10^{23}$ O_2 molecules

Or 32 gm of O_2 $= 6.022 \times 10^{23}$ O_2 molecules

Or 8 gm of O_2 $= 6.022 \times 10^{23} \times 8/32$ O_2 molecules

$= 1.51 \times 10^{23}$ O_2 molecules

QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS

1. Write full form of IUPAC.
2. Name the scientist who gave atomic theory of matter.
3. What are building blocks of matter ?
4. Name two laws of chemical combination.
5. Name the unit in which atomic radius is usually expressed.
6. Define molecular mass.
7. What is formula unit mass ?
8. Name the element used as standard for atomic mass scale.

SHORT ANSWER TYPE QUESTIONS

1. What is atomicity ? Explain with two examples.
2. State law of conservation of mass.
3. State law of constant proportion.
4. Calculate molecular mass of H_2 and NH_3. (At. mass of H = 1 *u*, N = 14 *u*)

LONG ANSWER TYPE QUESTIONS

1. Write postulates of Dalton's atomic theory.
2. What is the difference between molecule of an element and the molecule of a compound ? Give one example of each.

HOTS

1. In what form does oxygen gas occur in nature ?
2. In what form do noble gases occur in nature ?
3. What is the difference between 2H and H_2 ?

NUMERICALS

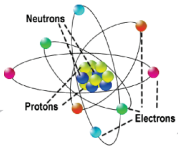
1. Calculate the gram atomic mass of one atom of oxygen. (Gram atomic mass of oxygen = 16 gm) *[**Ans.** 2.66×10^{-23} gm]*

2. What would be gram atomic mass of 5 moles of chlorine ?
*[**Ans.** 177.5 gm]*

3. Calculate the number of moles present in the following :

   (a) 52 gm of He

   (b) 12.044×10^{23} He atoms *[**Ans.** (a) 13 moles, (b) 2 moles]*



Chapter - 2

Structure of Atom

CHAPTER AT A GLANCE

Atom

- **Neutron** ← By Chadwick
- **Electron** → From cathode rays by Thomson
- **Proton** → From cathode ray by E. Goldstein

Atomic Models

- Thomson's Atomic Model
- Rutherford's Atomic Model
- Bohr's Atomic Model

Distribution of electrons in different shells

→ $(2n^2)$ Rule/Bohr-Bury Scheme

Valence Shell

→ Valence electron

Atomic Number

→ Number of protons in atom

Isotopes

→ Same atomic number different mass number

Mass Number

→ Number of protons + Number of neutrons

Isobars

→ Same mass number different atomic number

Contents :

John Dalton considered atom to be an indivisible entity, but his concept had to be discarded at the end of nineteenth century, when scientists through experiments were able to find existence of charged (electrons and protons) and neutral particles (neutrons) in the atom. These particles were called the 'Sub-atomic Particles'.

Discovery of Electrons – Cathode Rays (By J. J. Thomson)

Thomson explained presence of electrons by cathode rays experiment.

Facts about Electrons

- Charge on electron = -1.6×10^{-19} C (C = Coloumb)

  (As calculated by Robert E. Millikan)
- Mass of electron = 9.1×10^{-31} kg

Discovery of Protons – Anode Rays/Canal Rays (By E. Goldstein)

E. Goldstein by his famous anode rays/canal rays experiment was able to detect presence of positively charged particles called protons in the atom.

Facts about Protons

- Charge on proton = $+1.6 \times 10^{-19}$ C
- Mass of proton = 1.673×10^{-24} gm

  i.e., Mass of proton $\cong 1840 \times$ Mass of electron

Discovery of Neutrons (By J. Chadwick)

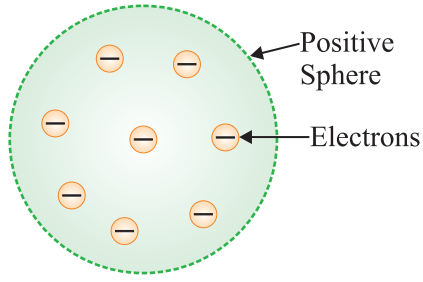
- J. Chadwick bombarded lighter elements (like lithium, boron etc.) with α-particles and observed emission of new particles having zero charge but having mass equal to that of proton.
- These particles were called 'Neutron' *i.e.,* neutral particle of the atom.
- Neutron are absent in Protium isotope of hydrogen atom.($_1H^1$)
- Since, mass of electrons are negligible as compared to that of proton and neutrons hence, sum of masses of protons and neutrons in an atom will compose its atomic mass.

Atomic Models

- From the knowledge of existence of subatomic particles viz., electron, proton and neutron in an atom, various atomic models were proposed by different scientists.
- Following are some of the atomic models :
  - (a) Thomson's Model of Atom
  - (b) Rutherford's Model of Atom
  - (c) Bohr's Model of Atom
- The most trusted and scientifically established model of atom which is adopted these days is 'Quantum Mechanical Model of Atom'. It will be dealt in higher classes.

Thomson's Atomic Model

- This model is often called the 'Water Melon Model'.
- In this model, Thomson predicted the presence of electrons inside positive sphere (made up of protons), just same as seeds of watermelon are embedded in red edible part of watermelon.



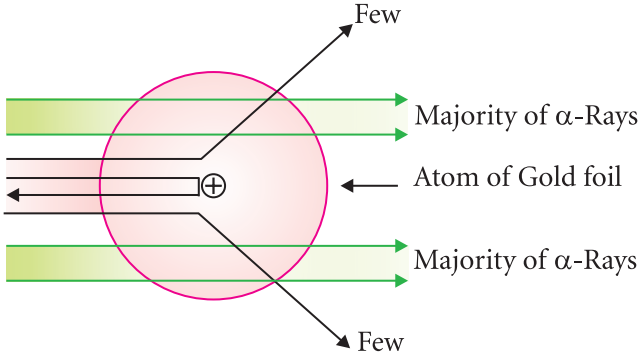
J. J. Thomson's Model of Atom

- Although this model explained neutrality of atom but couldn't able to explain other scientific experiments conducted on atom. Hence it was

discarded.

Rutherford's Atomic Model

- In his famous 'α-ray Scattering Experiment', Rutherford bombarded α-ray (Helium nucleus $_2He^4$) upon thin gold foil.
- Rutherford made following observations from this experiment :
  - (i) Most of α-particles passed through gold foil undeflected.
  - (ii) Some of the α-particles deflected by foil by small angles.
  - (iii) One out of every 12000 particles appeared to rebound.



Rutherford α-ray Scattering Experiment

- From his observation, Rutherford draw following conclusions :
  - (i) Atom consists of predominantly empty space as most of α-particles passed through gold foil undeflected.
  - (ii) Atom contains centrally placed positively charged nucleus (carrying positively charged particles), because few α-particles suffered deflected and very few *i.e.,* one in 12000 bounced back.
  - (iii) Since a minute fraction of α-particles suffered deflections and very few bounced back, this lead to conclusion that most of the space an atom is empty and the space occupied by nucleus is negligible compared to this empty space.

Size of nucleus was about 10^{-5} times that of size of atom.

  - (iv) Whole of the atomic mass concentrated in the nucleus.

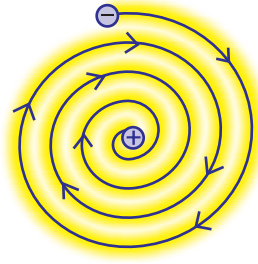
- On the basis of his experiment, Rutherford proposed model of atom having following features :
  - (i) There is positively placed nucleus in an atom. Nearly all the mass resides in nucleus (Proton + Neutron).

(ii) Electrons revolves round the nucleus in well defined orbits.

(iii) Size of nucleus is very small compared to the size of atom.

Drawbacks of Rutherford's Model (Unstability of Atom)

- According to Rutherford, electrons revolve round the nucleus in well-defined orbits, but electrons being charged particles will lose their energy and finally will fall into the nucleus. This will make atom highly unstable.
- This was the major drawback of Rutherford which was unexplained by him.



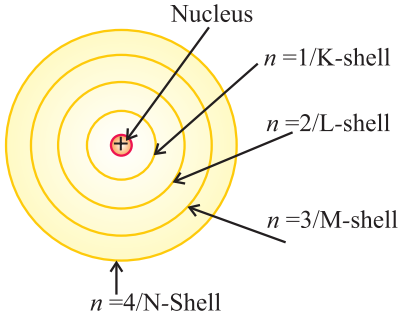
Bohr's Atomic Model

- To overcome drawbacks of Rutherford's Model, Neil Bohr in 1912 proposed modified model of structure of atom. He made following assumptions :

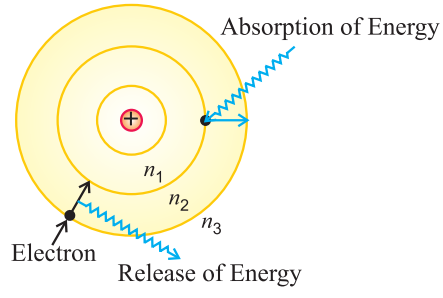
(i) Only certain special orbits known as discrete orbits of electrons are allowed inside the atom.

(ii) While revolving in discrete orbits, the electrons do not radiate energy.

(iii) Energy is emitted or absorbed by an atom only when an electron moves from one orbit to another.



Energy levels in Atom



"Electron's Energy Change"

Atomic Number

The total number of proton lying in the nucleus of any atom is called the atomic number.

- An atomic number is the identity of an atom, changing atomic number means changing the atom.
- Atomic number is denoted by 'Z'. ($Z = n_P$)
- For a neutral atom, no. of protons and electrons are equal.

Mass Number

It is the sum of total number of protons and no. of neutrons lying in the nucleus of an atom.

No. of proton No. of neutrons

- It is denoted by 'A'. ($A = n_P + n_N$)

Representation of Atom : ${}^{A}_{Z}E$ (E = Symbol of element)

E.g., ${}^{26}_{13}Al$ [$Z_{Al} = 13\ (n_P)$, $A = 13\ (n_P) + 13\ (n_N)$]

Example. *Calculate number of protons, electrons and neutrons for :*

(a) ${}^{35}_{17}Cl$ *(b)* ${}^{23}_{11}Na$

Solution : (a) ${}^{35}_{17}Cl$

$Z_{Cl} = 17\ (n_P)$

Here, since Cl is neutral, so $n_e = n_P = 17$.

Now, $A_{Cl} = 35$

Or $35 = n_P + n_N$

Or $35 = 17 + n_N$

Or $n_N = 35 - 17 = 18$

Distribution Of Electrons In Various Shells

The distribution of electrons in various shells is done in accordance to 'Bohr-Bury Scheme'.

Bohr-Bury Scheme

This scheme can be summarized as follows :

(i) The filling of electrons in an atom is done in accordance to '$2n^2$', where 'n' is the number of shell and '$2n^2$' represents the total number of

electrons that can be accommodated in that particular shell.

If $n = 1$, *i.e.,* K = shell, $2n^2 = 2 \times 1^2 = 2$ electrons

If $n = 2$, *i.e.,* L = shell, $2n^2 = 2 \times 2^2 = 8$ electrons

If $n = 3$, *i.e.,* M = shell, $2n^2 = 2 \times 3^2 = 18$ electrons

If $n = 4$, *i.e.,* N = shell, $2n^2 = 2 \times 4^2 = 32$ electrons

Maximum number of electrons that can be filled in particular shell.

(ii) The outermost shell can't hold more than 8 electrons, while second last shell can't have more than 18 electrons, even though they may have capacity to hold more electrons.

For example, in 'Ca_{20}', the electron distribution will be :

	K	L	M	N
Ca_{20} =	2	8	8	2

But Ca_{20} = 2, 8, 10 is wrong although 'M' shell can contain upto 18 electrons.

(iii) The outermost shell can't hold more than 2 electrons and the penultimate shell can't hold more than 8 electrons unless the preceding inner shell (antepenultimate shell) is filled completely obeying '$2n^2$' rule.

Some examples :

(a) K_{19} = 2, 8, 8, 1

(b) Al_{13} = 2, 8, 3

(c) F_9 = 2, 7

(d) Ne_{10} = 2, 8

(e) Na_{11} = 2, 8, 1

Valence Shell and Valence Electrons

- From Bohr-Bury sequence, we know that maximum number of electrons which can be accommodated in outermost shell is 8.
- Every element has an urge to have 8 electrons in its outermost shell, in achieving 8 electrons an atom can either gain electrons or loose electrons.
- The number of electrons lost or gained by an element in achieving 8

electrons in its outermost shell will be called its Valence.

For example,

S. No.	Element	Electron distribution	Valence
1.	C_6	2, 4	4
2.	N_7	2, 5	3
3.	O_8	2, 6	2
4.	F_9	2, 7	1
5.	Ne_{10}	2, 8	0
6.	Na_{11}	2, 8, 1	1
7.	Mg_{12}	2, 8, 2	2
8.	Ca_{20}	2, 8, 8, 2	2

- For elements like H, He, Li, Be and B, these elements lose their outermost electron to achieve 2 electrons in their outermost shell. These elements will have valence in accordance to this act.

S. No.	Element	Electron distribution	Valence
1.	H_1	1	1
2.	He_2	2	0
3.	Li_3	2, 1	1
4.	Be_4	2, 2	2
5.	B_5	2, 3	3

Isotopes :

Isotopes are atoms of same elements having same atomic number and different mass numbers.

E.g., Chlorine has two isotopes of mass numbers 35 and 37 respectively. ${}^{35}_{17}Cl$ and ${}^{37}_{17}Cl$.

Uses of isotopes

(i) Uranium isotope is used as fuel in nuclear rector.

(ii) Isotope of cobalt is useful in treatment of cancer.

(iii) An isotope of iodine is used in the treatment of goiter.

Isobars

Isobars are the atoms of those elements which have the same mass number but different atomic numbers are called isobars. $^{40}_{20}Ca$ and $^{40}_{18}Ar$ have same mass number and different atomic number. $^{24}_{11}Na$ and $^{24}_{12}Mg$ are another examples.

QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

1. The total number of electrons in Nitrogen is 7. What is its valency ?
2. What name is given to pair of atoms such as $^{14}_{7}N$ and $^{15}_{7}N$?
3. Name three subatomic particles present in an atom.
4. Name the negatively charged particle present in the atom of all the elements.
5. Which part of atom was discovered by Rutherford's alpha particle scattering experiment ?

SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. Why is an atom neutral inspite of the presence of charged particles in it ?
2. How does a proton differ from an electron ?
3. Write the distribution of electrons in an atom of element whose atomic number is 18. What is special about the outermost shell of atom in this element ?
4. An element has Z = 7. What is the valency of the element. Also name the element.

LONG ANSWER TYPE QUESTIONS (5 Marks)

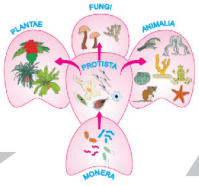
1. Differentiate between isotopes and isobars.
2. What is the relationship between the valency of an element and the number of valence electrons in its atoms ?
3. Describe Thomson's model of atom. Which subatomic particle was not

present in Thomson's model of atom ?

4. Describe Rutherford's model of atom.

HOTS

1. From the symbol $^{31}_{15}P$ state :
   (a) mass number of phosphorus.
   (b) atomic number of phosphorus.
   (c) electronic configuration of phosphorus.

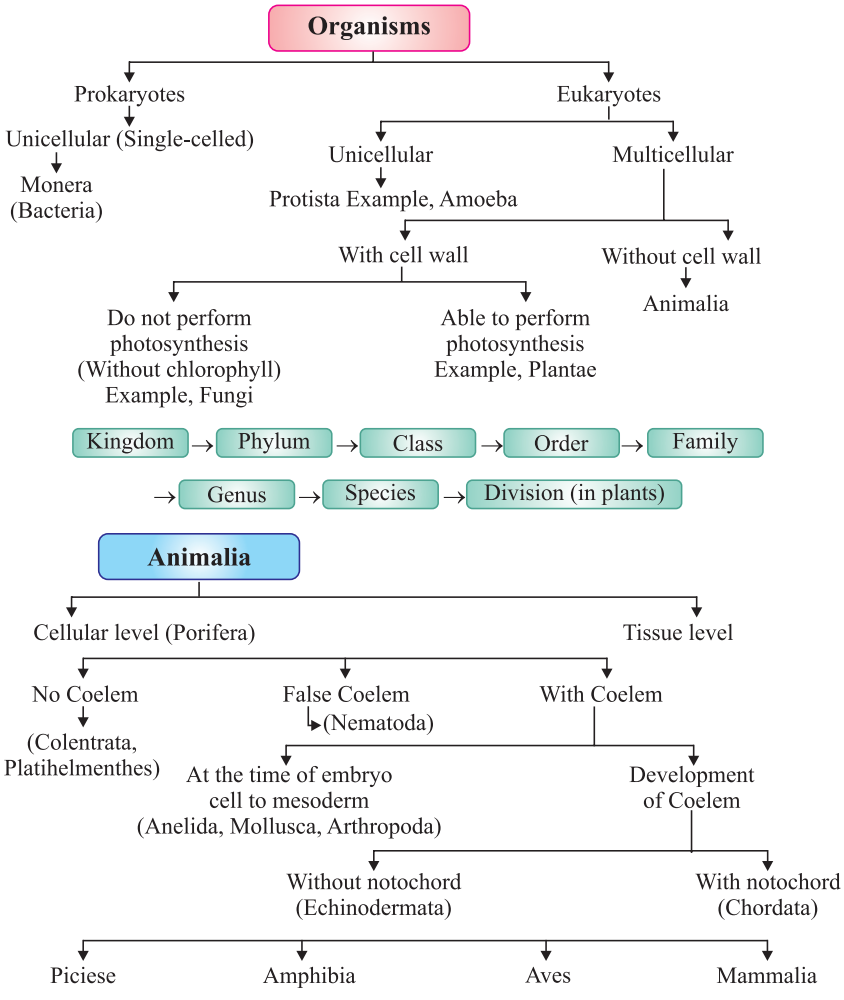


Chapter - 3

Diversity in Living Organism

CHAPTER AT A GLANCE

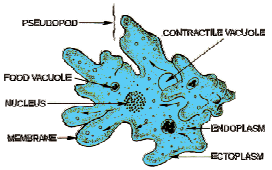
All living organism are grouped on the basis of their similarities and increasing complexities into different complexities.



FIVE KINGDOM CLASSIFICATIONS

MONERA (Unicellular Prokaryotes)	PROTISTA	FUNGI	PLANTAE	ANIMALIA
1. No defined nucleus.	1. Unicellular, eukaryotes.	1. Eukaryotic, multicellular.	1. Eukaryotic	1. Eukaryotic
2. No walled (defined cell organelles).	2. Hair like cilia, flagella for movement.	2. Hetrotrophic nutrition.	2. Multicellular	2. Multicellular
3. Nutrition-Autotrophic & Heterotrophic (Autotrophic – made by self, Hetero – made by others)	3. Nutrition – Autotrophic or heterotrophic.	3. Consume organic decaying material called saprophytes.	3. Autotrophs – Contain chlorophyll, do photosynthesis.	3. Heterotrophs
Examples – Bacteria, Blue-green algae (cyano bacteria), mycoplasma.	Examples – Unicellular, algae, diatoms and protozoans.	4. Cell made up of cell wall of tough complex sugar called chitin. Examples – Penicillium, Aspergillus, Agaricus.	4. Cells have cell walls.	4. Without cell wall.Further divided into 10 sub-groups on the basis of extent and type of body design differentiation. Examples – Tiger, peacock, ant, insects, fishes and soon.

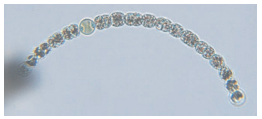
BACTERIA



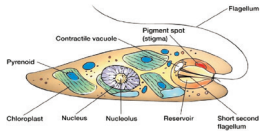
AMOEBA

PENICILIUM

5. All the green plants are there.
Further divided into five sub-groups on the basis of :
(a) Plant body well differentiated or not.
(b) Special tissue for the transport of water are there or not.
(c) Beer seeds, whether naked or enclosed within fruits.
Examples – Pinus, algae, funeria, Mangifera indica.



ANABAENA



EUGLENA

AGARICUS

Biodiversity means the variety of living organisms present on a particular region. There are about 20 lac organisms known on the earth which differ from one another in external form, internal structure, mode of nutrition, habitat, etc.

Taxonomy : It is a branch of biology which deals with identification, nomenclature and classification of organisms. Carolus Lannaeus is called the father of taxonomy.

Classification : The method of arranging organisms into groups or sets on the basis of similarities and differences is called classification.

Importance of Classification

- It makes the study of wide variety of organisms easy and in systematic manner.
- It helps to understand how the different organisms have evolved with time.
- It helps to understand the inter-relationships among different groups of organisms.
- It forms a base for the study of other biological sciences, like biogeography.

Basis of Classification

- There are certain features or properties used for the classification of living organisms which are known as characteristics. Organisms with same characteristics are placed in same groups.

Classification System

- **1. Two kingdom classification :** Carolus Linnaeus in 1758 classified the living organisms into two groups as plants and animals.
- **2. Five kingdom classification :** H. Whittaker in 1959 further classified the organisms into five kingdoms as Kingdom Monera, Kingdom Protista, Kingdom Fungi, Kingdom Plantae and Kingdom Animalia.

Note : *Carl Woese in 1977 further divided Kingdom Monera into archaebacteria (or Archae) and Eubacteria (or Bacteria).*

Hierarchy of Classification : Linnaeus proposed a classification system by arranging organisms into taxonomic groups at different levels according to the characteristics they have. The groups or the levels from top to bottom are :

The major characteristics considered for classifying all organisms into five major kingdoms are :

- **Type of cellular organization**

  (a) Prokaryotic cells : These are primitive and incomplete cells without well-defined nucleus.

  (b) Eukaryotic cells : These are advanced and complete cells with well-defined nucleus.

- **Body organization**

  (a) Unicellular organisms : These are organisms made up of single cell with all activities performed by the single cell.

  (b) Multicellular organisms : These are organisms made up of large number of cells with different functions performed by different cells.

- **Mode of obtaining food**

  (a) Autotrophs : These are the organisms that make their own food by photosynthesis.

  (b) Heterotrophs : These are the organisms which depend on other organisms for food.

Nomenclature : An organism can have different names in different languages. This creates confusion in naming organism. A scientific name is needed which is same in all languages. Binomial nomenclature system given by Carolus Linnaeus is used naming different organisms.

Following are some conventions in writing the scientific names :

(1) Genus should be written followed by the species.

(2) First letter of the genus should be capital and that of the species should be in small letter.

(3) When printed the name should be written in italics and when written with hands genus and species should underlined separately.

Example : Homo sapiens for humans, Panthera tigris for tiger.

Kingdom I : MONERA

(i) Prokaryotic, unicellular.

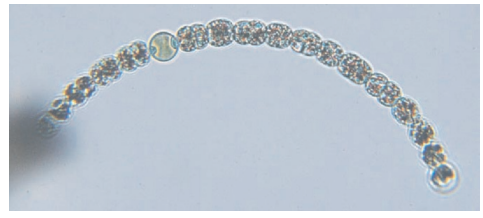
(ii) Can be autotrophs or heterotrophs.

(iii) May or may not have cell wall.

(iv) *Examples :* Anabaena and Bacteria (heterotrophic), Cyano-bacteria or

Blue-green algae (autotrophic).

BACTERIA



ANABAENA

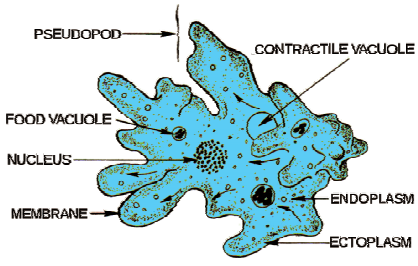
Kingdom II : PROTISTA

(i) Eukaryotic, unicellular.

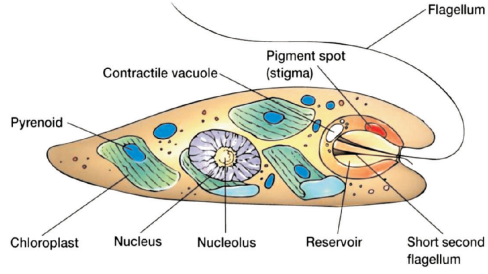
(ii) Can be autotrophic or heterotrophic.

(iii) May have cilia, flagella or pseudophodia for locomotion.

(iv) *Examples :* Plants like unicellular algae, diatoms; animals like protozoans (Amoeba, Paramecium, Euglena); fungi like slime molds and water molds.



AMOEBA



EUGLENA

Kingdom III : FUNGI

(i) Eukaryotic.

(ii) Mostly multicellular but sometimes unicellular (yeast).

(iii) Source of food :

(a) Mostly saprophytes : These organisms use decaying material for food.

(b) Some parasitic : These organisms live inside body of other living organism to have food and can be disease causing.

(c) Symbiotic relation : These are relations between two organisms in which they live together for benefit of one or both. Lichens are a symbiotic relation between fungi and cyanobacteria. Here fungi gets food from cyanobacteria and in return cyanobacteria gets water and

protection from sunlight through fungi.

(iv) Cell wall is made of chitin.

(v) *Examples :* Mushrooms (Agaricus), green mold (Penicillium), smut (Aspergilus).

PENICILIUM

AGARICUS

Kingdom IV : PLANTAE

(i) Eukaryotic, multicellular.

(ii) Autotrophs.

(iii) Cell wall present.

Basis of division in Kingdom Plantae

(a) Differentiated body parts : Body is differentiated into leaves, stems, roots, flowers, etc.

(b) Presence of vascular tissue : There are two types of vascular tissues present in the plants :

- **Xylem :** Helps in transport of water.
- **Phloem :** Helps in transport of food.

(c) Reproduction through seeds or spores :

- **Phanerogamae :** Plants with seeds are called phanerogamae. They contains embryo with stored food and are multicellular.
- **Cryotogamae :** Plants with spores are called cryptogamae. They contains only naked embryo and are generally unicellular.

(d) Seeds are inside the fruit or naked :

- **Angiospermae :** These are plants with seeds inside the fruit and bears flowers.

- **Gymnospermae :** These are plants with naked seeds and do not bear flowers.

Division 1 : Thallophyta

(i) Basic and elementary plants with undifferentiated body parts.

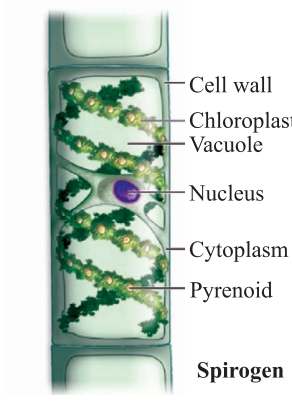
(ii) Generally called algae.

(iii) No vascular tissue present.

(iv) Reproduce through spores.

(v) Mainly found in water.

(vi) Example : Ulva, Spirogyra, Ulothrix, Cladophora, Chara.



Spirogen


ULVA

Division 2 : Bryophyte

(i) Body structure differentiated but not fully developed.

(ii) No vascular tissues present.

(iii) Reproduce through spores.

(iv) Found on both land and water therefore known as **'Amphibians of Plantae Kingdom'**.

(v) *Example :* Liverwort (Marchantia, Riccia), Mosses (Funaria), Hornwort (Dendrocerous).


FUNARIA


RICCIA

Division 3 : Pteridophyta

(i) Differentiated body structure – leaves, stems, roots, etc.

(ii) Vascular tissues present.

(iii) Reproduce through spores.

(iv) *Examples :* Marsilea, fern, horsetails.

MARSILEA

FERN

Division 4. Gymnosperms

(i) Differentiated body parts.

(ii) Vascular tissues.

(iii) Naked seeds without fruits or flowers.

(iv) Perennial, evergreen and woody.

(v) *Examples :* Pines (deodar), Cycus, Ginkgo.

PINUS

CYCUS

Division 5 : Angiosperms

(i) Also known as flower-bearing plants.

(ii) Later on flower becomes fruit.

(iii) Seeds are inside the fruit.

(iv) Embryos in seeds have structure called cotyledons. They are also called seed leaves because in many plants they emerge and become green when they germinate.

Angiosperms are further divided on the basis of number of cotyledons into two parts :

S. No.	Features	Monocots	Dicots
1.	Seed	One cotyledon	Two cotyledons
2.	Root	Fibrous root	Prominent primary root
3.	Stem	False or hollow	Strong
4.	Leaf	Parallel venation	Reticulate venation
5.	Flower (petals)	Five or multiple of five	Three or multiple of three
6.	Example	Potato, Sunflower, Peanuts, Beans, Mango etc.	Banyan, Wheat etc.

Five Kingdom Classification

R. H. Whittaker taxonomist was the first one to propose five kingdom classification.

	Monera	Protista	Fungi	Plantae	Animalia
Type	Unicellular Prokaryotic	Unicellular Eukaryotic	Multicellular Non-green Eukaryotic	Multicellular Eukaryotic	Multicellular Eukaryotic
Mode of Nutrition	Autotrophic or heterotrophic	Autotrophic or Heterotrophic	Saprophytic or Parasitic Sometimes symbiotic	Autotrophic	Heterotrophic
Body	Lack well-defined nucleus and cell organelles	Some organisms use pseudopodia or cilia or flagella for movement	Fungus is made up of long filaments called hyphae. The network of hyphae is mycelium.	Exhibits high level of tissue differentiation and have specialized body organs.	Exhibits high level of tissue ifferentiation and have specialized body organs. They have well developed nervous system.

Examples	Bacteria, Blue-green algae	Amoeba, Paramecium, Euglena	Yeast, Rhiozpus, Mushrooms moulds	Trees, Plants, Shrubs	Fish, Insects, Animals, Humans, Birds
					

Kingdom V : ANIMALIA

Basis of classification of Animalia kingdom :

(i) Symmetry :

(a) Bilateral symmetry : It is when an organism can be divided into right and left halves, identical but mirror images, by a single vertical plane.

(b) Radial symmetry : It is when an organism is equally spaced around a central point, like spokes on a bicycle wheel.

(ii) Germ layers : In embryonic stages there are different layers of cells called germ cells. The three different types of germ cells are :

- **Ectoderm :** It is the outermost layer which forms nail, hair, epidermis, etc.
- **Endoderm :** It is the innermost layer which forms stomach, colon, urinary, bladder, etc.
- **Mesoderm :** It is the middle layer between ectoderm and endoderm which forms bones, cartilage, etc.

So, according to the number of germ layers present in embryonic stage, animal could be :

- **Diploblastic :** Organisms which are derived from two embryonic germ layers (ecto and endo).
- **Triploblastic :** Organisms which are derived from all the three embryonic germ layers.

(iii) Coelom : Body cavity or coelom is important for proper functioning of various organs. For example, heart which has to contract and expand needs some cavity or empty space, which is provided by the coelom.

On the basis of presence or absence of coelom, organisms are divided into :

- **Acoelomates :** These are the simple organisms having no body cavity.
- **Coelomates :** These are complex organisms having true cavity lined by mesoderm from all sides. These are further sub-divided into **schizocoelomates** or **protostomes** (coelom formed due to splitting or mesoderm) and **enterocoelomates** or **dueterostomes** (coelom formed from pouches pinched off from endoderm).
- **Pseudo coelamate :** These are organisms having false coelom. They have pouches of mesoderm scattered between endoderm and ectoderm.

(iv)Notochord : It is a long rod like structure, which runs along the body between nervous tissues and gut and provides place muscle to attach for ease of movement.

Organisms could be :

- without notochord
- with notochord
- with notochord in initial embryonic stages and vertebral column in adult phase

Phylum 1 : Porifera or Sponges

(i) Cellular level of organization

(ii) Non-motile animals

(iii) Holes on body which led to a canal system for circulation of water and food

(iv)Hard outside layer called as skeletons

(v) Examples : Sycon, spongilla, euplectelia

SYCON

EUPLECTELIA

Phylum 2 : Coelenterata

(i) Tissue level of organization

(ii) No coelom

(iii) Radial symmetry, diploblastic

(iv) Hollow gut

(v) Can move from one place to another

(vi) Examples : Hydra, sea anemone, jelly fish (solitary), corals (colonies)

SEA ANNEMON

CORALS

Phylum 3 : Platyhelminthes

(i) Also called flat worms

(ii) No coelom present

(iii) Bilateral symmetry, triploblastic

(iv) Free living or parasite

(v) Digestive cavity has one opening for both ingestion and egestion

(vi) Examples : Planaria (free living), liver fluke (parasitic)

PLANARIA

LIVER FLUKE

Phylum 4 : Mollusca

(i) Coelom present

(ii) Triploblastic, bilateral symmetry

(iii) Soft bodies sometimes covered with shell

(iv) Generally not segmented

(v) No appendages present

(vi) Muscular foot for movement

(vii) Shell is present

(viii) Kidney like organ for excretion

(ix) *Examples :* Chiton, octopus, pila, unio

CHITON

OCTOPUS

Phylum 5 : Annelida

(i) Second largest phylum

(ii) Coelom present

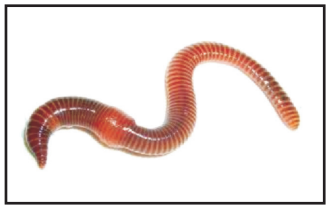
(iii) Bilateral, triploblastic

(iv) Segmented (segments specialized for different functions)

(v) Water or land

(vi) Extensive organ differentiation

(vii) *Examples :* Earthworm, leech, nereis



EARTHWORM

NEREIS

Phylum 6 : Arthropoda

(i) Largest phylum (consist of 80% of species)

(ii) Generally known as insects

(iii) Coelom present

(iv)Bilateral, triploblastic

(v) Segmented, sometimes fused

(vi) Tough exo-skeleton of chitin

(vii) Joing appendages like feet, antenna

(viii) *Examples :* Prawn, scorpio, cockroach, housefly, butterfly, spider

Phylum 7 : Echinodermata

(i) Spiny skin, marine

(ii) No notochord

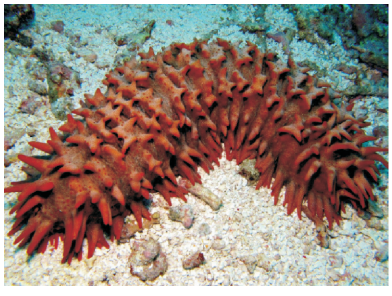
(iii) Coelom present, bilateral symmetry, triploblastic

(iv) Endoskeleton of calcium carbonate

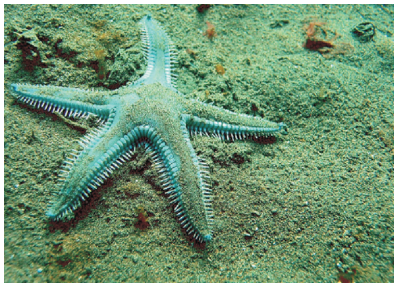
(v) Water vascular system for locomotion

(vi) Bilateral symmetry before birth and radial symmetry after birth

(vii) *Examples :* Antedon, sea cucumber, star fish, echinus



SEA CUCUMBER



STARFISH

Phylum 8 : Hemichordata

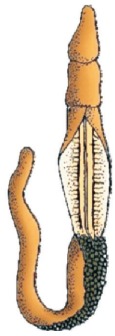
(i) Small group of marine animals

(ii) Cylindrical, bilateral symmetry, triploblastic

(iii) Coelom present

(iv) Gills for respiration

(v) *Examples :* Balanoglossus



BALANOGLOSSUS

Phylum 9 : Chordata

(i) Bilateral symmetry, triploblastic

(ii) Coelom present

(iii) Notochord

(iv) Gills present at some phase of life

(v) Dorsal nerve chord

(vi) Post anal tail present at some stage of life, for example, present in humans in embryonic stages

(vii) Sub-divided into two :

(a) Prochordata

- Notochord at some stage of life
- Marine
- Examples : Herdemania, amphioxus

(b) Vertebrata

- Notochord converted to vertebral column
- 2, 3, 4 chambered heart
- Organs like kidney for excretion
- Pair appendages
- Examples : Humans (4-chambered), frog (3-chambered), fishes (2-chambered)

Vertebrates are divided into five classes namely Pisces, Amphibia, Reptilia,

Aves and Mammalia.

- **Warm blooded organisms :** These are organisms which maintain same body temperature irrespective of outside temperature. *Example :* Humans. Human's body temperature is approximately 37º.
- **Cold blooded organisms :** These are organisms which change their body temperature as per surrounding temperature. *Example :* Frog.
- Fishes are divided into two categories on the basis of skeleton :

(i) Fishes with bony skeleton called **bony fishes.** Example : Tuna.

(ii) Fishes with cartilage skeleton called **cartilaginous fishes.** *Example :* Shark.

(i) Pisces (Fishes)

- They are fishes living in water.
- Their skin is covered with scales or plates.
- They respire using gills.
- They have streamlined body and fins which help them to move in water.
- They are cold blooded and their heart has only two chambers.
- They lay eggs from which the young ones hatch out.

Some fishes have skeleton made of cartilage like Sharks, Rays etc. and some have skeleton made of bones and cartilage like Tuna, Rohu etc.




(ii) Amphibia (Amphibians)

- They are found in land and water.
- They do not have scales but have mucous glands on their skin.
- They are cold blooded and the heart is three chambered.
- Respiration is through gills or lungs. They lay eggs in water.

- *Example :* Frogs, Toads, Salamanders etc.



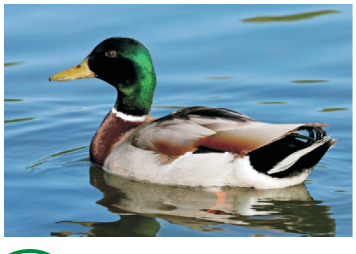
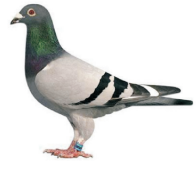
(iii) Reptilia (Reptiles)

- They have scales and breathe through lungs.
- They are cold blooded.
- Most of them have three chambered heart but crocodiles have four chambered heart.
- They lay eggs with hard covering in water.
- *Example :* Snakes, Turtles, Lizards, Crocodiles etc.



(iv) Aves (Birds)

- They are warm blooded animals.
- They have four chambered heart.
- They breathe through lungs.
- They have an outer covering of feathers.
- Their two fore limbs are modified into wings for flying. They lay eggs.
- *Example :* Crow, Sparrow, Pigeon, Duck, Stork, Ostrich etc.


(v) Mammalia (Mammals)

- They are warm blooded animals.
- They have four chambered heart.
- They have mammary glands for production of milk to nourish their young ones.
- The skin has hairs and sweat glands. Most of them give birth to their young ones.
- Some of them lay eggs (like Platypus and Echidna).
- *Example :* Cat, Rat, Dog, Lion, Tiger, Whale, Bat, Humans etc.




S. No.	Features	Pisces	Amphibian	Reptilia	Aves	Mammalia
1.	Inhabit	Water	Water and land	Water and land	Water, land and air	Land or water
2.	Respiratory organs	Gills	Gills, lungs	Lungs	Lungs	Lungs
3.	Heart	2-chambered	3-chambered	3-chambered	4-chambered	4-chambered
4.	Maintenance of body temperature	Cold blooded	Cold blooded	Cold blooded	Warm blooded	Warm blooded
5.	Youngones	Eggs	Eggs in water	Eggs with tough coating on land	Eggs	Young babies except platy-pus and echidna.
6.	Skin	Skin covered with scales	Mucus glands in skin	Skins covered with scales	Skin covered with feathers	Hair, oil and sweat glands are present on the skin

7.	Special features	Streamlined body				Mammary glands which produces milk for children
8.	*Example :*	Anabas, Dog fish, Angler fish, Mandarin fish, Electric ray, String fish, Sea horse, Flying fish.	Salamander, Common frog, Toad, Hyla (tree frog)	Turtle, Snakes, Lizard, Flying lizard, Crocodile, Chameleon	Ostrich, Sparrow, Crow, Pigeon, Tufted Duck, White Stork	Humans, Lion, Tiger, Cat, Bat, Whale

QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

1. Define biodiversity.
2. Who wrote the book 'Origin of Species'.
3. What do you mean by primitive organism and advanced organism ?
4. Who is known as the father of taxonomy ?
5. Collect the range of variation that you see around you.
6. Whittaker's five kingdom classification in detail. The basis of five kingdom classification.
7. Write the correct sequence of five kingdom classification.
8. Write the examples of Archaebacteria and Eubacteria.
9. What are resting spore and heterocyst ?

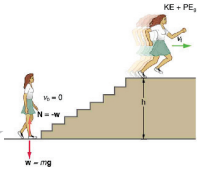
SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. What is thallus ?
2. Why bryophytes are called amphibians of plant kingdom ?
3. Write the difference between cryptogams and phanerogams.

4. List the difference between monocots and dicots.
5. List the number of phyla that come under animal kingdom.
6. Use the same tips to study the animal kingdom.
7. Explain all the important characteristics of the given phyla :
   (a) Platihelminthes
   (b) Coelenterates
   (c) Annelida

LONG ANSWER TYPE QUESTIONS (5 Marks)

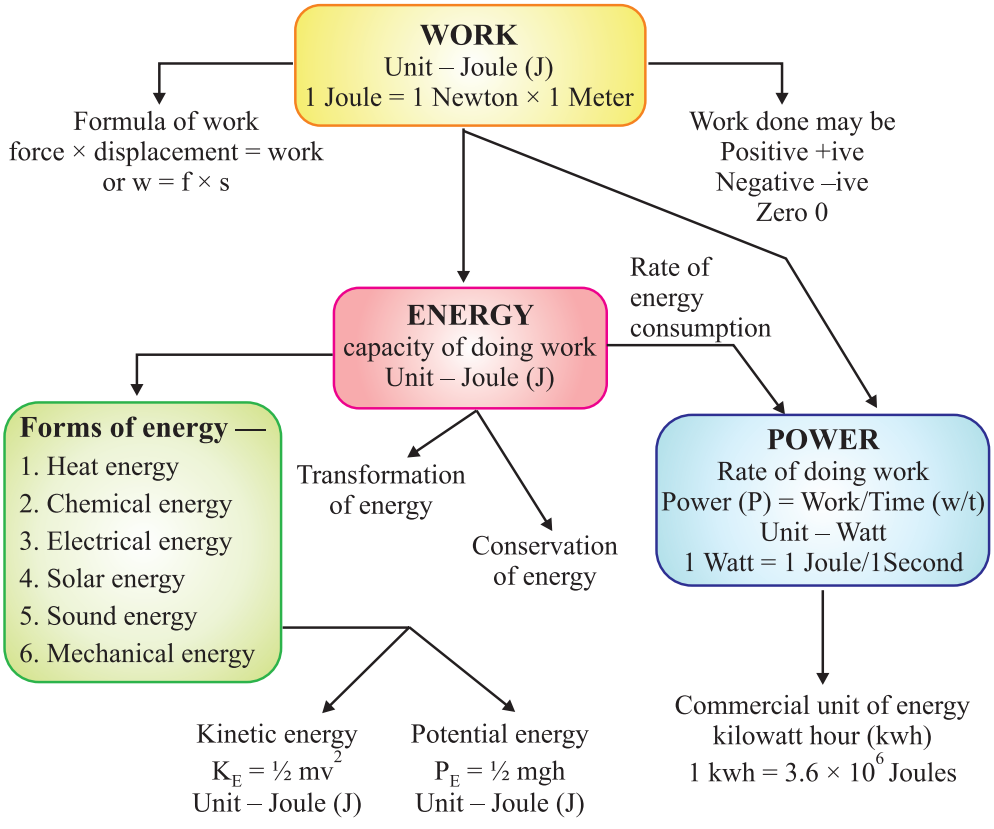
1. Give two examples belonging to members of nematode.
2. What is the cause of elephantiasis ?
3. What is the most striking feature of phylum arthropoda ?
4. List the difference between annelids and arthropods.
5. What is notochord and describe its function.
6. Give two examples from phylum protochordata.
7. Bats and whales are classified as mammals. Why ?
8. Circulatory system found in the phylum molusca ?



Chapter - 4

Work And Energy

CHAPTER AT A GLANCE



Work

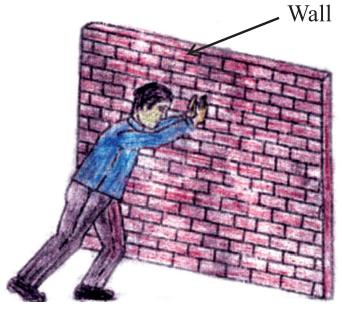
For doing work, energy is required.

- In animals, energy is supplied by food they eat.
- In machine, energy is supplied by fuel.

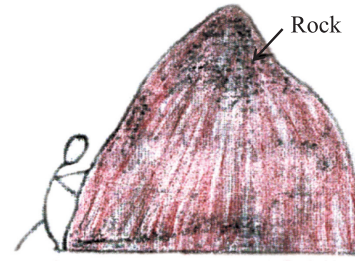
Not much work inspite of working hard : Reading, writing, drawing, thinking,

analysing are all energy consuming. But in scientific manner, no work is done in above cases.

- *Example :* A man is completely exhausted in trying to push a rock (wall), but work done is zero as wall is stationary.
- A man standing still with heavy suitcase may be tired soon but he does no work in this situation as he is stationary.



When a force is applied on the wall, the wall does not move. So work is not done



When a force is applied on the rock, the rock does not move. So work is not done

Work is said to be done when :

(i) a moving object comes to rest.

(ii) an object at rest starts moving.

(iii) velocity of an object changes.

(iv) shape of an object changes.

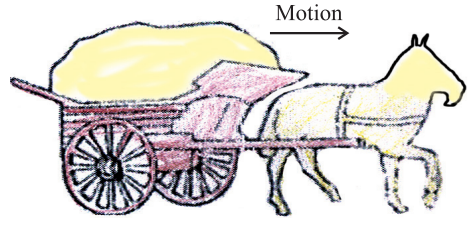
Scientific Conception of Work

- Work is done when a force produces motion in a body.
- Work is said to be done when a force is applied on a body and the body moves under the influence of force.

Condition of Work

(i) Force should be applied on the body.

(ii) Body should be displaced.



Examples : Work is done when :

(i) A cyclist is pedaling the cycle.

(ii) A man is lifting load in upward or downward direction.

Work is not done when :

(i) A coolie carrying some load on his head stands stationary.

(ii) A man is applying force on a big rock.

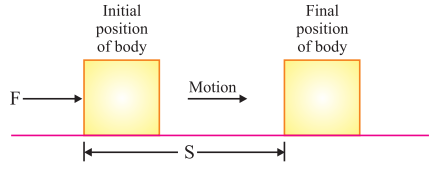
Work Done by a Fixed Force

Work done in moving a body is equal to the product of force and displacement of body in the direction of force.

$$\text{Work} = \text{Force} \times \text{Displacement}$$

$$W = F \times S$$

Work is a scalar quantity.



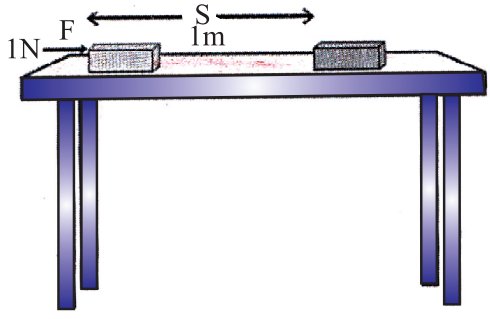
Unit of Work

Unit of work is Newton metre or Joule.

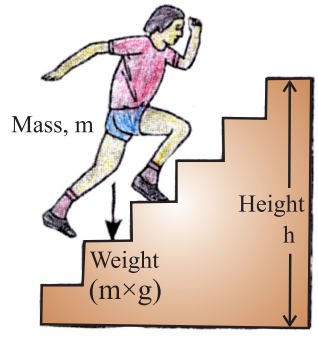
When a force of 1 Newton moves a body through a distance of 1 metre in its own direction, then the work done is 1 Joule.

$$1 \text{ Joule} = 1 \text{ Newton} \times 1 \text{ metre}$$

$$1 \text{ J} = 1 \text{ Nm}$$



1J = 1N × 1 m



During climbing work is done against gravity

The amount of work done depends on the following factors :

(i) Magnitude of force : Greater the force, greater is the amount of work & vice-versa.

(ii) Displacement : Greater the displacement, greater is the amount of

work & vice-versa.

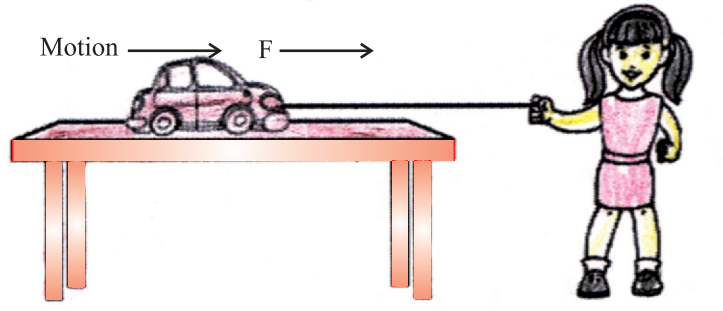
Negative, Positive and Zero Work

Work done by a force can be positive, negative or zero.

(i) Work done is **positive** when a force acts in the direction of motion of the body.[Fig. (a)] ($\theta = 0^{\circ}$).

Example : A child pulls a toy car with a string horizontally on the ground. Here work done is positive.

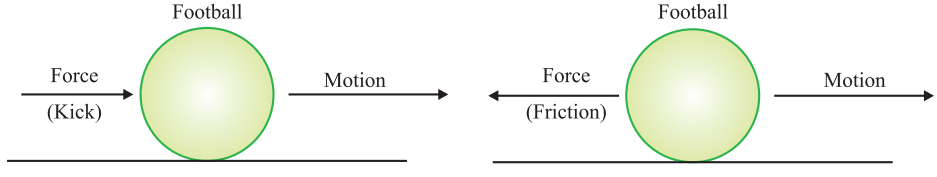
$$W = F \times S$$



Positive work

(ii) Work done is **negative** when a force acts opposite to the direction of motion of the body.

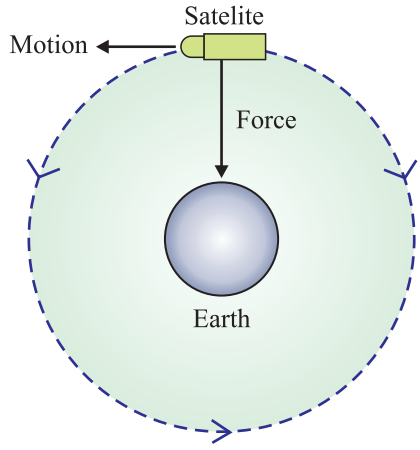
Example : When we kick a football lying on the ground, the force of our kick moves the football. Here direction of force applied & motion of football is same so work done is positive. But when football slows due to force of friction acting in a direction opposite to direction of motion of football [Fig. (b)], work done is negative.



Positive work **Negative work**

(iii) Work done is **zero** when a force acts at right angles to the direction of motion.

Example : The moon moves around the earth in circular path. Here force of gravitation acts on the moon at right angles to the direction of motion of the moon. So work done is zero.



Zero work

- -ve (negative) sign indicates that work is done against gravity.

Note that if work is done against the direction of motion (gravity), then it is taken –ve.

Example. *A coolie lifts a luggage of 15 kg from the ground and put it on his head 1.5 m above the ground. Calculate the work done by him on the luggage.*

Solution : Mass of luggage (m) = 15 kg

Displacement (S) = 1.5 m

So, Work done, W = F × S

= mg × S [$f = mg$]

= 15 × 10 × 1.5 [g = 10 m/s^2]

[g = force of gravity]

= 225.0 kg m/s^2

= 225 Nm = 225 J

Hence, work done = 225 J.

Energy

(i) The sun is the biggest source of energy.

(ii) Most of the energy sources are derived from the sun.

(iii) Some energy is received from nucleus of atoms, interior of the earth and the tides.

Definition : The capacity of doing work is known as energy.

The amount of energy possessed by a body is equal to the amount of work it can do. Working body losses energy, body on which work is done gains energy.

Energy is a scalar quantity.

Unit : The SI unit of energy is Joule (J) and its bigger unit is kilo joule (kJ).

$$1 \text{ kJ} = 1000 \text{ J}$$

The energy required to do 1 Joule of work is called 1 Joule energy.

Forms of Energy

Main forms of energy are :

(i) Kinetic energy
(ii) Potential energy
(iii) Heat energy
(iv) Chemical energy
(v) Electrical energy
(vi) Light energy
(vii) Sound energy
(viii) Nuclear energy

- Sum of kinetic energy & potential energy of a body is called mechanical energy.

Mechanical energy

The energy possessed by a body on account of its motion or position is called mechanical energy.

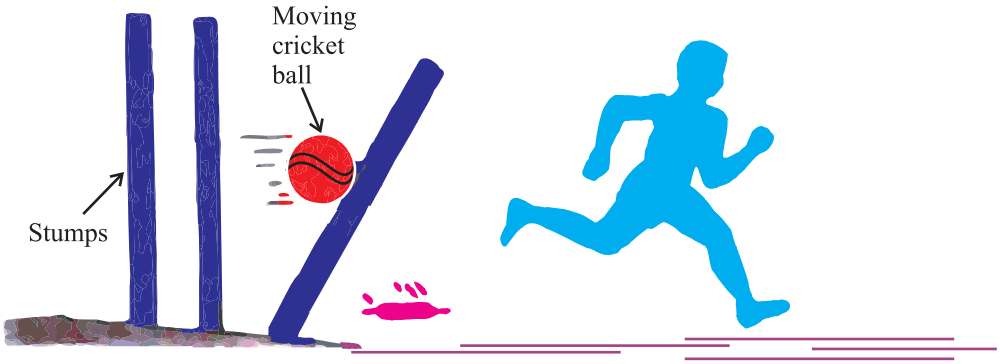
Kinetic Energy

The energy of a body due to its motion is called kinetic energy.

Examples of kinetic energy :

- A moving cricket ball
- Running water
- A moving bullet
- Flowing wind
- A moving car
- A running athelete
- A rolling stone

- Flying aircraft



Kinetic energy

Kinetic energy is directly proportional to mass and the square of velocity.

Formula for Kinetic Energy

If an object of mass '*m*' moving with uniform velocity '*u*', it is displaced through a distance '*s*'. Constant force *'f'* acts on it in the direction of displacement. Its velocity changes from '*u*' to '*v*'. Then acceleration is '*a*'.

$$\text{Work done, } W = f \times s \quad \text{...(i)}$$

and $$f = ma \quad \text{...(ii)}$$

According to third equation of motion, relationship between *u, v, s* and *a* is as follows :

$$v^2 - u^2 = 2as$$

So, $$s = \frac{v^2 - u^2}{2a} \quad \text{...(iii)}$$

Now putting the value of *f* and *s* from (ii) and (iii) in equation (i),

$$W = ma \times \frac{v^2 - u^2}{2a}$$

$$= \frac{m}{2} \times v^2 - u^2 = \frac{1}{2} m\left(v^2 - u^2\right)$$

If $u = 0$ (when body starts moving from rest)

$$W = ½mv^2$$

Or $$E_K = ½mv^2$$

Example. *An object of mass 15 kg is moving with uniform velocity of 4 m/sec. What is the kinetic energy possessed by it ?*

Solution : Mass of the object, m = 15 kg

Velocity of the object, v = 4 m/s

$E_K = \frac{1}{2}mv^2$

$= \frac{1}{2} \times 15 \text{ kg} \times 4 \text{ ms}^{-1} \times 4 \text{ ms}^{-1}$

$= 120 \text{ J}$

The kinetic energy of the object is 120 J.

Potential Energy

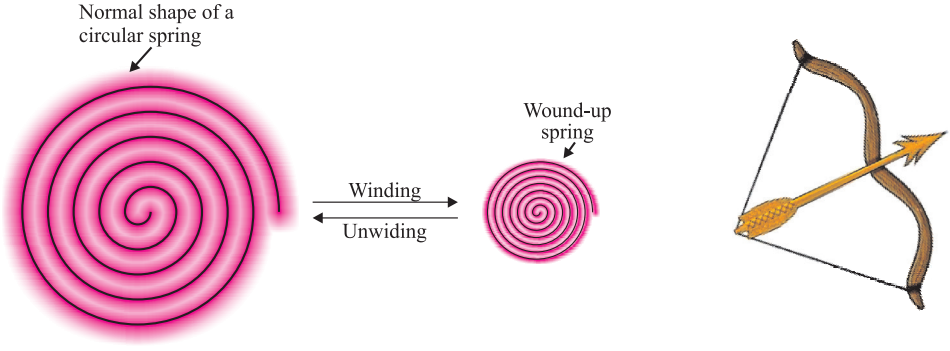
The energy of a body due to its position or change in shape is known as potential energy.

Examples :

(i) Water kept in dam : It can rotate turbine to generate electricity due to its position above the ground.

(ii) Wound up spring of a toy car : It possess potential energy which is released during unwinding of spring. So toy car moves.

(iii) Bent string of bow : Potential energy due to change of its shape (deformation) released in the form of kinetic energy while shooting an arrow.



Factors affecting Potential Energy

(i) Mass : P. E. $\propto m$

More the mass of body, greater is the potential energy and vice-versa.

(ii) Height above the ground :

P. E. $\propto h$ (Not depend on the path it follows)

Greater the height above the ground, greater is the P.E. and vice-versa.

(iii) Change in shape : Greater the stretching, twisting or bending, more is

the potential energy.

Potential Energy of an Object on a Height

If a body of mass '*m*' is raised to a height '*h*' above the surface of the earth, the gravitational pull of the earth ($m \times g$) acts in downward direction. To lift the body, we have to do work against the force of gravity.

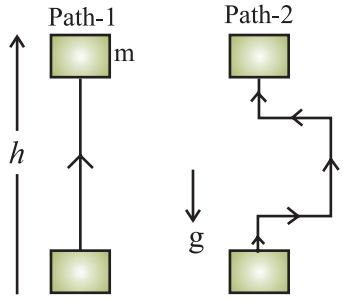
Thus, Work done, W = Force × Displacement

Or $W = m \times g \times h = mgh$

This work is stored in the body as potential energy (gravitational potential energy).

Thus, Potential energy, $E_P = m \times g \times h$

where g = acceleration due to gravity.



Ep = M×g×h = Ep = mgh

Example. *If a body of mass 10 kg is raised to a height of 6 m above the earth, calculate its potential energy.*

Solution : Potential energy of the body = *mgh*

Mass of body = 10 kg

Height above the earth = 6 m

Acceleration due to gravity = 10 m/s^2

So, $E_P = 10 \times 10 \times 6$

$= 600$ J

Thus, potential energy of the body is 600 Joules.

Transformation of Energy

The change of one form of energy to another form of energy is known as transformation of energy.

Example :

(i) A stone on a certain height has entire potential energy. But when it starts moving downward, potential energy of stone goes on decreasing as height goes on decreasing but its kinetic energy goes on increasing as velocity of stone goes on increasing. At the time stone reaches the ground, potential energy becomes zero and kinetic energy is maximum.

Thus, its entire potential energy is transformed into kinetic energy.

(ii) At hydroelectric power house, the potential energy of water is transformed into kinetic energy and then into electrical energy.

(iii) At thermal power house, chemical energy of coal is changed into heat energy, which is futher converted into kinetic energy and electrical energy.

(iv) Plants use solar energy to make chemical energy in food by the process of photosynthesis.

Law of Conservation of Energy

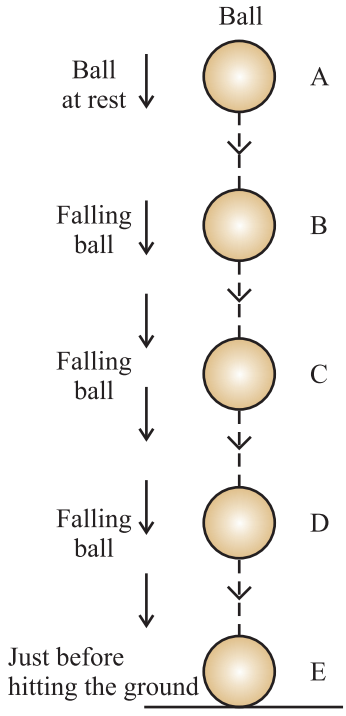
- Whenever energy changes from one form to another form, the total amount of energy remains constant.
- "Energy can neither be created nor be destroyed."
- Although some energy may be wasted during conversion, but the total energy of the system remains the same.

Conservation of Energy during Free Fall of a Body

- A ball of mass 'm' at a height 'h' has potential energy = mgh.
- As ball falls downwards, height 'h' decreases, so the potential energy also decreases.
- Kinetic energy at 'h' is zero but it is increasing during falling of ball.
- The sum of potential energy & kinetic energy of the ball remains the same at every point during its fall.

$$\frac{1}{2}mv^2 + mgh = \text{Constant}$$

Kinetic energy + Potential energy = Constant



Ball	P.E. of Ball	K.E. of Ball	Total Energy of Ball (P.E. + K.E.)
A	20J	0J	20 + 0 = 20J
B	15J	5J	15 + 5 = 20J
C	10J	10J	10 + 10 = 20J
D	5J	15J	5 + 15 = 20J
E	0J	20J	0 + 20 = 20J

Rate of Doing Work – Power

"Power is defined as the rate of energy consumption."

$$\text{Power} = \frac{\text{Work done}}{\text{Time taken}} \quad \text{Or} \quad P = \frac{W}{t}$$

where P = Power
W = Work done
t = Time taken

Unit of Power

SI unit of Power is Watt (W) = 1 Joule/second.

$$1 \text{ Watt} = \frac{1 \text{ Joule}}{1 \text{ second}} \quad \text{Or} \quad 1 \text{ W} = \frac{1 \text{ J}}{1 \text{ s}}$$

Power is one Watt when one Joule work is done in one second.

$$\text{Average Power} = \frac{\text{Total work done or total energy used}}{\text{Total time taken}}$$

Power of Electrical Gadget

The power of an electrical appliance tells us the rate at which electrical energy is consumed by it.

Bigger unit of Power : Bigger unit of power is called Kilowatt or KW.

1 Kilowatt (KW) = 1000 Watt = 1000 W or 1000 J/s

Example. *A body does 20 Joules of work in 5 seconds. What is its power ?*

Solution : $\text{Power} = \frac{\text{Work done}}{\text{Time taken}}$

Work done = 20 Joules

Time taken = 5 sec.

$$P = \frac{20\ J}{5\ s}$$

So, Power = 4 J/s = 4 W

Thus, power of the body is 4 Watts.

Commercial Unit of Energy : Joule is very small unit of energy and it is inconvenient to use it where a large quantity of energy is involved.

For commercial purpose, bigger unit of energy is Kilotwatt hour (KWh).

1 KWh : 1 KWh is the amount of energy consumed when an electric appliance having a power rating of 1 Kilowatt is used for 1 hour.

Relation between Kilowatt hour and Joule

1 Kilowatt hour is the amount of energy consumed at the rate of 1 Kilowatt for 1 hour.

1 Kilowatt hour = 1 Kilowatt for 1 hour

= 1000 Watt for 1 hour

= 1000 Watt × 3600 seconds (60 × 60 seconds = 1 hour)

= 36,00,000 Joules

So, 1 KWh = 3.6×10^6 J = 1 unit

Example. *A bulb of 60 Watt is used for 6 hrs. daily. How many units (KWh) of electrical energy are consumed ?*

Solution : Power of bulb = 60 W = $\frac{60}{1000}$ KW = 0.06 KW

t = 6 hours

Energy = Power × Time taken = 0.06 × 6 h

= 0.36 KWh = 0.36 units

QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

1. Define the term 'work'.
2. Define 1 Joule of work.
3. Give an example in which a force does positive work.
4. Give an example in which a force does negative work.
5. Define the term energy of a body.
6. Write the units of : (a) Work, (b) Energy.
7. Define Power.
8. Define 1 Watt energy.
9. Define 1 Kilowatt hour.

SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. What do you undertstand by kinetic energy ? Write its formula.
2. On what factors does the kinetic energy of a body depends ?
3. What happens to potential energy of a body when its height is doubled ?
   (Ans. Doubled)
4. How many joules are there in 1 Kilowatt hour ?
5. What is conservation of energy ? Explain with an example.

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. What are the quantities on which the amount of work done depend ? How are they related to work ?
2. A load of 100 kg is pulled up to 5 m. Calculate the work done. (g = 10 m/s^2) *(Ans. 5000 J)*

3. A body of mass m is moving with a velocity 5 ms^{-1}. Its kinetic energy is 25 J. If its velocity is doubled, what is its kinetic energy ?

(Ans. 100 J)

LONG ANSWER TYPE QUESTIONS (3 Marks)

1. A boy weighing 50 kg climbs up a vertical height of 100 m. Calculate the amount of work done by him. How much potential energy he gains ? (Given $g = 9.8\ m/s^2$) *(Ans. 4.9×10^4 J)*

2. Five electric fans of 120 watts each are used for 4 hours. Calculate the electrical energy consumed in kilowatt hours.

(Ans. 2.4 KWh)

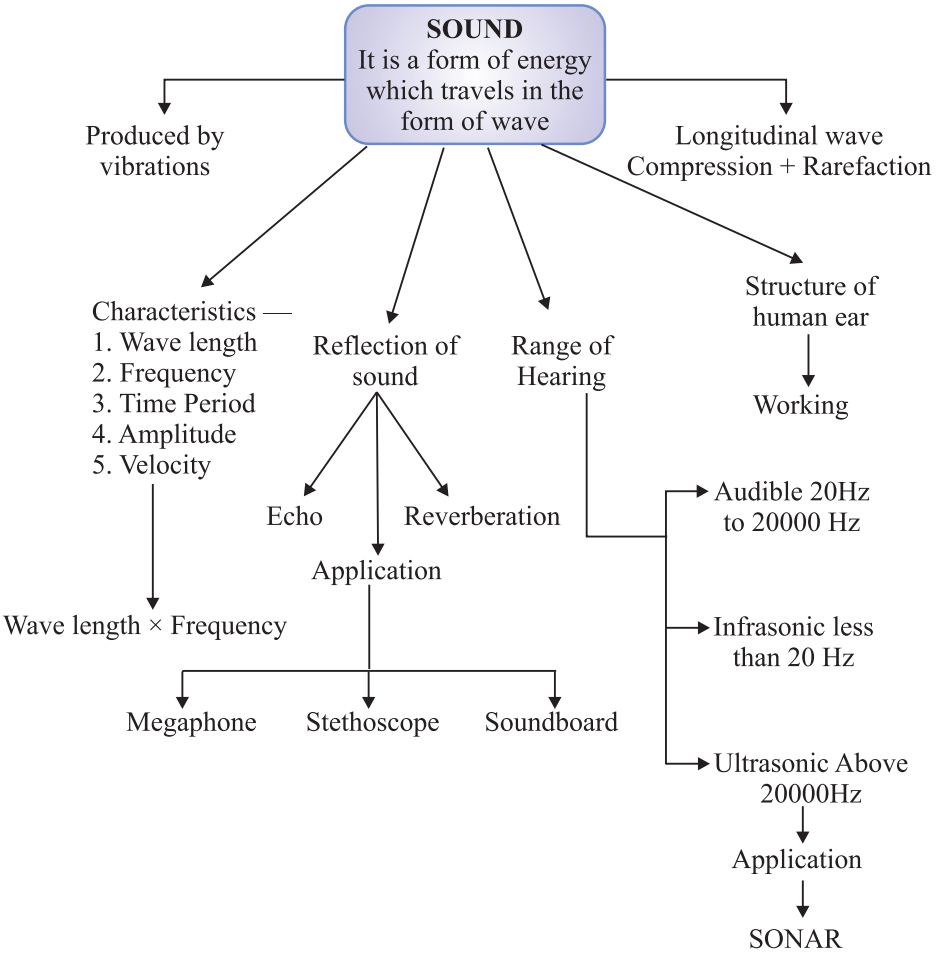
3. The power of an electric heater is 1500 Watt. How much energy it consumes in 10 hours ?

[Ans. 15 KWh (units)]

Chapter - 5

Sound

CHAPTER AT A GLANCE



Sound

(i) The sensation felt by our ears is called sound.

(ii) Sound is a form of energy which makes us hear.

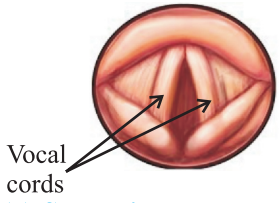
(iii) Law of conservation of energy is also applicable to sound.

(iv) Sound travels in form of wave.

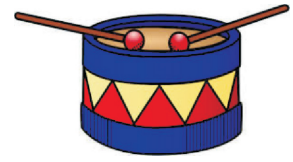
Production of Sound

Sound is produced when object vibrates or sound is produced by vibrating objects.

- The energy required to make an object vibrate and produce sound is provided by some outside source (like our hand, wind etc.).
- *Example :* Sound of our voice is produced by vibration of two vocal cords in our throat [Fig. (a)].
- Sound of a drum or tabla is produced by vibration of its membrane when struck [Fig. (b)].

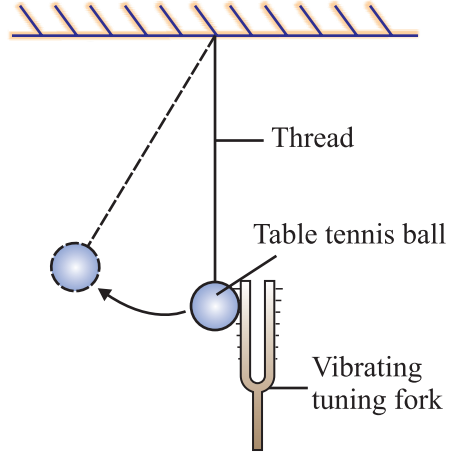


(a) Sound is produced when our vocal cords vibrate



(b) Sound is produced when the skin of a drum vibrates

- In laboratory experiments, sound is produced by vibrating tuning fork. The vibrations of tuning fork can be shown by touching a small suspended pith ball (cork ball) with a prong of the sounding tuning fork. The pith ball is pushed away with a great force.



Sound can be produced by following methods :

(i) By vibrating string (sitar)

(ii) By vibrating air (flute)

(iii) By vibrating membrane (table, drum)

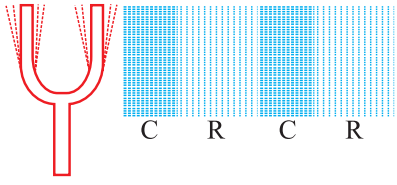
(iv) By vibrating plates (bicycle bell)

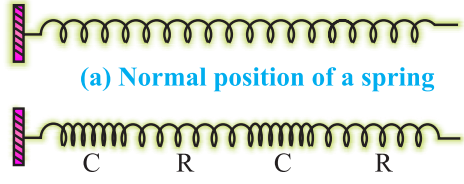
(v) By friction in objects

(vi) By scratching or scrubbing the objects etc.

Propogation of Sound

- The substance through which sound travels is called a medium.
- The medium may be solid, liquid or gas.
- When an object vibrates, then the air particles around it also start vibrating in exactly the same way and displaced from their stable position.
- These vibrating air particles exert a force on nearby air particles so they are also displaced from their rest position and start to vibrate.
- This process is continued in the medium till sound reaches our ears.
- The disturbance produced by sound travels through the medium (not the particles of the medium).
- Wave is a disturbance which travels through a medium and carries energy.
- So sound travels in wave form known as mechanical waves.





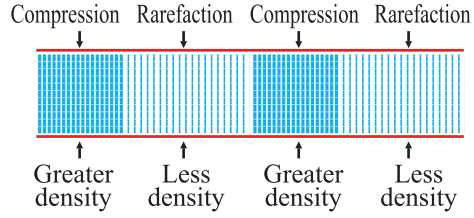
(a) Normal position of a spring

(b) Longitudinal wave in a spring

Sound Waves are Longitudinal Waves

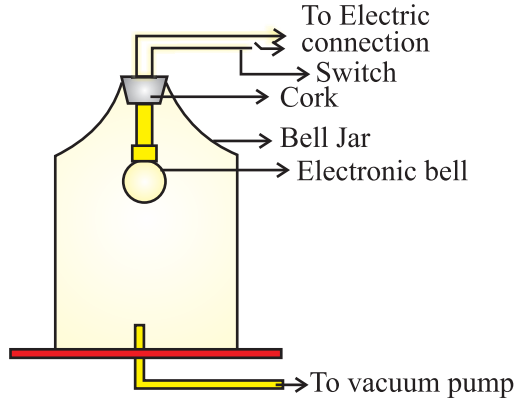
- When a body vibrates then it compresses the air surrounding it and form a area of high density called compression (C).
- Compression is the part of wave in which particles of the medium are closer to one another forming high pressure.
- This compression move away from the vibrating body.
- When vibrating body vibrates back a area of low pressure is formed called rarefaction (R).
- Rarefaction is the area of wave in which particles of the medium are further apart from one another forming a low pressure or low density area.

- When body vibrates back and forth, a series of compression and rarefaction is formed in air resulting in sound wave.
- Propogation of sound wave is propogation of density change.



Sound needs Medium for Propogation

- Sound waves are mechanical waves.
- It needs material medium for propogation like air, water, steel etc.
- It cannot travel in vaccum.
- An electric bell is suspended in airtight bell jar connected with vacuum pump.
- When bell jar is full of air, we hear the sound but when air is pumped out from the bell jar by vacuum pump and we ring the bell, no sound is heard.
- So medium is necessary for propagation of sound.



Experiment to show that sound cannot travel through vacuum

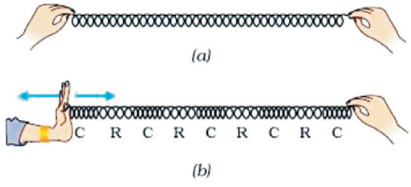
Sound Waves are Longitudinal Waves

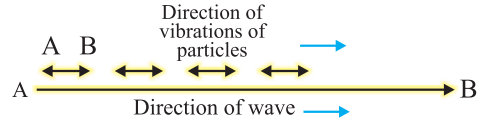
(i) A wave in which the particles of the medium vibrate back and forth in the same direction in which the wave is moving, is called a **longitudinal wave**.

- When we push and pull the slinky compression (number of turns are more or closer) and rarefaction (number of turns are less or

farther) are formed.

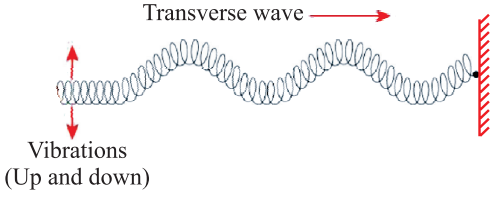
- When a wave travels along with slinky, its each turn moves back and forth by only a small distance in the direction of wave. So the wave is longitudinal.
- The direction of vibrations of the particles is parallel to the direction of wave.

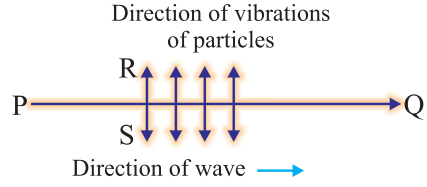




(ii) When one end of a slinky is moved up and down rapidly whose other end is fixed, it produces **transverse wave.**

- This wave possess along the slinky in horizontal direction, while turns of slinky (particles) vibrate up and down at right angle to the direction of wave.
- Thus in transverse wave particles of the medium vibrate up and down at right angles to the direction of wave.
- Light waves are transverse waves but they don't need a material medium for propagation.

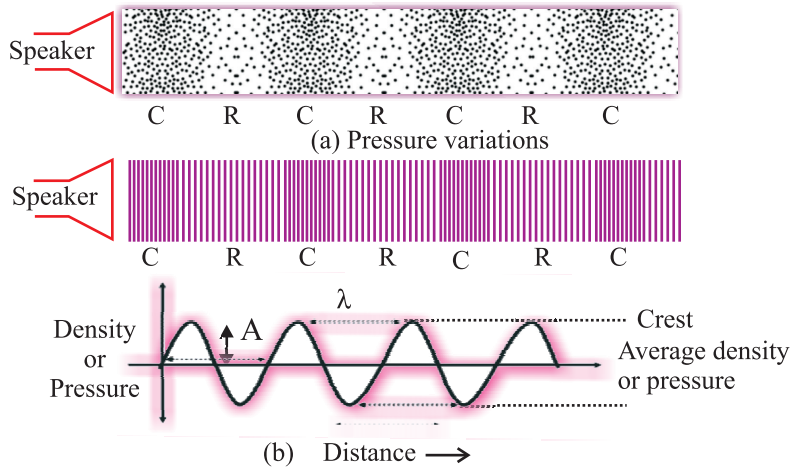




Characteristics of Sound Wave

The characteristics of sound waves are : wavelength, frequency, amplitude, time period and velocity.

- When a wave travel in air the density and pressure of air changes from their mean position.
- Compression is shown by crest while rarefaction is shown by trough.
- Compression is the region of maximum density or pressure.
- Rarefaction is the region of minimum density or pressure.

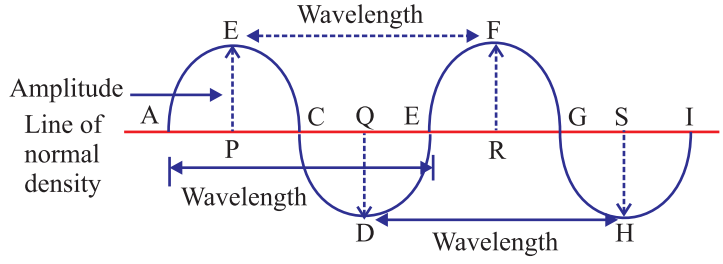


(i) Wavelength :

(a) In sound waves the combined length of a compression and an adjacent rarefaction is called its wavelength.

(b) The distance between the centres of two consecutive compressions or two consecutive rarefactions is also called its wavelength.

(c) It is denoted by the Greek letter lamda λ. Its SI unit is metre.



(ii) Frequency :

(a) No. of complete waves produced in one second or number of vibrations per second is called frequency.

(b) Number of compressions or rarefactions passed in one second is also frequency.

- Frequency of wave is same as the frequency of the vibrating body which produces the wave.
- The SI unit of frequency is hertz (Hz). The symbol of frequency is ν (nu).
- **1 Hertz :** One Hz is equal to 1 vibration per second.
- Bigger unit of frequency is kilohertz kHz = 1000 Hz.

(iii) Time Period :

(a) Time taken to complete one vibration is called time period.

(b) Time required to pass two consecutive compressions or rarefactions through a point is called time period.

- SI unit of time period is second (s). Time period is denoted by T.
- The frequency of a wave is the reciprocal of the time period.

$$v = \frac{1}{T}$$

(iv) Amplitude :

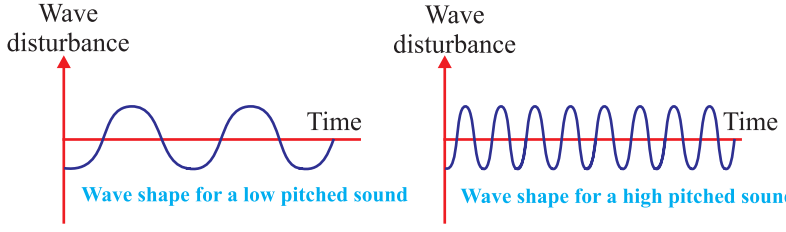
The maximum displacement of the particle of the medium from their original undisturbed position is called amplitude of the wave.

- Amplitude is denoted by A and its SI unit is metre (m).

Sound have characteristics like pitch and loudness and timbre.

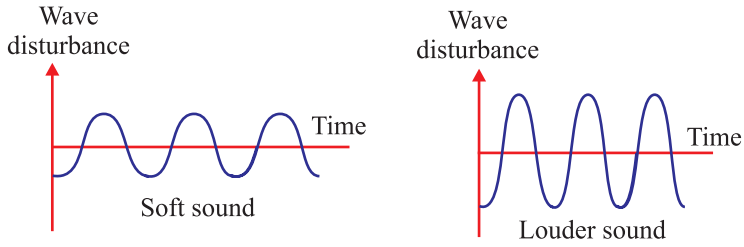
Pitch : The pitch of sound depends on the frequency of sound (vibration). It is directly proportional to its frequency. Greater the frequency, higher is the pitch and lesser the frequency, lower is the pitch.

- A woman's voice is shrill having a high pitch while a man's voice is flat having low pitch.
- High pitch sound has large number of compressions and rarefactions passing a fixed point per unit time.



Loudness : The loudness depends on the amplitude of the sound wave.

- Loudness is the measure of the sound energy reaching the ear per sec.
- Greater the amplitude of sound wave, greater is the energy, louder the sound; short is the amplitude, less is the energy, soft is the sound.
- Loudness is measured in decibel 'dB'.



Quality or Timbre : The timbre of a sound depends on the shape of sound wave produced by it. It is the characteristic of musical sound.

- It helps us to distinguish between two sounds of same pitch & loudness.
- Sound of single (same) frequency is called **tone** while a mixture of different frequencies is called **note**. Noise is unpleasant to hear while music is pleasant to hear and it is of good quality.

(v) Velocity :

The distance travelled by a wave in one second is called velocity of the wave. Its SI unit is metre per second (ms^{-1}).

$$\text{Velocity} = \frac{\text{Distance travelled}}{\text{Time taken}}$$

$$V = \frac{\lambda}{T}$$

(λ is the wavelength of the waves travelled in one time timeperiod T)

$$V = \lambda v \quad \left(\frac{1}{T} = v\right)$$

So, Velocity = Wavelength × Frequency

This is the wave equation.

Example. *What is the frequency of sound wave whose time period is 0.05 second ?*

Solution : Frequency, $v = \frac{1}{T}$

Given $T = 0.05$ s

So, $$v = \frac{1}{0.05} = \frac{100}{5} = 20 \text{ Hz}$$

Hence frequency = 20 Hz.

Speed of Sound in Various Mediums

(i) Speed of sound depends on the nature of material through which it travels. It is slowest in gases, faster in liquids and fastest in solids.

(ii) Speed of sound increases with the rise in temperature.

(iii) Speed of sound increases as humidity of air increases.

(iv) Speed of light is faster than speed of sound.

(v) In air, speed of sound is 344 ms^{-1} at 22ºC.

Sonic Boom

Some aircrafts, bullets, rockets etc. have 'supersonic speed'.

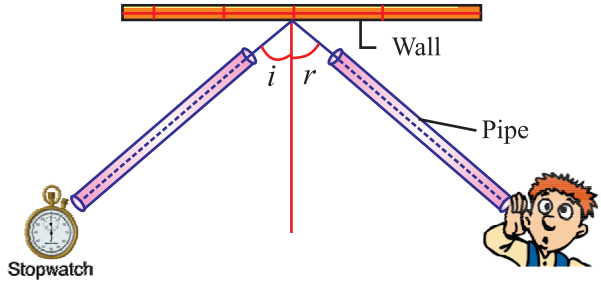
- Supersonic refers to the speed of an object which is greater than the speed of sound and it produces extremely loud sound waves called 'shock waves' in air.
- Sonic boom is an explosive noise caused by shock waves.
- It emits tremendous sound energy which can shatter the glass panes of windows.

Reflection of Sound

Like light, sound also bounce back when it falls on a hard surface. It is called reflection of sound. The laws of reflection of light are obeyed during reflection of sound.

(i) The incident sound wave, the reflected sound wave and normal at the point of incidence lie in the same plane.

(ii) Angle of reflection of sound is always equal to the angle of incidence of sound.



Reflection of Sound

Echo

The repetition of sound caused by the reflection of sound waves is called an echo.

- We can hear echo when there is a time gap of 0.1 second in original sound and echo (reflected sound).
- Echo is produced when sound reflected from a hard surface (*i.e.,* brick wall, mountain etc.) as soft surface tends to absorb sound.

v To calculate the minimum distance to hear an echo :

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Here Speed of sound in air = 344 ms^{-1} at 22ºC

Time = 0.1 second

So, $$344 = \frac{\text{Distance}}{0.1 \text{ sec}}$$

Or Distance = 344 × 0.1 = 34.4 m

So, distance between reflecting surface and audience = $\frac{34.4}{2}$ = 17.2 m (at 22ºC).

- Rolling of thunder is due to multiple reflection of sound of thunder from a number of reflecting surfaces such as clouds and the earth.

Reverberation

(i) The persistence of sound in a big hall due to repeated reflection of sound from the walls, ceiling and floor of the hall is called reverberation.

(ii) If it is too long, sound becomes blurred, distorted and confusing.

Methods to reduce reverberation in big halls or auditoriums

(i) Panels made of felt or compressed fibre board are put on walls and ceiling to absorb sound.

(ii) Heavy curtains are put on doors and windows.

(iii) Carpets are put on the floor.

(iv) Seats are made of material having sound absorbing properties.

Difference between Echo and Reverberation

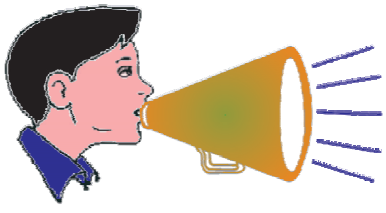
Echo	Reverberation
1. The repetition of sound caused by reflection of sound wave is called echo.	1. The persistence of sound in a big hall due to repeated or multiple reflections of sound from the walls, ceiling and floor of the hall is called reverberation.

2. Echo is produced in a big empty hall. Here is no multiple reflections of sound. Sound is not persistant.	2. If reverberation is too long, sound becomes blurred, distorted and confusing due to overlapping of different sound.

Applications of Reflection of Sound

(i) Megaphone, loudspeakers, bulb horns and trumpets, shehnai etc. are designed to send sound in a particular direction without spreading all around. All these instruments have funnel tube which reflects sound waves repeatedly towards audience. In this amplitude of sound waves adds up to increase loudness of sound.

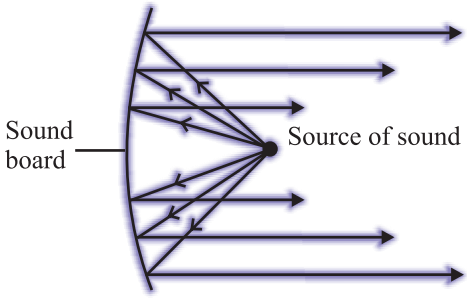
(ii) **Stethoscope :** It is a medical instrument used for listening the sounds produced in human body mainly in heart and lungs. The sound of the heartbeats reaches the doctor's ears by the multiple reflection of the sound waves in the rubber tube of stethoscope.

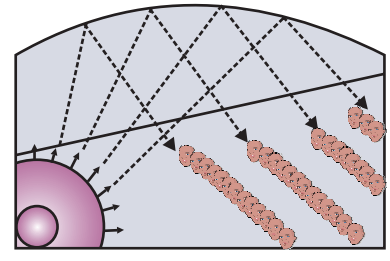


Megaphone

(iii) **Sound Board :** In big halls or auditoriums sound is absorbed by walls, ceiling, seats etc. So a curved board (sound board) is placed behind the speakers so that his speech can be heard easily by audiences. The soundboard works on the multiple reflection of sound.

(iv) The ceiling of concert halls are made curved, so that sound after reflection from ceiling, reaches all the parts of the hall.





Concert hall

Range of Hearing

(i) Range of hearing in human is 20 Hz to 20000 Hz.

- Children younger than 5 years and dogs can hear upto 25 KHz.

(ii) The sounds of frequencies lower than 20 Hz are known as 'infrasonic sounds'.

- A vibrating simple pendulum produces infrasonic sounds.
- Rhinoceroses communicate each other using frequencies as low as 5 Hz.
- Elephants and whales produces infrasonic waves.
- Earthquakes produces infrasonic waves (before shock waves) which some animals can hear and get disturbed.

(iii) The sounds of frequencies higher than 20 KHz are known as 'ultrasonic waves'.

- Dogs, parpoises, dolphins, bats and rats can hear ultrasonic sounds.
- Bats and rats can produce ultrasonic sounds.

Hearing Aid

It is battery operated electronic device used by persons who are hard of hearing. Microphone convert sound into electrical signals, than those are amplified by amplifier. Amplified signals are send to the speaker of hearing aid. The speaker converts the amplified signal to sound and sends to ear for clear hearing.

Applications of Ultrasound

(i) It is used to detect cracks in metal blocks in industries without damaging them.

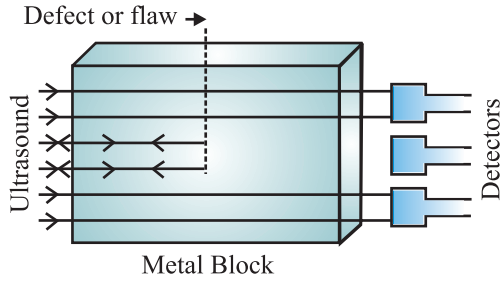
(ii) It is used in industries to clean 'hard to reach' parts of objects such as spiral tubes, odd shaped machines etc.

(iii) It is used to investigate the internal organs of human body such as liver, gall bladder, kidneys, uterus and heart.

(iv) **Ecocardiography :** These waves are used to reflect the action of heart and its images are formed. This technique is called echocardiography.

(v) **Ultrasonography :** The technique of obtaining pictures of internal organs of the body by using echoes of ultrasound waves is called ultrasonography.

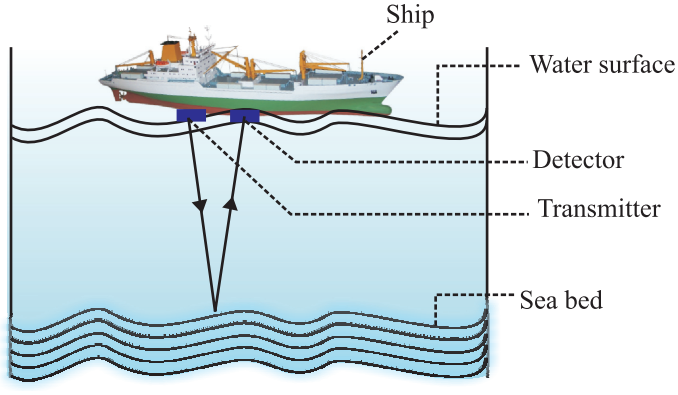
(vi) Ultrasound is used to split tiny stones in kidneys into fine grains.



SONAR

The word 'SONAR' stands for 'Sound Navigation And Ranging'.

- SONAR is a device which is used to find distance, direction and speed of underwater objects.
- SONAR consists of a transmitter and a receptor or detector and installed at the bottom of a ship.
- The transmitter produces and transmits ultrasonic waves.
- These waves travel through water and after striking the objects on the bottom of sea, are reflected back and received by detector.



SONAR

- These reflected waves are converted into electric signals by detector.
- The sonar device measures the time taken by ultrasound waves to travel from ship to bottom of sea and back to ship.

Half of this time gives the time taken by the ultrasound waves from ship to bottom.

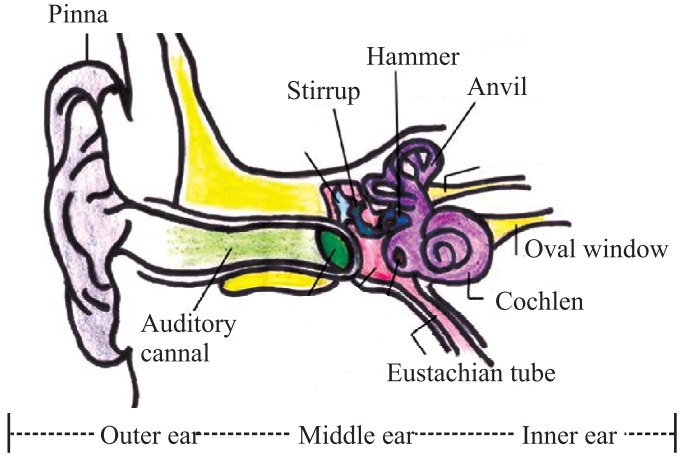
Let the time interval between transmission and reception of ultrasound signal is t. Speed of sound through sea water is v, total distance travelled by waves = $2d$. Then, $2d = v \times t$. This is called echo ranging.

The sonar is used to find the depth of sea, to locate underwater hills, valleys, submarines, icebergs and sunken ships etc.

- Bats fly in the dark night by emitting high pitched ultrasound waves which are reflected from the obstacle or prey and returned to bats ear. The nature of reflection tells the bat where the obstacle or prey is and what it is like.

Structure of Human Ear

- The ear consists of three parts : outer ear, middle ear and inner ear.
- The ears are the sense organs which help us in hearing sound.
- **The outer ear** is called **pinna**. It collects the sound from surroundings.
- This sound passes through the auditory canal.
- At the end of auditory canal, is a thin elastic membrane called ear drum or tympanic membrane.
- **The middle ear** contains of three bones : hammer, anvil and stirrup linked with one another. Free end of hammer touches ear drum and that of stirrup linked with membrane of oval window of inner ear.
- The lower part of middle ear has a narrow 'Eustachian tube'.
- **The inner ear** has a coiled tube called cochlea, which is connected with oval window. Cochlea is filled with a liquid containing nerve cells. Other side of cochlea is connected to auditory nerve which goes to brain.



Working :

- When compression of sound wave strikes the ear drum, the pressure on the outside of ear drum increases and pushes the ear drum inwards.

While during rarefaction ear drum moves outwards. Thus, ear drum starts vibrating back and forth.

- These vibrations are increased by three bones and middle ear transmits these amplified pressure variations received from sound waves to inner ear.
- In the inner ear the pressure variations are turned into electric signals by the cochlea.
- These electric signals are sent to the brain via auditory nerve and the brain interprets them as sound.

Working of Human ear

Pinna → Ear canal → Ear drum → Hammer → Anvil → Stirrup → Oval window → Cochlea → Auditory nerve → Brain

QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

1. Why sound waves are called mechanical waves ?
2. Which characteristic of sound determine : (a) Pitch, (b) Loudness ?
3. Write wave formula for velocity of sound.
4. Write the hearing range of human being.
5. What is sound ?
6. Name the two types of waves which can be generated in a slinky.
7. What is SI unit of frequency ? Write its bigger unit also.
8. How is sound produced ?
9. In which medium sound travels fastest : air, water or steel ?
10. Name two devices which work on the reflection of sound.

SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. State two laws of reflection of sound.
2. Define the term wavelength & frequency.
3. Define the term time period and amplitude.

4. Explain why, the flash of lighning reaches us first and the sound of thunder is heard a little later ?

5. What is meant by supersonic speed ?

6. Why are the ceiling of concert halls made curved ?

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. What is reverberation ? How can reverberation in a big hall be reduced ?

2. What is echo ? How is echo formed ? How thunder of clouds is formed ?

3. Write any three applications of ultrasound.

4. Explain how bats use ultrasound to catch the prey.

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. What is SONAR ? Explain its working. Give its uses.

2. A wave is moving in air with a velocity of 340 m/s. Calculate the wavelength if its frequency is :

   (a) 512 vibrations per second (b) 100 Hz.

3. A sonar station picks up a return signal after 3 seconds. How far away is the object ? [Speed of sound in water = 1440 m/s]

4. A stone is dropped from the top of a tower 500 m high into a pond of water at the base of tower. When is the splash heard at the top ? Given $g = 10\ ms^{-2}$ and speed of sound = $340\ ms^{-1}$.

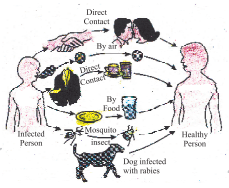
Hints to Long Answer Type Questions

2. (a) 0.66 metre (b) 3.4 m

3. 2160 m

4. 11.47 s

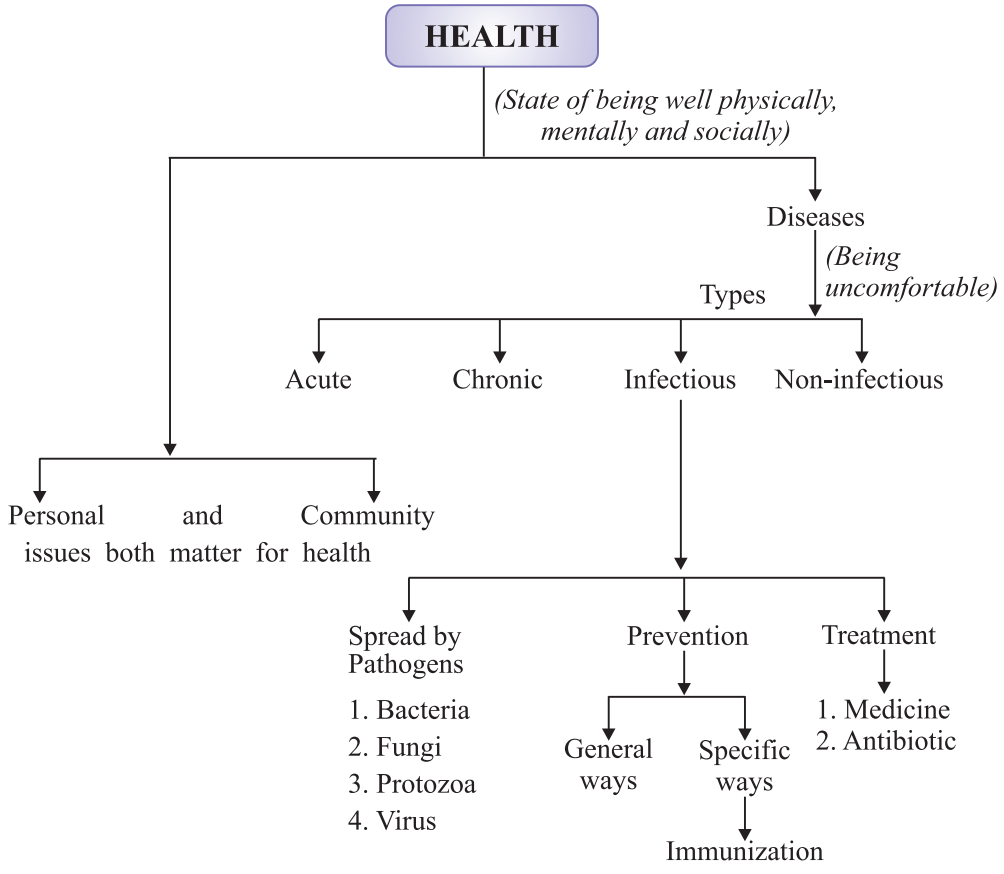
[*Hint :* Time taken by stone to reach at pond, t = ?, Use $s = ut + \frac{1}{2}gt^2$, $500 = 0 + \frac{1}{2} \times 10t^2$; so, $t^2 = 100$ or $t = 10$ sec.]



Chapter - 6

Why Do We Fall Ill ?

CHAPTER AT A GLANCE



Health is a general condition of a preson's mind and body. According to WHO (World Health Organisation) health is a "state of physical, metal and social well-being of a person".

To make people aware and conscious of keeping healthy and disease-free we celebrate WORLD HEALTH DAY on 7th April.

- 'Health' is a state of being well enough to function well physically, mentally and socially.
- Disease : Any disturbance in the structure or function of any organ or part of body.
- The various causes of diseases are pathogens (virus, bacteria), lack of nutritious diet/balanced diet and lack of public health services.
- Acute diseases occur suddenly and lasts for a short duration while chronic diseases develop slowly and lasts for long period of time.
- The diseases/infections can be prevented by life style (exercise, proper sleep, enough relaxation) modification, taking balanced diet, good personal health and hygiene and also maintaining a clean and healthy surrounding.
- Treatment involves killing of the microbes/pathogens.

Health

- Health is a state of physical, mental and social well-being.
- The conditions necessary for good health are :
  (i) Good physical and social environment.
  (ii) Good economic conditions.
- Good physical and social environment includes clean surroundings, good sanitation, proper garbage disposal and clean drinking water.
- Good economic conditions includes job opportunities for earning to have nutritious food and to lead a healthy life.

Personal and Community Issues Both Matter for Health

Community Health :

- All those activities which people do both individually and in groups for the development of their society, constitute the community health.
- Personal and community health are supplementary to each other.
- We protect ourselves by keeping our body clean.
- For this, we also require a good and healthy environment in our surroundings.
- We can have this only by the means of community health and

development.

- So, both personal and community health are inter-related.

Differences between Being Healthy and Disease-free

Being Healthy	Being Disease-free
1. It is a state of being well enough to function well physically, mentally and socially.	1. It is a state of absence from diseases.
2. It refers to the individual, physical and social environment.	2. It refers only to the individual.
3. The individual has good health.	3. The individual may have good health or poor health.

Disease and Its Causes

What does disease look like ?

- When a person is affected by a disease either the functioning or the appearance of one or more systems of the body will change for the worse.
- These changes give rise to symptoms and signs of disease.
- On the basis of the symptoms the physicians look for the signs of a particular disease and conduct tests to confirm the disease.

Types of Diseases

(i) Acute Diseases : Acute diseases which last for only very short period of time and affect body suddenly and quickly. *E.g.,* Cold, cough, typhoid etc.

(ii) Chronic Diseases : The diseases which last for a long time, even as much as a life time, are called chronic diseases. *E.g.,* Diabetes, tuberculosis, elephantiasis etc.

Causes of Diseases

Diseases are caused by :

- Pathogens like virus, bacteria, fungi, protozoans or worms.
- Poor health and under nourishment.
- Hereditary and genetic disorder.

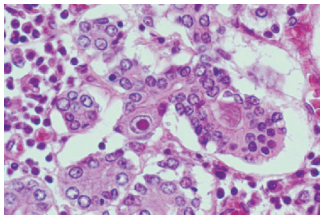
- Lack of proper treatment of immunization.
- Environmental pollution (air, water etc.)

Infectious and Non-infectious Diseases

(i) Infectious Diseases : The diseases which spread due to infection by micro-organisms are called infectious diseases. It is communicated from diseased person to healthy person, caused by some biological agents/pathogens like viruses, bacteria, fungi, protozoans, fungi worms.

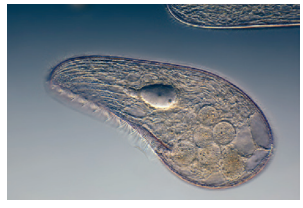
(ii) Non-infectious Diseases : The disease which does not spread by contact between infected and healthy person through air and water, is called non-infectious disease. *E.g.,* Arthritis, heart disease.

Pictures of Different Micro-organisms



(i) The picture shows SARS viruses coming out of the surface of an infected cell (see the arrows for example).

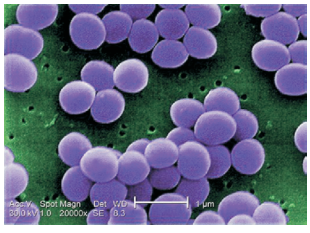
(ii) 500 nanometer = 0.5 micrometer = 0.001 millimeter.



(i) The picture shows Trypanosoma, a protozoan organism.

(ii) It causes sleeping sickness.

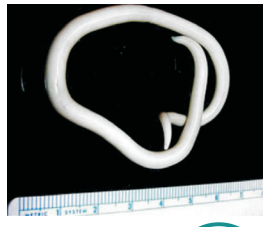
(iii) The saucer-shaped substance lying next to the protozoa, is a red blood cell.



(i) The picture shows *Staphylococcus* bacteria.

(ii) The *Staphylococcus* bacteria causes acne.

(iii) The scale is indicated at the line at the top left of the picture. It is 5 micrometers long.



(i) The given picture shows an adult roundworm from the small intestine.

(ii) Its technical name is *Ascaris Lumbricoides.*

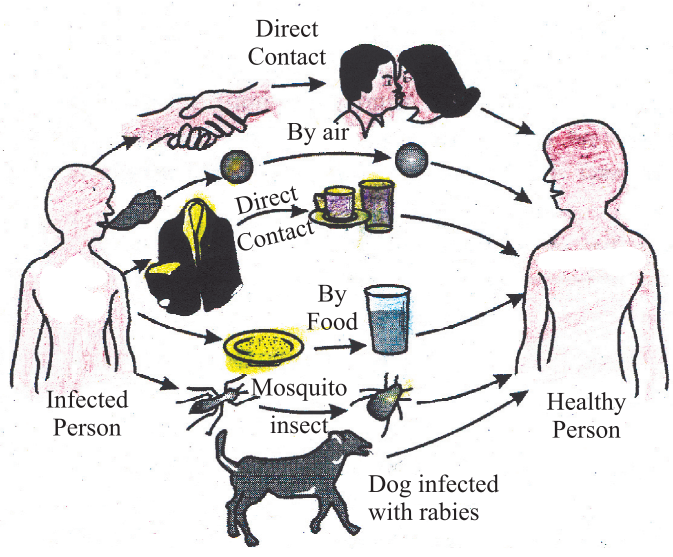
(iii) The ruler next to it shows 4 centimeter to give an idea of the scale.

Micro-organisms :

S. No.	Infectious Agents	Diseases
1.	Viruses	Common cold, influenza, measles, chicken pox, AIDS, Hepatitis-B etc.
2.	Bacteria	Cholera, typhoid, TB, tetanus, anthrax, food poisoning etc.
3.	Fungi	Skin infections
4.	Protozoan	Malaria, kala-azar, amoebic dysentery, sleeping sickness
5.	Worms	Intestinal infections, elephantiasis

Antibiotics

- Antibiotics blocks biochemical pathways important for bacteria. Hence, they are effective against them. *E.g.,* Penicillin, tetracycline.
- Many bacteria make a cell wall to protect themselves, the antibiotics (Penicillin) blocks the bacterial process that builds cell wall.
- Antibiotics works only against the **bacteria** and **not** against the **viruses.**



Common method of transmission of diseases

(Diseases spread from affected person to healthy person)

Means of Spread of Infectious Diseases

Infectious diseases spread from an infected person to a healthy person through air, water, food, vectors, physical contact and sexual contact.

- **Through air :** By sneezing and coughing, the microbes spread into air and enter into the body of a healthy person, like common cold, tuberculosis, pneumonia etc.
- **Through water :** The microbes enter into our body by drinking/eating polluted and contaminated water/food, like cholera, amoebic dysentery etc.
- **Vectors :** Some organisms like female anopheles mosquito also work as a vector of disease, like malaria, dengue, yellow fever etc.
- **Through sexual contact :** Syphilus, AIDS spread by sexual contact with infected person. AIDS virus can also spread through blood transfusion and from the mother to her child during pregnancy and through breast feeding.

AIDS (Acquired Immuno Deficiency Syndrome)

Causes :

AIDS is caused by a retro-virus called HIV (Human Immuno Deficiency Virus).

Method of transmission of AIDS :

The transmission of AIDS from an infected to a healthy person takes place :

- through sexual contact
- blood transfusion
- use of infected needle or blade etc.
- This may also get transmitted from infected mother to her foetus.

Prevention :

- Avoid transfusion of infected blood. This can be done by testing whether the blood is HIV negative or not.
- Always use disposable needle and syringe.
- Avoid sexual contact with unknown person.
- Avoid the same razor used in the salons.

ORGAN – Specific and Tissue-specific Manifestations

Disease causing microbes enter the body by different means and goes to different organs and tissues.

(i) Microbes which enter through the nose are likely to go to the lungs. (Bacteria which cause tuberculosis of lungs).

(ii) Microbes which enter through the mouth are likely to stay in the gut (bacteria which causes typhoid) or liver (bacteria which causes jaundice).

(iii) Virus which causes AIDS enter the body through sexual organs during sexual contact and spread through the lymph to all parts of the body and damages the immune system.

(iv) Virus which causes Japanese encephalitis (brain fever) enters the body through mosquito bite and goes and infects the brain.

Principles of Treatment :

The treatment of infectious diseases consists of two steps. They are **to reduce the effects** of the disease (symptoms) and **to kill the microbes** which caused disease.

(i) To reduce the effects of the disease : This can be done by taking medicines to bring down the effects of the disease like fever, pain or loose motions etc. and by taking bed rest to conserve our energy.

(ii) To kill the microbes : This can be done by taking suitable antibiotics and drugs which kills the microbes and the disease is cured.

Principles of Prevention

There are two ways of prevention of infectious diseases. They are general ways and specific ways.

(i) General ways of prevention : Public hygiene is most important for prevention of infectious diseases. Proper and sufficient food for everyone will make people healthy to resist the infection.

Air borne diseases can be prevented by living in conditions that are not crowded. Water borne diseases can be prevented by providing safe drinking water. Vector borne diseases can be prevented by providing clean environment.

(ii) Specific ways of prevention : There are disease specific measures which are used to fight them. It is done by **Immunisation.** This is the

process of introducing a weakened pathogen inside the body of the host to fool his/her immune system to produce antibodies against that particular disease. Not only does our immune system fight the disease (feeble pathogen), but also keeps a memory of the incident by keeping those antibodies in blood. Thus, next time even if the disease will strike the host's body with full vigor, the body will be able to protect itself with the help of these antibodies. This is also the basic law followed by vaccination programmes done for infants.

A Few Diseases

Disease	Pathogen	Vector (if any)	
1. Malaria	Protozoa	Female anopheles mosquito	Recurrent fever, chills
2. Typhoid	Bacteria – *Salmonella*	Cockroaches etc.	High fever and intestinal infections
3. AIDS	Virus – HIV	–	Not a disease in itself, it affects our lymph glands thereby decreasing our immunity
4. Dengue	Virus	Female *aedies egypte* mosquito	Headache + fever
5. Worms	Worms in intestine	–	Stomach ache
6. Kala azar	Protozoa – *Leishmania*	–	Brain fever
7. Round worms	Ascaris in intestine	–	Stomach ache
8. SARS	Bacteria	–	–
9. Swine flu	Virus	Pig + human	Fever – spreads
10. Bird flu	Virus	Birds	Fever – spreads
11. Ebola	Ebola virus	–	Fever – spreads

QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

1. Why is food necessary for us ?
2. Write the full form of WHO.
3. Name two non-infectious diseases.
4. Write two water-borne diseases.

SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. Write the difference between acute and chronic disease.
2. Write the expanded form of AIDS.
3. What is the difference between 'Being healthy' and 'Disease free' ?
4. Name two methods for treatment of infectious diseases.

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. How do micro-organisms enter into our body ?
2. Name four diseases caused by protozoa, virus, bacteria, fungi.
3. What are the different means by which infectious diseases spread ?
4. What precautions can you take in your school to reduce the incidence of infectious diseases ?

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. Name five diseases against which immunization vaccines are available.

OR

Name two diseases that can be prevented by using vaccine.

2. Fill in the blanks :

   (i) .....is a state of physical, mental and social well-being.

   (ii) AIDS is a.....(communicable/non-communicable) disease.

   (iii) Common cold is a.....(acute/chronic) disease.

(iv) Breathing in polluted air causes.....disease.

(v) Small pox is prevented through..... .

Hints to Long Answer Type Questions

1. Protozoa – Malaria, Virus – Polio, Bacteria – Pneumonia, TB, Fungi – Skin disease

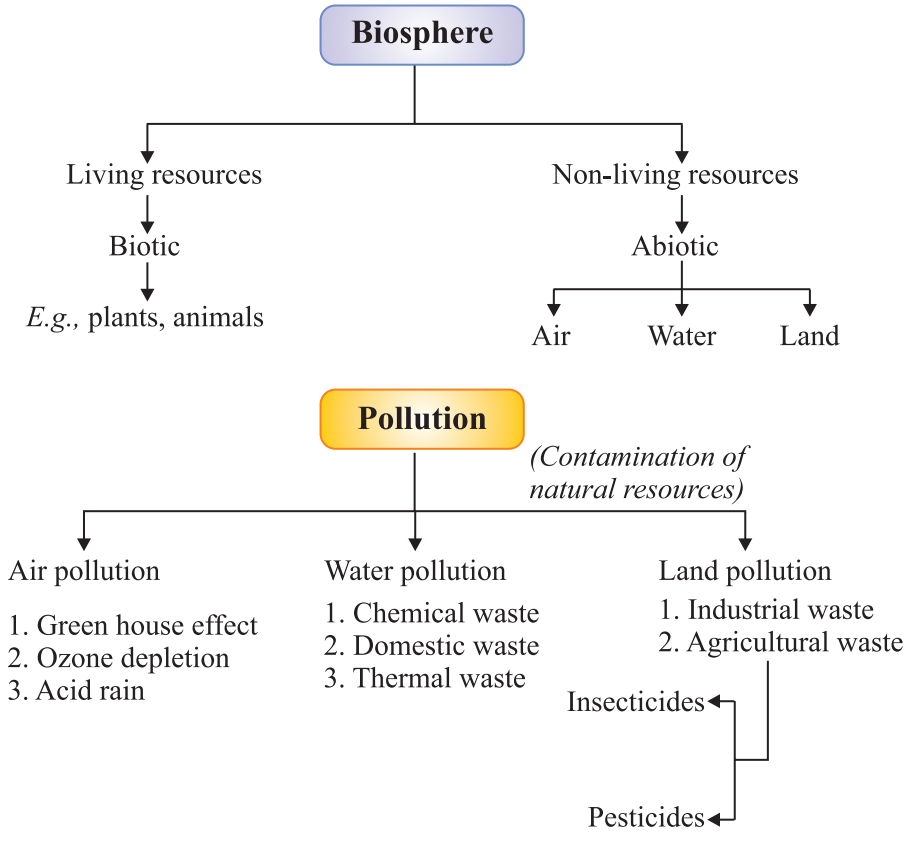
2. (i) Health (ii) communicable (iii) acute

   (iv) respiratory (v) vaccination

Chapter - 7

Natural Resources

CHAPTER AT A GLANCE



- Life on earth depends on resources like soil, water, air and energy from sun.
- Uneven heating of air over land and water-bodies causes winds.
- Evaporation of water from water-bodies and subsequent condensation give us rain.

- Pollution of air, water and soil affect the quality of life.
- We need to conserve our natural resources and use them in a sustainable manner.
- Various nutrients are used again and again in a cycle fashion. This leads to a certain balance between the various components of the biosphere.

Natural Resources

The resources available on the earth and the energy from the sun are necessary to meet the basic requirements of all life forms on the earth.

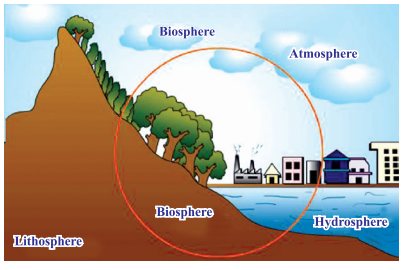
The stocks of nature which are useful to mankind are known as natural resources. *E.g.,* air, water, soil, minerals etc.

What are these resources on the earth ?

The outermost crust of the earth is called the **lithosphere**. Water covers 75% of the earth's surface. It is also found underground. These comprise the **hydrosphere.** The air that covers the whole of the earth like blanket is called the **atmosphere.**

Biosphere

All living things on earth together with atmosphere, the hydrosphere and the lithosphere interact and make life possible is known as biosphere. It may be :



Biotic components : Plants and animals.

Abiotic components : Air, water and soil.

AIR

- Air is a mixture of different gases.
- Air contains oxygen which is essential to living organisms for respiration. So it is called breath of life.

Role of Atmosphere

- Air is a bad conductor of heat. It keeps the average temperature of the earth constant during the day and even during the course of the whole year.
- Prevents the sudden increase in temperature during day time and during the night, it slows down the escape of heat into outer space. *E.g.,* At moon, there is no atmosphere and so the temperature varies from

190ºC to 110ºC.

The Movement of Air : Winds

- During the day, the direction of wind is from sea to land. This is because the air above the land gets heated faster and starts rising.
- During the night, the direction of wind is from land to sea. This is because at night, both land and sea start to cool.
- The movement of air from one region to the other creates winds.

RAIN

- Rain is formed by evaporation and condensation of water through water cycle in which distribution of water takes place. Rain is very important because it carries out all the agriculture processes in the plants.
- So we should conserve rain by contracting dams, pools etc.

Air Pollution

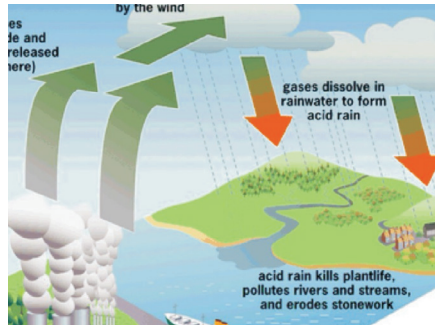
- An increase in the content of harmful substance (pollutants) in the air like carbon dioxide, carbon monoxide, oxides of sulphur, nitrogen, fluoride, lead, nickel, arsenic and dust particles etc. causes air pollution. It may cause :

In humans : Respiratory and renal problems, high blood pressure, eye irritation, cancer.

In plants : Reduced growth, degeneration of chlorophyll, mottling (patches/ spots of colour) of leaves.

Acid Rain

- When fossil fuels are burnt, gases like sulphur dioxide and nitrogen dioxide (NO_2) are released.
- These gases are dissolving in water form nitric acid and sulphuric acid.



Acid rain kills plant life, pollutes river and streams

Green House Effect

- Carbon dioxide keeps the earth warm much like glass which keeps the green house warm.
- Increase in carbon dioxide (CO_2) :
  - (i) intensifies green house effect.
  - (ii) leads to global warming.
  - (iii) increase in average temperature of earth.
  - (iv) may lead to melting of polar caps.
  - (v) sub-merging number of coastal cities.

Changes in environment affects us and our acitivities change the environment around us.

Environmental Problems Caused by Humans

Depletion of Ozone Layer

- Ozone layer is present in the stratosphere which is a part of our atmosphere from 16 km to 60 km above sea level.
- Ozone is an allotrope of oxygen. Its molecule is made up of three oxygen atoms. Molecular formula is O_3.
- Ozone layer absorbs the ultra-violet rays coming from the sun and protects living being from their harmful effects like skin cancer, cataract in eyes, weaken immune system.
- The decline of ozone layer thickness in Antartica was first observed in 1985 and was termed as ozone hole.

Reason of Ozone Depletion

- Excessive use of CFCs (Chloro Fluoro Carbon) in refrigeratos, jet planes, spray cans, fire extinguishers.
- Nuclear explosion

Smog

- Smog is a type of air pollution.
- The word ‘smog’ comes from the blend of two words : Smoke and fog.
- Smog can form in any climate where there is a lot of air pollution especially in cities.

Water : A wonder Liquid

- The most unusual natural compound found on earth and which fulfills almost various demands of different living things.
- About three-fourth of the earth surface is 75% are covered with water.
- It is present underground, a very large area on the surface (sea, ocean etc.) and also in the form of water vapour in the atmosphere.

Water Necessary for all Organisms

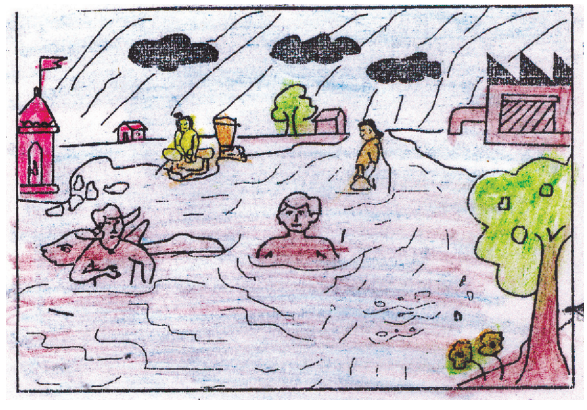
- It maintains a uniform temperature of the body.
- All cellular processes take place in a water medium.
- All the reactions that take place within our body and within our cells occur between substances that are dissolved in water.
- Water forms the habitat of many plants and animals.

Water Pollution

When water becomes unfit for drinking and other uses, then water is said to be polluted.

Causes of Water Pollution

- Dumping of wastes from the industries into water bodies.
- Washing of clothes near water bodies.
- Spraying chemical in water field.
- Dumping household wastes into the water bodies.



Various causes of water pollution

(Bathing of humans and animals, disposal of factory wastes, washing clothes etc.)

Soil

Soil is the portion of the earth surface consisting of disintegrated rock and decaying organic material. It provides the support for many plants and animals.

Creation of Soil : Various Factors

Factor 1. Sun

The sun heats up rocks during the day so that they expand. At night these rocks cool down and contract. Since all parts of the rocks do not expand and contract at the same rate, this results in the formation of cracks and ultimately the huge rocks breaks up into smaller pieces.

Factor 2. Water

Fast flowing water carries big and small particles of rock downstream. These rocks rub against other rocks and the resultant abrasion causes the rocks to wear down into smaller particles.

Factor 3. Wind

Wind carries sand from one place to another.

Living Organisms

Lichen (A slow growing plant)

Lichen, moss also grow on surface of rocks. While growing, they release certain substances that cause the rock surface to powder down and form a thin layer of soil.

Soil Erosion

Carrying away of upper fertile layer of soil by rain, wind, human activities and wrong agricultural practice is called soil erosion.

Causes

- Over grazing of land.
- Removal of top soil by wind and water.
- Due to lack of trees the upper layer of soil is eroded by air and water.
- Leaving land uncultivated for long time.

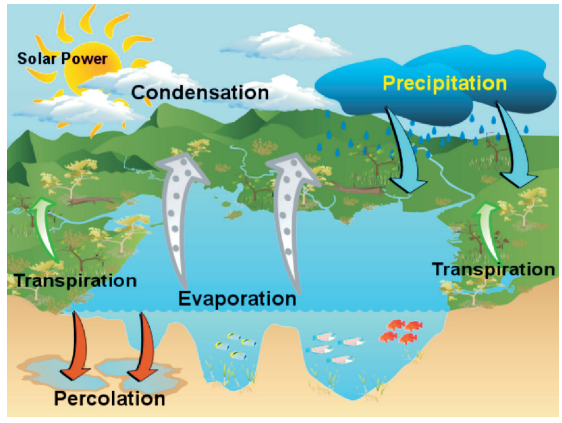
Biogeochemical Cycles

- The flow of substances from non-living to living and back to non-living

is called the cycling of substances.

- The cycling of chemical elements like carbon, oxygen, nitrogen, phosphorus, sulphur and water in the biosphere is called **biogeochemical cycle.** It operates through soil, water, air and biotic factors.

Water Cycle



Water Cycle

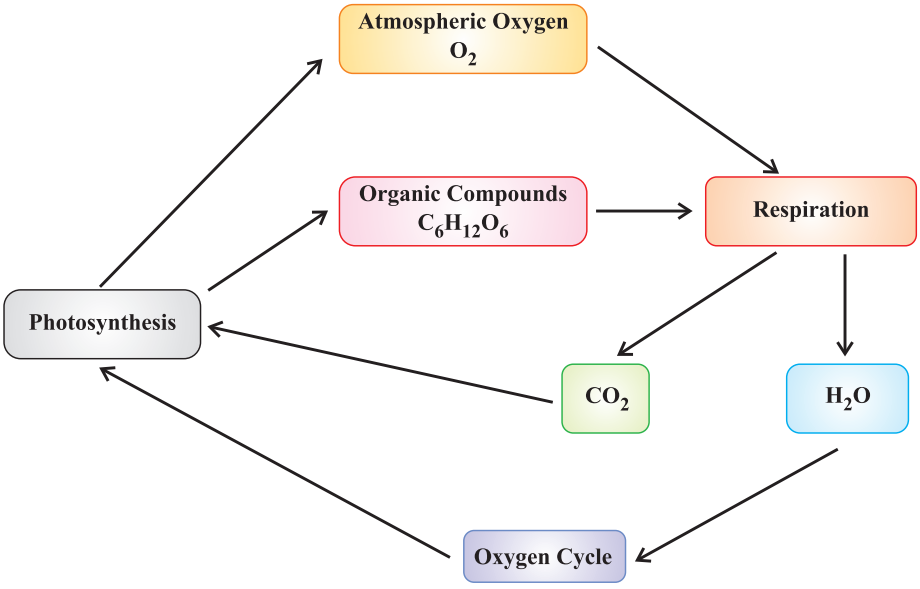
- The whole process in which water evaporates and falls on the land as rain and later flows back into the sea via rivers is known as **water cycle.**
- When sun shines, water evaporates continuously from the water bodies and forms **water vapour.** This water vapour rises up and goes into the **atmosphere.**
- The plants absorb water from the soil and use it during the process of **photosynthesis.**

They also loose water by the process of **transpiration**.

- The water vapour produced by transpiration also goes into the **atmosphere.**
- The process of respiration and evaporation from the surface of animal body produces water vapour which goes into the atmosphere.
- The evaporation and condensation of water vapour leads to rain. During winter, the water falls down in the form of dew or snow.
- All of the water that falls on the land does not immediately flow back into the sea. Some of it seeps into the soil and becomes part of the underground reservoir of fresh water.

- The underground water is again taken by plants and water cycle continues.

Oxygen Cycle



Oxygen Cycle

The % of oxygen in air is 21%.

- The cyclic process by which oxygen element is circulated continuously through the living and non-living components of the biosphere constitutes oxygen cycle.
- Human beings and animals take oxygen from the atmosphere during the process of respiration.

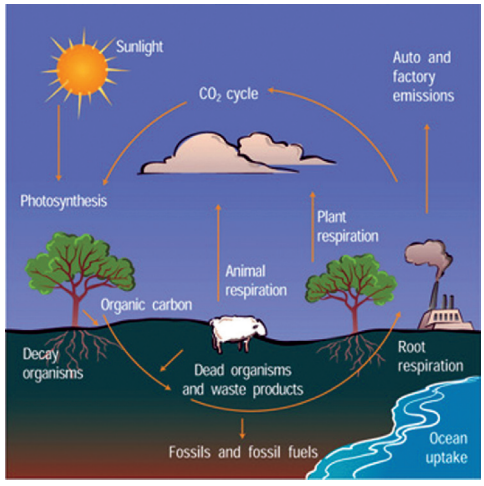
The decomposition of dead organisms also takes in oxygen from the atmosphere.

Respiration and decay of dead organisms release CO_2 and water.

- The carbon dioxide and water are used by the green plants during the process of photosynthesis.
- They give out oxygen during this process. This oxygen is again used by human beings and animals.

Thus, the oxyen cycle keeps repeating in nature.

Carbon Cycle



Carbon Cycle

0.03-0.04% carbon is present in the atmosphere in the form of CO_2.

- Carbon cycle maintains the balance of the element carbon in the atmosphere. Carbon is found in various forms on the earth.
- Carbon is present in the atmosphere as carbon dioxide.
- Carbon can also occur as carbonates and bicarbonate salts in minerals.
- Carbon is the essential part of nutrients like carbohydrates, fats, proteins, nucleic acids and vitamins.
- Carbon cycle keeps the level of CO_2 constant in the atmosphere.

The Carbon Cycle starts in plants as :

Step I.

Plants use CO_2 in the atmosphere, convert it into glucose in the presence of sunlight by the process of photosynthesis. Plants and animals break these carbohydrates for energy and release CO_2 through respiration.

Step II.

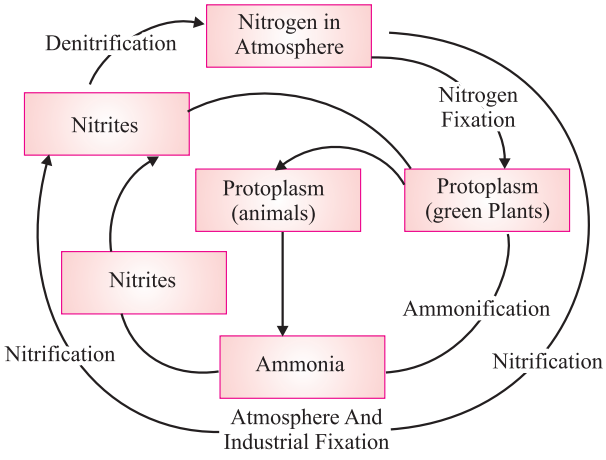
When the plants and animals die, fungi and bacteria decompose the dead remains. This releases the carbon in the remains as carbon dioxide.

Step III.

Some of the dead plants and animals which get buried under the earth under certain temperature and pressure get transformed into fossil fuels like coal and petroleum.

On burning these fuels, CO_2 is released into the atmosphere.

Nitrogen Cycle



Nitrogen Cycle

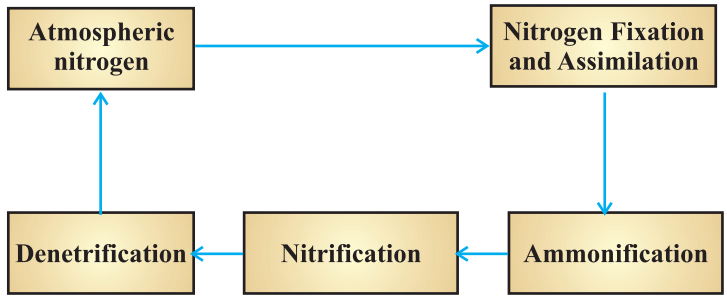
The sequence in which nitrogen passes from the atmosphere to the soil and organisms, and then is eventually released back into the atmosphere, is called nitrogen cycle.

- Nitrogen makes up 78% of the earth's atmosphere.
- Nitrogen is an essential constituent of proteins, nucleic acids like DNA and RNA, vitamins and chlorophyll.
- Plants and animals cannot utilize atmospheric nitrogen readily.
- It has to be fixed by some organisms called nitrogen fixers.
- Nitrogen-fixing bacteria like *Rhizobium* live in symbiotic association in the root nodules of certain leguminous plants.

Root nodules of leguminous plant

- These bacteria convert atmospheric nitrogen into ammonia which is utilized readily by plants.
- Nitrogen-fixing bacteria along with free living bacteria in the soil achieve 90% of nitrogen fixation.
- Lightning plays an important role in nitrogen fixation. When lightning occurs, the high temperature and pressure convert nitrogen and water into nitrates and nitrites.
- Nitrates and nitrites dissolve in water and are readily used by aquatic plants and animals.

- **Ammonification :** It is the process by which soil bacteria decompose dead organic matter and release ammonia into soil.
- **Nitrification :** It is the process by which ammonia is converted into nitrites and nitrates.
- **Denitrification :** It is the process by which nitrates are converted into atmospheric nitrogen.



A flow chart to show the important stages of Nitrogen Cycle

QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

1. What are the resources present on the earth ?
2. Name two gases of air.
3. Expand the term CFCs.
4. Write the formula of ozone.
5. Which acids are present in acid rain ?
6. Name four water borne diseases.
7. What are the nitrogen-fixing bacteria called ?

SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. Name three types of soil.
2. Name the disease that can be caused by UV rays.
3. What is the major source of fresh water ?

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. Draw a neat and labelled diagram of water cycle in nature.
2. How is green house effect related to global warming ? Explain.

3. What are the causes of soil erosion ?
4. Why is water necessary for all organisms ?

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. Write the differences between oxygen and ozone.
2. Explain the oxygen cycle.

OR

What are the factors or processes that make soil ?

SUMMATIVE ASSESSMENT EXAMINATION – II, 2015-16

Subject : Science

Class : IX

Time : 3 Hrs. **Max. Marks : 90**

General Instructions :

(i) The question paper comprises of three Sections A, B and C. You are to attempt all the sections.

(ii) All questions are compulsory.

(iii) There is no choice in any of the questions.

(iv) All questions of Section A, Section B and Section C are to be attempted separately.

(v) Question numbers 1 to 3 in Section A are one mark questions. These are to be answered in one word or in one sentence.

(vi) Question numbers 4 and 5 in Section A are two marks questions. These are to be answered in about 30 words each.

(vii) Question numbers 6 to 16 in Section A are three marks questions. These are to be answered in about 50 words each.

(viii) Question numbers 17 to 21 in Section A are five marks questions. These are to be answered in about 70 words each.

(ix) Section B has 3 OTBA questions. Question number 22 is two marks, Question number 23 is three marks and Question number 24 is five marks question.

(x) Question numbers 25 to 33 in Section C are multiple choice questions based on practical skills. Each question is a one mark question. You are to select one most appropriate response out of the four provided to you.

(xi) Question numbers 34 to 36 in Section C are two marks questions based on practical skills. These are to be answered in about 30 words each.

सामान्य निर्देश :

(i) इस प्रश्न–पत्र को तीन भागों – भाग अ, भाग ब और भाग स में बाँटा गया है। आपको तीनों भागों के प्रश्नों के उत्तर लिखने हैं।

(ii) सभी प्रश्न अनिवार्य हैं।

(iii) पूरे प्रश्न-पत्र में किसी प्रश्न में कोई चयन प्राप्त नहीं है।

(iv) आपको भाग अ, भाग ब और भाग स के सभी प्रश्नों के उत्तर पृथक्-पृथक् लिखने होंगे।

(v) भाग अ के प्रश्न संख्या 1 से 3 के प्रश्न एक-एक अंक के हैं। इनके उत्तर एक शब्द अथवा एक वाक्य में दें।

(vi) भाग अ के प्रश्न संख्या 4 व 5 के प्रश्न दो-दो अंकों के हैं। इनके उत्तर लगभग 30 शब्दों में देने हैं।

(vii) भाग अ के प्रश्न संख्या 6 से 16 के प्रश्न तीन-तीन अंकों के हैं। इनके उत्तर लगभग 50 शब्दों में देने हैं।

(viii) भाग अ के प्रश्न संख्या 17 से 21 के प्रश्न पाँच-पाँच अंकों के हैं। इनके उत्तर लगभग 70 शब्दों में देने हैं।

(ix) भाग ब के तीन प्रश्न, प्रश्न संख्या 22 से 24 मुक्त पाठ पर आधारित हैं। इनमें प्रश्न संख्या 22 के 2 अंक, प्रश्न संख्या 23 के 3 अंक तथा 24 के 5 अंक हैं।

(x) भाग स के प्रश्न संख्या 25 से 33 के प्रश्न प्रयोगात्मक कौशल पर आधारित बहुविकल्पीय प्रश्न हैं। प्रत्येक प्रश्न एक अंक का है। दिए गए विकल्पों में से आपको सबसे उपयुक्त विकल्प चुनना है।

(xi) भाग स के प्रश्न संख्या 34 से 36 के प्रश्न प्रयोगात्मक कौशल पर आधारित दो-दो अंकों के प्रश्न हैं। इनके उत्तर लगभग 30 शब्दों में देने हैं।

SECTION 'A'

(भाग 'अ')

1. Write one example each of : 1

(i) Triatomic molecule

(ii) Polyatomic molecule

प्रत्येक का एक-एक उदाहरण लिखिए –

(i) त्रिपरमाणुक अणु

(ii) बहुपरमाणुक अणु

2. Mass number of an element is 27, it has 13 electrons. Find the number of protons and neutrons in it. 1

किसी तत्व की द्रव्यमान संख्या 27 है, इसमें 13 इलेक्ट्रॉन हैं। इसमें प्रोटॉनों तथा न्यूट्रॉनों की संख्या ज्ञात कीजिए।

3. Where are seeds of gymnosperms formed ? 1

जिम्नोस्पर्म पौधों में बीज का निर्माण कहाँ होता है?

4. A person fires a gun standing at a distance of 55 m from a wall. If the speed of sound in air is 330 m/sec, find the time for an echo to be heard. 2

एक व्यक्ति एक दीवार से 55 मी. की दूरी पर खड़ा होकर बंदूक चलाता है। यदि वायु में ध्वनि की चाल 330 मी./से. है तो प्रतिध्वनि सुनने के लिए लगा समय ज्ञात कीजिए।

5. State the mathematical expressions for kinetic energy and potential energy. Give two examples where an object possesses both type of energy. 2

गतिज ऊर्जा तथा स्थितिज ऊर्जा के लिए गणितीय व्यंजक लिखिए। दो उदाहरण लिखिए जिनमें किसी वस्तु में ये दोनों ऊर्जाएँ आविष्ट होती हैं।

6. Calculate the number of particles in each of the following : 3

(i) 0.5 mole of carbon atoms

(ii) 7 g of nitrogen molecules

(iii) 17.75 g of hydrochloric acid

नीचे दिए गए प्रत्येक भाग में कणों की संख्या परिकलित कीजिए –

(i) कार्बन परमाणुओं के 0.5 मोल

(ii) नाइट्रोजन अणुओं के 7 ग्राम

(iii) हाइड्रोक्लोरिक अम्ल के 17.75 ग्राम

7. (i) Which of the following species have 18 electrons ? 3

Ca^{+2}, K^{+}, Na, Cl^{-}, Ar

(ii) Chemical properties of all the isotopes of an element are similar. State reason.

(i) नीचे दी गई स्पीशीज में किसमें 18 इलेक्ट्रॉन हैं ?

Ca^{+2}, K^{+}, Na, Cl^{-}, Ar

(ii) किसी तत्व के सभी समस्थानिकों के रासायनिक गुण एक समान होते हैं। कारण लिखिए।

8. What is meant by the term chemical formula ? Write the chemical formula of calcium carbonate. Calculate its formula unit mass. (Atomic mass of Ca = 40*u*, C = 12*u*, O = 16*u*) 3

रासायनिक सूत्र से क्या तात्पर्य है ? कैल्सियम कार्बोनेट का रासायनिक सूत्र लिखिए। इसका सूत्र इकाई द्रव्यमान परिकलित कीजिए। परमाणु द्रव्यमान Ca = 40*u*, C = 12*u*, O = 16*u*)

9. (i) Draw the relevance of scientific naming of an organism. 3

(ii) Who introduced this system of nomenclature ?

(iii) *Rana tigrina* is the scientific name of common frog. What do these two terms imply ?

(i) किसी जीव के वैज्ञानिक नाम पद्धति की अनुरूपता लिखिए।

(ii) वैज्ञानिक नाम पद्धति को किसने प्रस्तावित किया?

(iii) साधारण मेंढक का वैज्ञानिक नाम 'राना टिग्रिना' है। ये दो शब्द क्या दर्शाते हैं?

10. Complete the given table : 3

Disease	**Micro Causative organism**	**Mode of transmission**
Dengue fever	(a).....	(b).....
(c).....	*Vibrio cholera*	Contaminated food and water
(d).....	HIV	(e).....
Common cold	Virus	(f).....

दी गई सारणी को पूर्ण कीजिए –

रोग	**रोग उत्पन्न करने वाला सूक्ष्मजी**	**वसंचरण**
डेंगू ज्वर	(a).....	(b).....
(c).....	विब्रियो कोलरी	संक्रमित भोजन तथा जल
(d).....	HIV	(e).....
सामान्य जुकाम	वाइरस	(f).....

11. What are the two principles followed to treat an infectious disease ? Explain by giving examples. 3

संक्रामक रोगों के उपचार के कौन-से दो उपाय हैं? उदाहरण के साथ समझाइए।

12. An object when falls from rest possesses 400 J of kinetic energy at the end of 2 seconds. Calculate the mass of the object. 3

जब कोई वस्तु विरामावस्था से नीचे गिरती है तो 2 सेकण्ड के अन्त में उसमें 400 J गतिज ऊर्जा आविष्ट होती है। वस्तु का द्रव्यमान परिकलित कीजिए।

13. Define buoyancy. State two factors on which it depends. 3

उत्प्लावकता की परिभाषा लिखिए। यह किन दो कारकों पर निर्भर करती है?

14. With the help of a labelled diagram explain the echo ranging technique. 3

नामांकित आरेख की सहायता से प्रतिध्वनि परास तकनीक का वर्णन कीजिए।

15. Define relative density. Relative density of mercury is 13.6. The density of water is 10^3 kg/m**3.** What is the density of mercury in SI unit ? 3

आपेक्षिक घनत्व को परिभाषित कीजिए। मरकरी का आपेक्षिक घनत्व 13.6 है, जल का घनत्व 10^3 kg/m^3 हो तो मरकरी का घनत्व SI मात्रक में क्या होगा ?

16. Rahul and his younger brother Rohan went to see Dussehra fair. Rohan purchased a bow and arrow there and tried to aim but, the arrow fell on the ground just below. Then Rahul told him to stretch the string and then release. Rohan did the same and was able to release the arrow to a good distance. 5

(i) What type of energy is possessed by the stretched string ?

(ii) How did the arrow gain kinetic energy ?

(iii) What characteristic values of Rahul and Rohan did you notice ?

राहुल तथा उसका छोटा भाई रोहन दशहरे का मेला देखने के लिए गए। रोहन ने वहाँ एक तीर-कमान खरीदा और निशाना लगाना चाहा लेकिन तीर वहीं जमीन पर नीचे गिर गया। तब राहुल ने उसे कहा कि वह डोरी को खींचकर तीर छोड़े। रोहन ने एकसा ही किया और वह तीन को कुछ दूरी तक छोड़ पाया।

(i) तनी हुई डोरी में किस प्रकार की ऊर्जा आविष्ट होती है ?

(ii) तीर ने गतिज ऊर्जा किस प्रकार प्राप्त की ?

(iii) आपने राहुल तथा रोहन में किन विशिष्ट मूल्यों को देखा ?

17. The sub-atomic particles of atoms of two elements A and B are given below. Study it and answer the following questions. Give justification for your answers. 5

Element	**Protons**	**Electrons**	**Neutrons**
A	2	2	2
B	11	11	12

(i) Which of the two is bigger in atomic size ?

(ii) Which of the two has a stronger nucleus ?

(iii) Explain the nature of elements A and B.

दो तत्वों A और B के परमाणुओं के अवपरमाणुक कण नीचे दिए गए हैं। उनका अध्ययन

कीजिए तथा निम्न प्रश्नों के उत्तर लिखिए। अपने उत्तर की सत्यता "द्ध कीजिए।

तत्व	प्रोटॉन	इलेक्ट्रॉन	न्यूट्रॉन
A	2	2	2
B	11	11	12

(i) दोनों में से किसके परमाणु का आकार बड़ा है?

(ii) दोनों में से किसका नाभिक अधिक प्रबल है?

(iii) तत्व A तथा B की प्रकृति की व्याख्या कीजिए।

18. Construct a table to differentiate between Monera and Fungi on the following grounds : 5

(i) Body organization

(ii) Prokaryotic/Eukatyotic

(iii) Cell wall

(iv) Mode of nutrition

Name an organism belonging to each of the two kingdoms.

नीचे दिए गए आधारों पर मोनेरा तथा फंजाई में विभेदन के लिए एक तालिका की संरचना कीजिए –

(i) शारीरिक संगठन

(ii) प्रोकैरियोटी/यूकैरियोटी

(iii) कोशिका भित्ति

(iv) पोषण का स्तर

दोनों जगतों से सम्बन्धित एक-एक जीव का नाम लिखिए।

19. About a hundred years ago, when small pox persisted, a group of people who had this disease earlier, survived as they had no chance of suffering from it again. So, having the disease once was a mean of preventing subsequent attacks of the same disease. 5

(i) Why does this happen ? Explain.

(ii) We can 'fool' the immune system. Explain.

(iii) Name this principles of prevention of diseases.

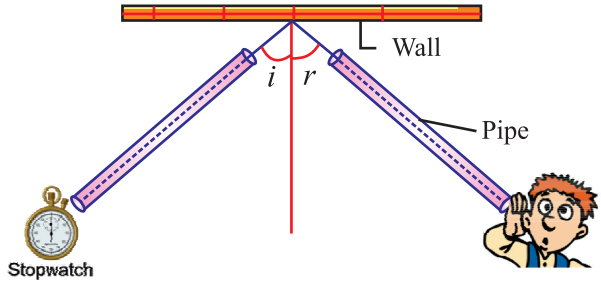
करीब सौ वर्ष पूर्व, जब चेचक फैली तब लोगों का एक वर्ग ऐसा भी था जिसे चेचक पहले हो चुकी थी और वे बच गए, अब उन्हें पुनः यह रोग होने की संभावना नहीं थी। इसलिए चेचक एक बार हो जाने पर पुनः उसी रोग से ग्रस्त होने की संभावना का बचाव हो जाता था।

(i) ऐसा क्यों होता है? समझाइए।

(ii) हम प्रतिरक्षा तंत्र को मूर्ख बना सकते हैं। स्पष्ट कीजिए।

(iii) रोगों से बचाव के इस "द्धान्त का नाम लिखिए।

20. For hearing the loudest ticking sound by the ear, following experimental setup is made : 2

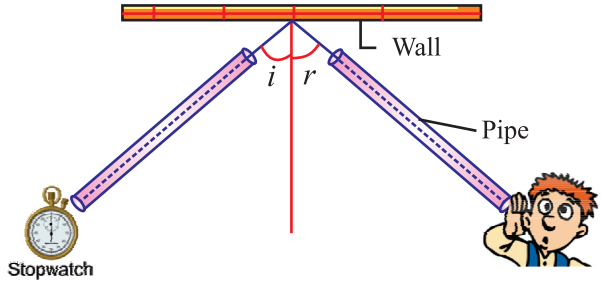


(i) Find the angles x and y in the figure above.

(ii) Name the phenomenon observed here.

(iii) State the laws of this phenomenon.

कान द्वारा प्रबलतम टिकिंग ध्वनि सुने जाने के लिए निम्न प्रायोगिक सैट-अप बनाया गया है –



(i) ऊपर दिए गए आरेख में कोण x तथा y ज्ञात कीजिए।

(ii) प्रेक्षित परिघटना का नाम लिखिए।

(iii) इस परिघटना के नियमों को व्यक्त कीजिए।

21. (i) Define work. Give SI unit of work done. Write an expression for positive work done. 5

(ii) Calculate the work done in pushing a cart through a distance of 50 m against the force of friction equal to 250 N. Also state the type of work done.

(iii) What will be the work done, if displacement of the object is perpendicular to the direction of force ?

(iv) When an object moves on a circular path, what will be the work done ?

(i) कार्य की परिभाषा लिखिए। किए गए कार्य का SI मात्रक लिखिए। धनात्मक कार्य के लिए व्यंजक लिखिए।

(ii) एक गाड़ी को 50 मी. की दूरी तक धकेलने में घर्षण के विरुद्ध लगाया गया बल 250 N है, किया गया कार्य परिकलन कीजिए। साथ ही कार्य का प्रकार भी व्यक्त कीजिए।

(iii) यदि किसी वस्तु का विस्थापन बल की दिशा के लम्बवत् है तो किया गया कार्य क्या होगा ?

(iv) जब कोई वस्तु वृत्तीय पथ पर गतिशील है तो किया गया कार्य कितना होगा ?

SECTION C

(भाग 'स')

25. While studying the laws of reflection of sound, three students used different reflecting surfaces. The best result would be obtained by the student who used the reflecting surface : 1

(a) a thermocol sheet

(b) a polished, plane metal sheet

(c) a rough cardboard sheet

(d) a cushioned surface

ध्वनि के परावर्तन के नियमों का अध्ययन करते समय तीन छात्रों ने विभिन्न परावर्तक पृष्ठ उपयोग किए। सर्वोत्तम परिणाम उस छात्र को प्राप्त होगा जिसके द्वारा उपयोग किया जाने वाला परावर्तक पृष्ठ होगा –

(a) एक थर्मोकोल शीट

(b) एक पॉलिश की हुई समतल धात्विक शीट

(c) एक खुरदरे गत्ते की शीट

(d) एक गद्देदार सतह

26. A book of mass 'm' having dimensions as length (l), breadth (b) and thickness (t), where $t > b > l$ is placed on a table. If the thrust exerted by it on the table is F, then the maximum pressure exerted by the book on the table is : 1

(a) F/lbt N/m (b) F/bt N/m^2

(c) F/lt N/m^2 (d) F/lb N/m^2

'm' द्रव्यमान की एक पुस्तक जिसकी विमाएँ लम्बाई (l), चौड़ाई (b) तथा मोटाई (t) हैं, जिसमें

$t > b > l$ को मेज पर रखा जाता है। पुस्तक द्वारा मेज पर लगने वाला प्रणोद F हो तो इसके द्वारा लगाया अधिकतम दाब है –

(a) F/lbt N/m (b) F/bt N/m^2

(c) F/lt N/m^2 (d) F/lb N/m^2

27. Neena, James, Lohit and Madhur did the experiment on measuring the speed of pulse propagated through a stretched string as follows : 1

(1) Neena stretched her thick cotton string and gave it a strong horizontal jerk.

(2) James stretched a thin jute string and gave it a mild transverse jerk.

(3) Lohit stretched his thick cottong string very tight and gave it a mild transverse jerk.

(4) Madhur stretched his thin jut string and gave it a strong horizontal jerk.

The best choice is of :

(a) Neena (b) James

(c) Lohit (d) Madhur

नीना, जेम्स, लोहित तथा मधुर ने एक खिंची हुई डोरी से संचरित स्पंद की चाल मापने का प्रयोग किया जो इस प्रकार है –

(1) नीना ने अपनी मोटी कॉटन की डोरी को क्षैतिज झटका देकर खींचा।

(2) जेम्स ने अपनी पतली जूट की डोरी को टाइट पकड़कर हल्का अनुप्रस्थ झटका देकर खींचा।

(3) लोहित ने अपनी मोटी कॉटन की डोरी को बहुत टाइट पकड़कर हल्का अनुप्रस्थ झटका देकर खींचा।

(4) मधुर ने अपनी पतली जूट की डोरी को प्रबल क्षैतिज झटका देकर खींचा।

सर्वोत्तम चयन जिसने किया है, वह है –

(a) नीना (b) जेम्स

(c) लोहित (d) मधुर

28. You are identifying a plant that possesses seeds but not fruits. It may belong to : 1

(a) Pteridophyta (b) Gymnosperm

(c) Bryophyta (d) Angiosperm

आप एक ऐसे पौधे की पहचान करने की चेष्टा करते हैं जिसमें बीज तो होते हैं परन्तु फल नहीं होता। यह पौधा जिस वर्ग से सम्बन्धित है, वह है –

(a) टेरिडोफाइटा (b) जिम्नोस्पर्म

(c) ब्रायोफाइटा (d) एन्जियोस्पर्म

29. 28 g nitrogen combines with 6 g hydrogen to form ammonia gas. If the law of conservation is true, the mass of ammonia gas will be : 1

(a) 28 g (b) 6 g

(c) 22 g (d) 34 g

28 ग्राम नाइट्रोजन 6 ग्राम हाइड्रोजन से संयोजन करके अमोनिया गैस बनाती है। यदि द्रव्यमान संरक्षण का नियम सत्य है, तो अमोनिया गैस का द्रव्यमान होगा –

(a) 28 g (b) 6 g

(c) 22 g (d) 34 g

30. Given below is a chemical equation to show the formation of iron sulphide by heating a mixture of iron and sulphur :

$$Fe + S \rightarrow FeS$$

Calculate the mass of unrelated sulphur in g when 28 g of iron reacts with 22 g of sulphur to form 44 g of iron sulphide. Mass of unreacted sulphur is : (Relative atomic masses : Fe = 56*u* and S = 32*u*) 1

(a) 22 g (b) 6 g

(c) 16 g (d) 12 g

नीचे आयरन तथा सल्फर के मिश्रण को गर्म करने के पश्चात् आयरन सल्फाइड के निर्माण को प्रदर्शित करती हुई रासायनिक अभिक्रिया दी गई है –

$$Fe + S \rightarrow FeS$$

जब 28 g आयरन 22 g सल्फर से अभिक्रिया करके 44 g आयरन सल्फाइड निर्मित करता है तो ग्राम में अभिक्रिया रहित सल्फर का द्रव्यमान परिकलित कीजिए। (सापेक्ष परमाणु द्रव्यमान : Fe = 56*u*, S = 32*u*)

(a) 22 g (b) 6 g

(c) 16 g (d) 12 g

31. Dicotyledonous plants often have : 1

(a) cambium absent (b) isobilateral leaves

(c) floral parts in units of three (d) reticulate venation

द्विबीजपत्री पादपों में होते हैं प्रायः –

(a) कैम्बियम अनुपस्थित (b) समपार्श्वीय पत्तियाँ

(c) तीन की इकाई में पुष्प भाग (d) जालिकावत् शिराविन्यास

32. Which of the following statement is correct in respect of monocotyledonous plant ? 1

(a) Reticulate venation, one cotyledon and tetramerous flower

(b) Reticulate venation, two cotyledons and pentamerous flower

(c) Parallel venation, two cotyledons and dimerous flower

(d) Parallel venation, one cotyledon and trimerous flower

एकबीजपत्री पादप के संदर्भ में निम्नलिखित में से कौन-सा कथन सत्य है ?

(a) जालिकावत् शिराविन्यास, एकबीजपत्र एवं चतुर्तयी पुष्प

(b) जालिकावत् शिराविन्यास, द्विबीजपत्र एवं पंचभागी पुष्प

(c) समानान्तर शिराविन्यास, द्विबीजपत्र एवं द्वितयी पुष्प

(d) समानान्तर शिराविन्यास, एकबीजपत्र एवं त्रितयी पुष्प

33. Out of the following statements regarding the different stages in the life cycle of a mosquito which one is incorrect ? 1

(a) The eggs of mosquito are deposited on stagnant water

(b) The larvae hatch out from the eggs within a few hours

(c) The larva stage is followed by the pupa stage

(d) From the pupa an adult mosquito emerges

मच्छर के जीवन चक्र में विभिन्न अवस्थाओं के संदर्भ में नीचे दिए गए कथनों में से कौन-सा कथन सही नहीं है ?

(a) मच्छर के अंडे रुके हुए पानी पर निक्षे"त होते हैं

(b) अंडों में से लार्वा कुछ घंटों में निकल आते हैं

(c) प्यूपा अवस्था के बाद लार्वा अवस्था आती है

(d) प्यूपा में से वयस्क मच्छर निकलता है

34. If two balls made of iron and aluminium of equal volumes are immersed in a liquid, then will they experiment equal up-thrust ? Justify your answer. 2

यदि आयरन तथा ऐलुमिनियम से बनी दो गेंदों जिनके आयतन एक समान हैं, को एक द्रव में डुबोया जाता है तो क्या उन पर एकसमान उत्प्लावन बल लगेगा? अपने उत्तर की पुष्टि कीजिए।

35. An object of volume 200 cm^3 is floating on a fluid with half of its portion inside the fluid as shown below. Find the volume and weight of the fluid displaced by the object. 2

आरेख में दर्शाए गए अनुसार 200 cm^3 आयतन की एक वस्तु एक तरल में इस प्रकार तैर रही है कि उसका आधा भाग तरल के अंदर है। वस्तु द्वारा विस्था"त तरल का आयतन तथा भार ज्ञात कीजिए।

36. Enumerate any two adaptive features of earthworm. 2

केंचुए के किन्हीं दो अनुकूली लक्षणों को समझाइए।

SCIENCE (Theory)

SUMMATIVE ASSESSMENT – 2

CLASS – IX

BLUE PRINT

S. No.	Chapter	VSA	SA-I	SA-II	LA	MCQ	Total
1.	Atoms and Molecule		2(1)	6(2)			8(3)
2.	Structure of Atom	1(1)		3(1)	5(1)		9(3)
3.	Diversity in Living Organisms		2(1)	6(2)		6(6)	14(9)
4.	Why do we Fall Ill			6(2)			6(2)
5.	Natural Resources	1(1)	2(1)	3(1)	5(1)		11(4)
6.	Work and Energy	1(1)		6(2)	5(1)		12(4)
7.	Sound			6(2)	5(1)	6(6)	17(9)
8.	Gravitation		2(1)		5(1)	6(6)	13(8)
	TOTAL	3(3)	8(4)	36(12)	25(5)	18(18)	90(42)

Time : 3 Hrs. **Max. Marks : 90**

General Instructions :

(i) The question paper comprises of two Sections A and B. You are to attempt both the sections.

(ii) All questions are compulsory.

(iii) There is no overall choice. However internal choice has been provided in all the five questions of five marks category. Only one option in such questions is to be attempted.

(iv) All questions of Section A and all questions of Section B are to be attempted separately.

(v) Question numbers 1 to 3 in Section A are one mark questions. These are to be answered in one word or in one sentence.

(vi) Question numbers 4 to 7 are two mark questions, to be answered in about 30 words each.

(vii) Question numbers 8 to 19 are three mark questions, to be answered in

about 50 words each.

(viii) Question numbers 20 to 24 are five marks questions, to be answered in about 70 words each.

(ix) Question numbers 25 to 42 in Section B are multiple choice questions based on practical skills. Each question is a one mark question. You are to choose one most appropriate response out of the four provided to you.

SECTION 'A'

1. Which form of energy will a body possess placed at the top of hill ?

2. In which layer of the atmosphere ozone layer is located ?

3. If Z = 3, what would be the valency of element ? Write the name of element.

4. Calculate the mass of 1 molecule of nitrogen gas.

5. Complete the following chart :

VERTEBRATA

PISCES	AMPHIBIANS	(A)	(C)	MAMMALIA
↓	↓	↓	↓	↓
ALL FISHES	Live on land and (b).....	3-chambered heart	Pneumatic	Have (d)..... to feed young ones

6. State two causes and two effects of depletion of ozone layer.

7. Relative density of silver is 10.8. The density of water is 10^3 kg/m^3. What is the density of silver in SI unit ?

8. Give reasons :

(a) Which division among plants have the simplest organisms ?

(b) Why do Gymnosperms and Angiosperms differ from each other ?

9. (a) Why a person suffering once from small pox cannot suffer from it again ?

(b) Name one disease associated with the attack of microbe on the lungs.

10. A child hears an echo from a cliff in 10 sec. after the sound from an animal is produced. Calculate the distance between the cliff and the child. (Take velocity of sound as 340 m/s)

11. (a) Draw a diagram showing graphical representation of low pitch and high pitch sound.

(b) Write any two applications of SONAR.

12. People often bemoan that quality of air has gone down since their childhood.

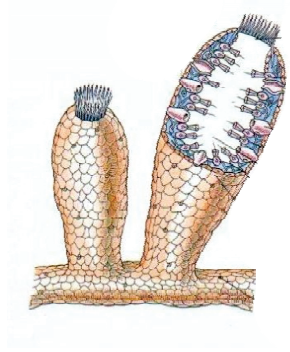
(a) How is quality of air affected ?

(b) How does this quality affect us and other life forms ?

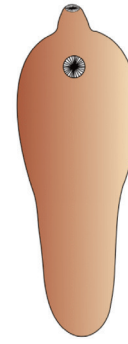
13. (a) Write two differences between acute and chronic diseases.

(b) Give one example of each.

14. Identify the phylum of the following 2 organisms and write 2 characteristic feature of each.



(a)



(b)

15. (a) Why are the shells in which electrons revolve called energy shells ?

(b) Name the shells.

(c) How many electrons can be there in M shell ?

16. (a) Calculate the molar mass of CH_3COOH. (Atomic mass of C = 12 *u*, H = 1 *u*, O = 16 *u*)

(b) Write the molecular formula for :

(i) Aluminium chloride

(ii) Ammonium nitrate

17. (a) Define power.

(b) A body of mass 45 kg climbs up 20 steps in 20 secs. If each step is 25 cm high, calculate the power used in climbing. Take $g = 10\ m/s^2$.

18. Identify the energy transformation in the following :

Hydroelectric power, Explosion of cracker and Oscillating pendulum.

19. (a) What mass of sodium sulphate will react with 5.22 g of barium chloride to produce 6.10 g of sodium chloride and 2.80 g of barium sulphate ?

(b) On the basis of which law did you calculate your answer.

20. Explain an activity with labelled diagram that sound needs material medium for propagation.

OR

Explain the working of human ear with the help of a well-labelled diagram.

21. (a) What are biogeochemical cycles ?

(b) Draw a labelled diagram of nitrogen cycle ?

OR

(a) What is green house effect ?

(b) Draw a well-labelled diagram of carbon cycle.

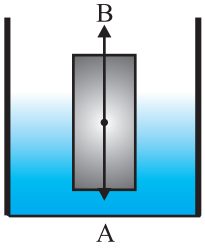
22. (a) On which principle lactometer and hydrometer are based ?

(b) A bucket of water is easily lifted as long as it is in water. Why ?

(c) Following forces act on body immersed in a liquid.

(i) Name the forces.

(ii) What happens when A is greater than B.



OR

(a) Give difference between thrust and pressure.

(b) Why does an object float or sink when placed on the surface of water ?

(c) What do you mean by Buoyancy ?

23. (a) Derive an expression for kinetic energy of a moving body.

(b) Name the type of energy possessed by :

(i) Flowing water

(ii) Stretched rubber band

(c) A car weighing 2000 kg is accelerated from rest and covers a distance of 40 m in 6 sec. Calculate the work done by the car.

OR

(a) Derive an expression for potential energy of a body.

(b) When do you say that work is done ?

(c) A porter lifts a luggage of 15 kg from the ground and puts on his head **1.**5 m above the ground. Calculate the work done by him on the luggage.

24. From the given table answer the following :

ELEMENT	MASS NUMBER	ATOMIC NUMBER
A	11	5
B	19	9
C	3	2
D	23	11
E	9	4

(a) How many electrons are present in E ?

(b) Which is an inert gas ? Why ?

(c) Which atom will form a negatively charged ion ?

(d) Which element has 12 neutrons ? Why ?

(e) Which atom will form a cation with one positive charge ?

OR

(a) Which postulate of Dalton's atomic theory is the result of Law of conservation of mass ?

(b) Why is it not possible to see an atom with naked eyes ?

(c) Write the symbols for the following elements :

Sodium, Zinc, Lead, Chlorine

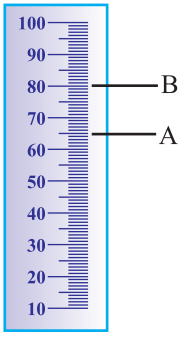
SECTION 'B'

Multiple Choice Questions (1 Mark each)

25. Jointed appandages are characteristic feature of :

(a) Cockroach
(b) Earthworm
(c) Bony fish
(d) Pigeon

26. The level of water in measuring cylinder before and after immersing a solid of mass **1.**5 g has risen from point A to B as shown below. The density of the solid object would be :



(a) 1 g/cc
(b) **1.**5 g/cc
(c) 2 g/cc
(d) 0.75 g/cc

27. If the reflected and incident sound are at an angle of 90 degrees with each other, the incident angle should be :

(a) 60 degrees
(b) 30 degrees
(c) 45 degrees
(d) 180 degrees

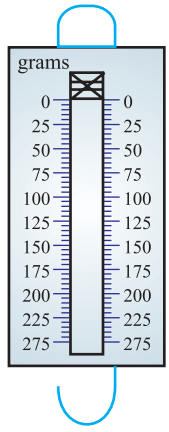
28. Two specimen A and B were observed by a child for spotting as shown below. After identifying the given specimens, in which of the following groups should he place them :

FIGURE -A

FIGURE -B

S. No.	A	B
(a)	Bryophyta	Pteridophyta
(b)	Pteridophyta	Gymnosperms
(c)	Algae	Gymnosperms
(d)	Gymnosperms	Algae

29. A spring balance is used to calculate the mass of the body as shown below. A student calculate the least count of the spring balance and found it to be :



(a) **1.**5 gwt/division (b) 2 gwt/division

(c) **2.**5 gwt/division (d) 1 gwt/division

30. Which one of the following is not an adaptive feature of bony fish ?

(a) It has streamlined body (b) Presence of anal cerci

(c) Presence of fins (d) Presence of gills

31. The density of pure water at 25 degree Celsius is :

(a) 1 g/m^3 (b) 1 g/cc

(c) 1000 kg/cc (d) 100 g/cc

32. For doing experiment on verification of laws of reflection of sound successfully, the reflecting surface should be :

(a) a foam padded board

(b) a sheet of pure white cloth

(c) a wooden board with many holes in it

(d) a wooden board without holes

33. The umbrella like spherical part of the button mushroom is :

(a) Stipe (b) Pileus

(c) Sporangiophore (d) Sporangium

34. The speed of sound in air is about :

(a) 3×10^8 m/s (b) 340 m/s

(c) 340 cm/s (d) 340 km/s

35. Ribbon shaped and spiral chloroplast is present in which of the following organism :

(a) Ulothrix (b) Agaricus

(c) Spirogyra (d) Chlamydomonas

36. Seeds are naked in :

(a) Angiosperms (b) Gymnospersm

(c) Both of these (d) None of these

37. While determining the density of a metal block using a spring balance and a measuring cylinder, a student followed the following steps in his experiment.

I. Noted the water level in the measuring cylinder without the metal block.

II. Immersed the metal block centrally in water without touching the sides and centre of the bottom.

III. Noted the water level in the measuring cylinder with the metal block inside it.

IV. Removed the metal block from the water and immediately weighed it using a spring balance.

The incorrect step in the procedure is :

(a) I (b) II

(c) III (d) IV

38. When sound gets reflected from a surface :

(a) The angle of reflection is always greater than the angle of incidence

(b) The angle of reflection is always less than the angle of incidence

(c) The angle of reflection is always equal to the angle of incidence

(d) The angle of reflection is always equal to 90 degrees

39. Upthrust is a force which acts in :

(a) Upward direction (b) Downward direction

(c) Any direction (d) None of the above

40. Weight of an object in air is 100 N. Its weight in water will be :

(a) Less than 100 N (b) More than 100 N

(c) Equal to 100 N (d) Zero

41. Pulse is a :

(a) Short duration disturbance (b) Does not repeat

(c) Can travel (d) All of the above

42. A pulse travels through a slinky 10 m long from one end to the other end and then back to the point of origin in 3 sec. The velocity of pulse in the slinky is :

(a) **3.**33 m/s (b) **4.**5 m/s

(c) 6 m/s (d) **6.**66 m/s

Summative Assessment – 2
Science (Theory)
Class – IX
MARKING SCHEME

SECTION 'A'

1. Potential energy — 1 mark

2. Stratosphere — 1 mark

3. Valency : 1, Name of element : Lithium — ½ mark each

4. Mass of 1 mole nitrogen gas = 28 g — ½ mark

1 mole = 6.022×10^{23} molecules of nitrogen gas — ½ mark

Mass of 6.022×10^{23} molecules of nitrogen gas = 28 g — ½ mark

Mass of 1 molecule of nitrogen gas = $28/3.022 \times 10^{23}$ g = 4.6×10^{23} g — ½ mark

5. (a) reptilian (b) water ½ mark each

(c) aves (d) mammary gland

6. **Causes :**

(a) Use of CFCs — ½ mark

(b) Increase in the level of methane or carbon dioxide — ½ mark

Effects :

(a) UV rays will reach the earth and may cause skin burns. — ½ mark

(b) Increased chances of cancer. — ½ mark

7. Relative density of silver = 10.8 — 2 marks

$$\text{Relative density of silver} = \frac{\text{Density of silver}}{\text{Density of water}}$$

Density of silver = Relative density of silver × Density of water

$= 10.8 \times 10^3$ kg/m^3

8. (a) Thallophyta — 1 mark

(b) Any two differences — 2 marks

9. (a) Development of immunity to small pox, memory cells are formed,

memory cells attack more vigorously and quickly if microbe enters the body second time. 2 marks

(b) Tuberculosis 1 mark

10. Formula : $2d = v \times t$ 1 mark

$d = 340 \times 10/2$ 1 mark

$= 1700$ m 1 mark

11. Refer to NCERT book Page 165 and 171. (2 marks for diagram + ½ mark each for application)

12. (a) Any one reason 1 mark

(b) Any two points 2 marks

13. (a)

Acute Diseases	**Chronic Diseases**
These diseases are short term.	These diseases have long duration.
The patient recovers completely.	The patient never recovers completely.

2 marks

(b) **Acute :** Common cold, tuberculosis.

Chronic : Diabetes, elephantiasis. (Any one from each) ½ mark each

14. (a) Porifera – any two characteristics (½ + 1) marks

(b) Platyhelminthes – any two characteristics (½ + 1) marks

15. (a) Because each shell has its own fixed energy. 1 mark

(b) K, L, M, N. 1 mark

(c) 18 electrons 1 mark

16. (a) Molar mass of $CH_3COOH = 12\,u + 3u \times 1\,u + 16\,u + 16u + 1\,u$ 1 mark

$= 60\,u$ 1 mark

(b) (i) $AlCl_3$ ½ mark

(ii) NH_4NO_3 ½ mark

17. (a) Refer to NCERT book. 1 mark

(b) Height of each step = 25 cm

Number of steps = 20

Total height = $25 \times 20 = 500$ cm $= 5$ m ½ mark

Work done = $mgh = 45 \times 10 \times 5 = 2250$ J ½ mark

Power = Work done/Time = 2250/20 = 112.5 Watt 1 mark

18. Hydroelectric power – Water to electricity, Explosion of cracker – Chemical to heat, light and sound energy, Oscillating pendulum – Kinetic energy to potential energy 1 + 1 + 1 marks

19. (a) Mass of sodium sulphate = x g

Mass of sodium sulphate + Mass of barium chloride = Mass of sodium chloride + Mass of barium sulphate

x g + 5.22 g = **6.**10 g + 2**.**80 g 1 mark

x g = 8.90 – 5.22 = 3.68 g. 1 mark

(b) Law of conservation of mass is used. 1 mark

20. Refer to NCERT (2 marks for diagram + 1 mark for labeling + 2 marks for explanation)

OR

Refer to NCERT (2 marks for diagram + 1 mark for labeling + 2 marks for working)

21. (a) Cyclic flow of nutrients between living and non-living components are called biogeochemical cycles. 1 mark

(b) Refer to NCERT book Page no. 198 (2 marks for diagram + 2 marks for labelling)

OR

(a) Refer to NCERT 1 mark

(b) Refer to NCERT book Page no. 199 (2 marks for diagram + 2 marks for labelling)

22. (a) Archimedes principle 1 mark

(b) In water the apparent weight of the bucket is less. 1 mark

(c) (i) A : Weight of the object, B : Upthrust 1 + 1 marks

(ii) Object will sink. 1 mark

OR

(a) Any two points 2 marks

(b) Refer to NCERT 2 marks

(c) Buoyancy is the upward force on an object produced by the surrounding liquid or gas in which it is fully or partially immersed. 1 mark

23. (a) Refer to NCERT book 2 marks

(b) (i) Kinetic energy ½ mark

(ii) Elastic potential energy ½ mark

(c) $s = ut + \frac{1}{2}at^2$ ½ mark

$40 = 0 + \frac{1}{2}a \times 36$

$a = 40/18 = 2.22$ m/s^2 ½ mark

Work done = F × S = $m \times a \times s = 2000 \times 2.22 \times 40 = 177600$ J 1 mark

OR

(a) Refer to NCERT textbook Page no. 153 2 marks

(b) Work is said to be done if force is applied on an object and it shows some displacement. 1 mark

(c) Mass of object, m = 15 kg

Displacement = 1.5 m

Work done = F × S = $mg \times$ S

$= 1.5 \times 10 \times 1.5 = 225$ J 2 marks

24. (a) 4 electrons

(b) C because it has completely filled shell.

(c) B because it has 7 valence electrons.

(d) D

(e) D 1 mark each

OR

(a) The law of conservation of mass is based on following postulate of Dalton's atomic theory :

"Atom can neither be created and nor be destroyed during a physical change or chemical reaction." 1 mark

(b) Because they are far too small to be seen even with a microscope. They have a diameter of between 32-225 pm (pm = 1×10^{-12} metres). 2 marks

(c) Na, Zn, Pb, Cl ½ mark each

SECTION 'B'

25. (a) **26.** (a)

27. (c) **28.** (d)

29. (c) **30.** (b)

31. (b) **32.** (d)

33. (b) **34.** (b)

35. (c) **36.** (b)

37. (d) **38.** (c)

39. (a) **40.** (a)

41. (d) **42.** (d)

SECOND TERM PRACTICALS

1. To verify the laws of reflection of sound.

2. To determine the density of solid (denser than water) by using a spring balance and a measuring cylinder.

3. To establish the relation between the loss in weight of a solid when fully immersed in

(a) water

(b) strongly salty water, with the weight of water displaced by it by talking at least two different solids

4. To observe and compare the pressure exerted by a solid iron cuboid on fine sand/wheat flour while resting on its three different faces and to calculate the pressure exerted in the three different cases.

5. To determine the velocity of a pulse propagated through a stretched string/ slinky.

6. To study the characteristic of Spirogyra/Agaricus, Moss/Fern, Pinus (either with male or female cone) and an angiospermic plant. Draw and give two identifying features of the groups they belong to.

7. To oberse the given pictures/charts/models of earthworm, cockroach, bony fish and bird. For each organism, draw their picture and record of :

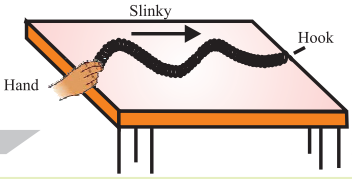
(a) One specific feature of its phylum

(b) One adaptive feature with reference to its habitat

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

9. To study the external features of root, stem, leaf and flower of monocot and dicot plants.

10. To study the life cycle of mosquito.



Experiment

EXPERIMENT NO. 1

Aim : *To verify laws of reflection.*

Material required : Chart paper, glass sheet/cardboard sheet, watch, gum, table, chalk pieces.

Theory : Sound follows laws of reflection like light. These laws are :

(a) Incident angle formed by sound wave, reflection angle are equal to each other.

$$\angle i = \angle r$$

(b) Incident ray, reflected sound ray and normal formed at the point of incidence all lie in the same plane.

Procedure :

(i) Make 2 pipes of 30 cm each and equal diameters from chart paper.

(ii) Put a cardboard/glass sheet between 2 chart pipes or rollers as shown in picture 1.

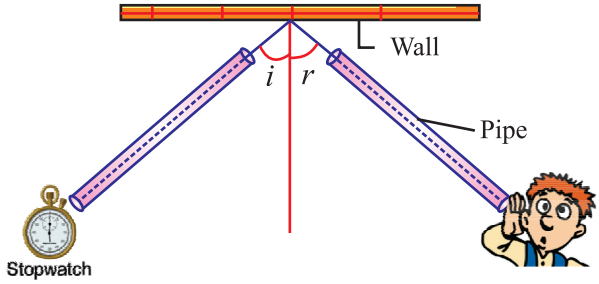
(iii) Put a clock in front of pipe P_1.

(iv) Now adjust pipe P_2 at different angles and find when do you hear the maximum sound.

(v) Now mark 2 points each at both the pipes A, B and C, D to mark their positions.

(vi) Remove the pipes and make lines making angle of incidence (between AB and MN) and reflection angle (CD and MN) and make their values

in the following table $\angle AON = \angle i$, $\angle CON = \angle r$.



Observations :

S. No.	Angle of incidence, $\angle i$	Angle of reflection, $\angle r$	$\angle i - \angle r$
1.			
2.			
3.			
4.			

Result/Conclusion :

(a) Angle of incidence is equal to angle of reflection of sound.

(b) Incident ray, reflected ray, normal at the point of incidence, all lie in the same plane.

Precautions & sources of error :

(i) Don't change the position of pipe P_1 until you are able to hear the maximum sound from P_2.

(ii) Keep watch very close to P_1.

(iii) Glass or cardboard should be of such size that you don't hear the direct sound from watch.

(iv) Table should not move at all.

(v) Both pipes should be of equal lengths and diameters.

MCQs Based on Practical 1

1. Sound waves are :

(a) Transverse waves (b) Longitudinal waves

(c) Radio waves (d) Supersonic waves

2. In a stethoscope sound of heartbeats travel through the stethoscope tube :

(a) Along a straight line

(b) As a sonic boom

(c) By beeding along the tube

(d) By undergoing multiple reflection

3. Find the false statement :

(a) Sound is a form of energy

(b) Sound travels in the form of longitudinal waves

(c) Sound travels in the form of transverse waves

(d) Sound follows the laws of reflection

4. Speed of sound depends upon :

(a) Pressure of the medium

(b) Temperature of the medium

(c) Vacuum

(d) None of the above

5. Nature of reflection of sound depends upon :

(a) Source of sound (b) Reflecting surface

(c) Normal to the reflecting surface (d) All of the above

6. Which of the following depends on the principle of reflection of sound ?

(a) Stethoscope (b) Sound board

(c) Ultrasound (d) All of above

7. Speed of sound in air is (at 22ºC) :

(a) 344 ms^{-1} (b) 344 km hr^{-1}

(c) 344 cms^{-1} (d) 344 m hr^{-1}

8. Speed of sound in air is :

(a) More than speed of sound in solids

(b) More than speed of sound in liquids

(c) Less than speed of sound in solids & liquids

(d) Equal to the speed of sound in solids and liquids

9. Speed of reflecting sound is :

(a) More than the speed of incident sound

(b) Less than the speed of incident sound

(c) Equal to the speed of incident sound

(d) All of the above

10. It is necessary for the reflection of sound :

(a) Glass plate (b) Concave surface

(c) Polished mirror (d) A large size reflecting surface

11. When sound is reflected from a surface :

(a) Angle of reflection is greater than angle of incidence

(b) Angle of reflection is smaller than angle of incidence

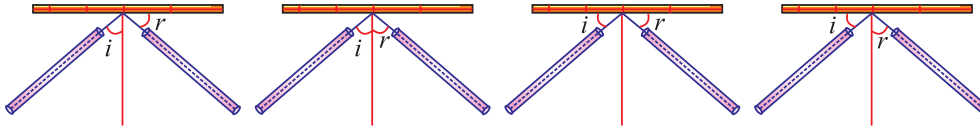
(c) Angle of reflection is equal to the angle of incidence

(d) Angle of reflection is not related to angle of incidence

12. To verify the laws of reflection, four students marks angle of incidence $\angle i$ and angle of reflection $\angle r$ as follows. Which student mark the angle correctly ?

(a) A (b) B

(c) C (d) D



(a) (b) (c) (d)

13. During experiment of verification of reflection of sound, reflected sound can be heard clearly when :

(a) One ear is placed near the pipe and other ear is closed

(b) One ear is placed near the pipe and other ear is opened

(c) One ear is 5 cm ahead from the pipe and other ear is closed

(d) One ear is 5 cm ahead from the pipe and other ear is opened

14. During experiment of verification of reflection of sound a student have to choose between (i) narrow and wide pipe, (ii) loud and low source of sound. For best result he choose :

(a) Narrow pipe and low source

(b) Narrow pipe and loud source

(c) Wide pipe and low source

(d) Wide pipe and loud source

15. In the experiment to verify the laws of reflection of sound, stop watch and ear both are placed in proper position on the ends of pipes, so that :

(a) Pipes can propagate sound

(b) Sound propogated (travelled) through first pipe and reflected through second pipe to enter the ear

(c) Sound of watch will be musical

(d) Surrounding air is not disturbing the experiment

Answers

1. (b)	**2.** (d)	**3.** (c)	**4.** (b)	**5.** (b)
6. (d)	**7.** (a)	**8.** (c)	**9.** (c)	**10.** (d)
11. (c)	**12.** (b)	**13.** (a)	**14.** (b)	**15.** (a)

EXPERIMENT NO. 2

Aim : *To find density of a solid with the help of a spring balance and measuring cylinder.*

Materials required : Spring balance, a piece of metal, spring balance, measuring cylinder, thread, water.

Theory : Density is mass per unit volume of a substance. Its unit is kg/m^3 or g/cm^3.

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Procedure :

(i) Tie the piece of the metal (or anything else) with a thread and hang it on a spring balance.

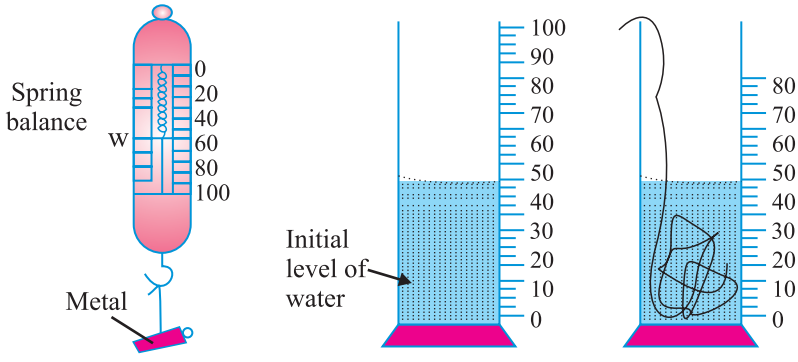
(ii) Find its mass in air.

(iii) Fill a measuring cylinder upto half.

(iv) Immerse this piece of metal fully in water.

(v) Find the volume of displaced water.

(vi) Find the volume with different levels of water.



Observations : Mass of the object (x) = ...grams

S. No.	Initial level of water, V_1	Final level of water, V_2	Displaced water	Volume $V_2 - V_1 = V$

Calculations : Density $= \frac{x}{V}$ g/cm^3

Result : Density of the solid is found to be..... .

Precautions :

(i) Metal piece used should be dry.

(ii) Calculate the zero error of spring balance beforehand.

(iii) There should be no bubble in water.

(iv) Water should not flow out when we put metal piece in it.

(v) Lower meniscus of water is read only.

MCQs Based on Practical 2

1. The spring balance used by one in the laboratory measures :

(a) Mass of body attached only

(b) Weight of body attached only

(c) Weight of spring and the body attached

(d) Mass of the spring and the body attached

2. The scale used in spring balance reads the mass since it has been :

(a) Elongated (b) Compressed

(c) Clibrated (d) Printed corrected

3. Density of a substance is a :

(a) Material character (b) Temperature variant

(c) Constant always (d) Both (a) and (b)

4. When a body is floating on the surface of a liquid, the net force experienced by it is :

(a) Zero (b) Weight

(c) Weight upthrust (d) Volume

5. A spring balance calibrated in Newton, reads 1**9.**6 N, its mass in grams is :

(a) 2000 g (b) 200 g

(c) 20 g (d) 2 g

6. The SI unit of density of a substance is :

(a) g/cm^3 (b) kg/m^3

(c) N/m^3 (d) N/cm^3

7. A balloon filled with hydrogen gas rises up into the air due to the :

(a) Weight of the balloon

(b) Low density of air in the balloon

(c) High density of air

(d) Buoyant force exerted by air on it

8. A body weights 500 g in air and 400 g in water. The upthrust on the body is :

(a) 100 gwt (b) 50 gwt

(c) 200 gwt (d) 100 N

9. An ice cube :

(a) sinks in water (b) Floats in water

(c) Completely melts (d) (b) and (c) both

10. 1 kg wt is equal to :

(a) 9.8 kg (b) 9.8 g

(c) 9.8 N (d) $\frac{1}{9.8}$ N

11. Which will be easier to lift ?

(a) 10 kg of iron

(b) 10 kg of loosely packed feathers

(c) 10 kg of water

(d) There will be no difference in either case

12. You are given 2 spring balance A and B, an iron and one aluminium block each of 4 cm side and solid. Spring balance A has a range of 0 to 250 gm and its least count is 2.5 gm whereas spring balance B has a range of 0 to 1000 gm and its least count is 10 gm. Which is best suited for finding mass ?

(a) Spring balance A for both

(b) Spring balance B for both

(c) Spring balance A for aluminium block and B for iron

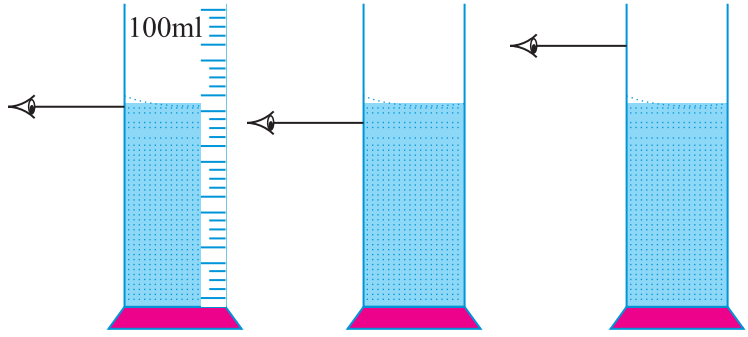
(d) Spring balance A for iron block and B for aluminium

13. If the spring balance is taken to moon and the measure is made, the reading will be :

(a) Less than that of earth
(b) Greater than that of earth
(c) The same as that on earth
(d) Six times that on earth

14. What is the correct position of eye with respect to the measuring cylinder to measure the level of water in it ?

(a) Only A
(b) (b) and (c) both
(c) Only C
(d) None of the above



15. When salt is added to water, its density :

(a) Increases
(b) Decreases
(c) No effect
(d) None of the above

Answers

1. (a)	**2.** (c)	**3.** (d)	**4.** (c)	**5.** (a)
6. (b)	**7.** (b)	**8.** (a)	**9.** (d)	**10.** (c)
11. (d)	**12.** (c)	**13.** (c)	**14.** (a)	**15.** (a)

EXPERIMENT NO. 3

Aim : *To establish relationship between loss in weight of a solid when fully immersed in (i) tap water, (ii) strongly salty water, with the weight of water displaced by it by taking at least 2 different solids.*

Materials required : Spring balance, measuring cylinder, piece of iron, thread, tap water, brine, piece of wood, overflow jar.

Theory : According to Archimedes principle :

"When an object is completely or partially immersed in water, it experiences a decrease in its weight which is equal to the weight of liquid displaced by the immersed part of solid."

Procedure :

(i) Find weight of an object (glass stopper) in air with the help of spring balance.

(ii) Keep the overflow jar on a wooden block.

(iii) Keep filling the overflow jar till water starts flowing.

(iv) Keep a measuring cylinder at the nozzle of the jar.

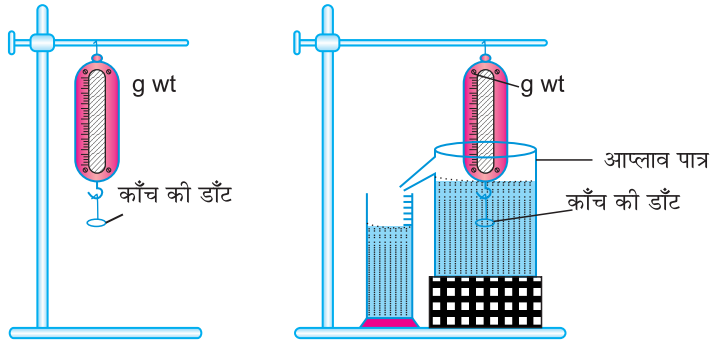
(v) Now, put this spring balance hung with glass stopper, fully immersed in water. Some water will overflow in the measuring cylinder. Find the amount of water collected in the measuring cylinder.

(vi) Note the weight of this glass stopper in water.

(vii) Repeat the steps with piece of iron.

(viii) Repeat the steps with both the objects in brine (saturated solution of salt in water).

Observations :



Object	Weight in air, W_1	Weight in tap water, W_2	Decrease in weight $W_2 - W_1$	Weight in brine, W_3	Decrease in weight, $W_3 - W_1$
1. Glass stopper					
2. Piece of iron					

Object	Weight of displaced water (tap water)	Weight of displaced brine
Glass stopper Piece of iron		

Conclusion : Weight of displaced water is equal to the weight of object in tap water or brine.

Precautions :

(i) Spring balance should be accurate.

(ii) Measuring cylinder taken should be dry.

(iii) When the object is immersed in water, the water collected in measuring cylinder should not overflow (not even a single drop).

(iv) Object immersed in water should not touch the walls of the container.

(v) Weight decreased in water should be measured from spring balance only once the object is stable.

(vi) Lower meniscus of colourless solution should be read.

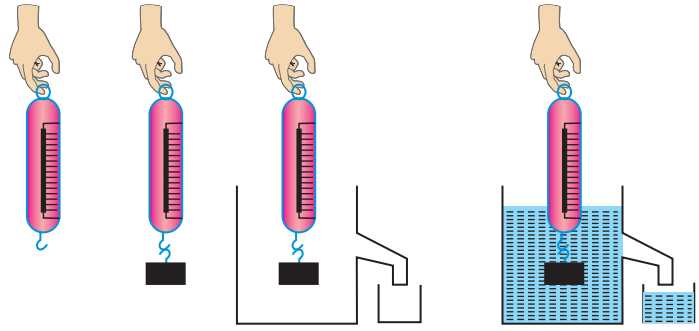
MCQs Based on Practical 3

1. In an experiment weight of a solid was measured. Also, weight of displaced water was also measured in the same experiment. Which law is verified by it ?

(a) Newton's law (b) Archimedes Principle

(c) Law of gravitation (d) Law of solution

2. Out of the following sketches, which shows measurement of weight of displaced water ?



3. An iron nail sinks in sea water but a ship, which is much heavier keeps floating. Why ?

(a) Density of sea

(b) Ship is not very heavy

(c) Amount of water displaced by ship is more than the weight of ship immersed in it

(d) Buoyant force exterted on the ship is less than the weight of ship

4. To find the density of powdered salt, what was taken in a eureka flask ?

(a) Water (b) Kerosene

(c) Milk (d) Honey

5. A boat A floats on water, a ship B's lower part is immersed in water and a submarine C is completely immersed in water, because :

(a) A and B are lighter than water

(b) Submarine C is heavier than water

(c) Weight of boat A is equal to the weight of water displaced, weight of B is less than that of displaced water and weight of C is more than that of displaced water

(d) Weight of displaced water is equal to the weights of B and C where weight of displaced water by A is less than that of the weight of A

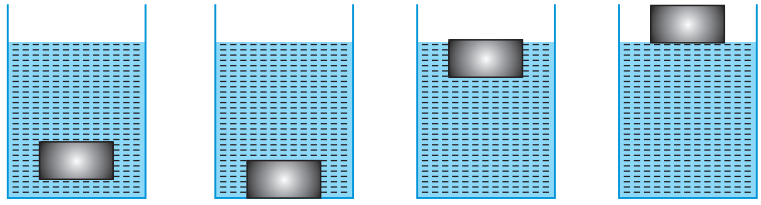
6. An experiment which shows decrease in the weight of an object when it is immersed in water indicates :

(a) Density of a solid (b) Flight of a plane

(c) Stopping a ship in sea (d) Sinking of a ship in sea

7. In which of the following, the decrease in the weight of an object (when

immersed in water) is equal to the weight displaced :



8. If an object is immersed in water in a eureka vessel and then in extremely salty water in the same eureka vessel, then collected extremely salty water is.....with respect to collected water.

(a) More (b) Equal

(c) Less (d) Can't be decided

9. What do we use to find weight of an object in air ?

(a) Scales (b) Physical balance

(c) Spring balance (d) Balance with single scale

10. We can find purity of a metal by..... .

(a) Archimedes principle (b) Newton's laws of motion

(c) Gravitational law (d) By mixing substances

11. Extremely salty water has.....density than normal tap water.

(a) Less

(b) More

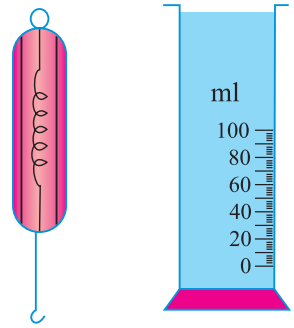
(c) Equal

(d) Depends on the concentration of solution – can be less or more

12. Least counts of the spring balance and measuring cylinder as given in the pictures are.....and..... respectively.

(a) 1 gwt, 1 ml (b) 1 gwt, 2 ml

(c) 2 gwt, 1 ml (d) 2 gwt, 2 ml



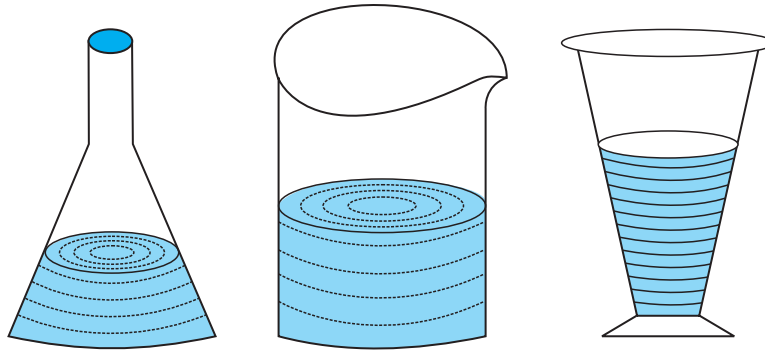
13. An object is weighed with the help of a spring balance in air, and then it is immersed fully in the following three vessels. Weight of the object in the three vessels is..... .

(a) Least in vessel A

(b) Least in vessel B

(c) Least in vessel C

(d) Equal in all three



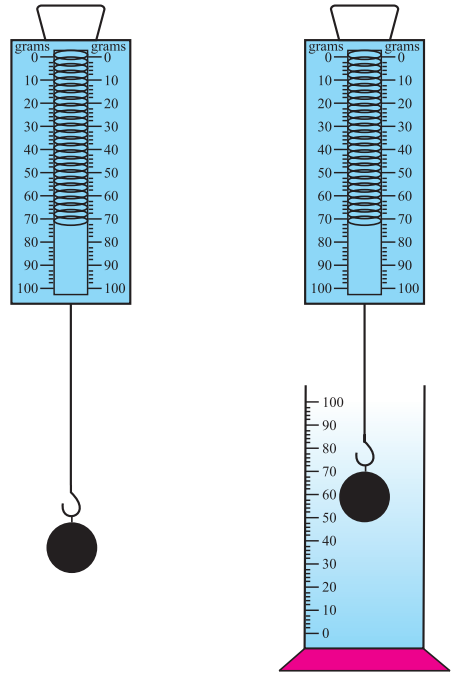
14. A student did the following experiment with a spring balance, a solid and measuring cylinder. The volume of the solid is :

(a) 64 cm^3

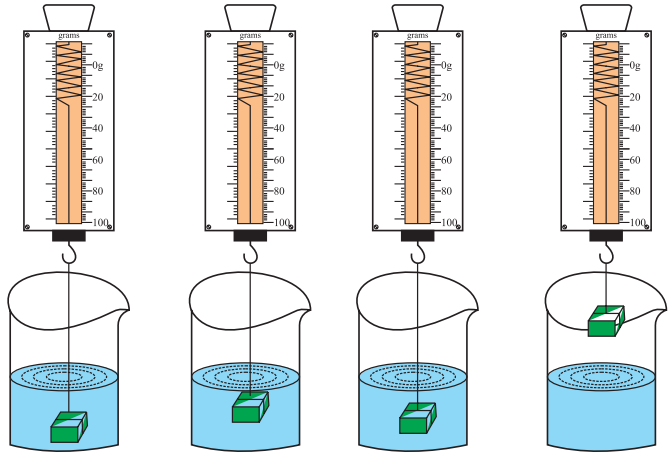
(b) 36 cm^3

(c) 28 cm^3

(d) 100 cm^3



15. Which one is the correct way to measure mass of an object in water ?



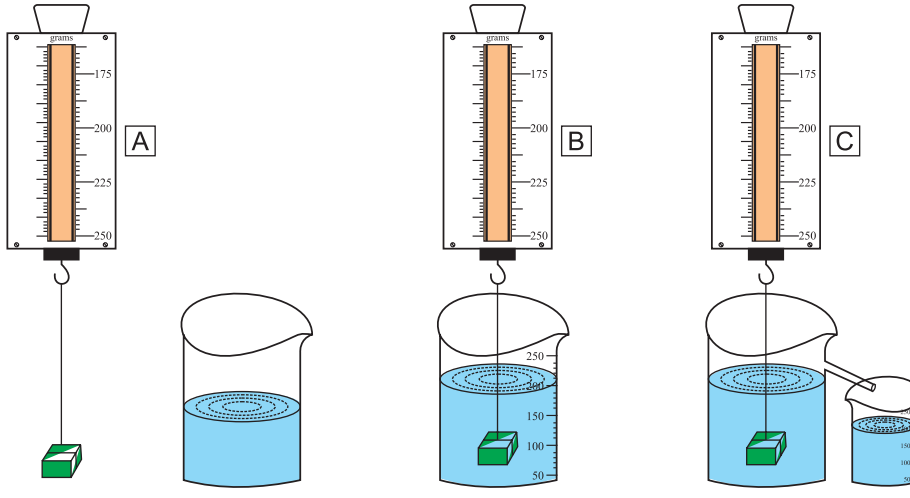
(a) A (b) B

(c) C (d) D

16. Reading of the spring balance will be :

(a) Equal in A, B, C (b) Equal in A & C only

(c) Equal in B & C only (d) Unequal in all



Answers

1. (b)	**2.** (d)	**3.** (c)	**4.** (b)	**5.** (c)
6. (d)	**7.** (c)	**8.** (b)	**9.** (c)	**10.** (a)
11. (b)	**12.** (d)	**13.** (d)	**14.** (c)	**15.** (c)
16. (c)				

EXPERIMENT NO. 4

Aim : *To observe and compare the pressure exerted by a solid iron cuboid on fine sand/wheat flour, while resting on 3 different faces and calculate the pressure exerted in 3 different cases.*

Materials required : Solid iron, cuboid, sand etc.

Theory : Force acting on a body perpendicular to its surface is called thrust.

Thrust per unit area is called pressure.

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}} \qquad P = \frac{F}{A}$$

Its units are Pascal or N/m^2.

Procedure :

(i) Take a cuboid of iron.

(ii) Find its weight using spring balance.

(iii) Find its length, breadth, height.

(iv) Now, find the pressure exerted by the cuboid on sand with 3 different faces *i.e.,* with length-breadth, breadth-height, length-height.

Observation :

Mass of the cuboid = ...kg

Length of the cuboid = ...cm

Breadth of the cuboid = ...cm

Height of the cuboid = ...cm

Acceleration due to gravity = 9.8 m/s^2

Calculations :

Force/weight of cuboid = mg

= .....N

(i) When length and breadth of cuboid are kept on sand

Area A_1 = Length × Breadth

= ..... × ..... cm^2 = ... m^2

Pressure on sand $= \frac{\text{Force}}{\text{Area}}$ Pascal $= \frac{F}{A_1} =$ .....

(ii) When breadth and height of cuboid are kept on sand

Area A_2 = Breadth × Height

= ..... × ..... cm^2 = ... m^2

Pressure on sand $= \frac{\text{Force}}{\text{Area}}$ Pascal $= \frac{F}{A_2}$ = ...

(iii) When length and height of cuboid are kept on sand

Area A_3 = Length × Height

= ..... × ..... cm^2 = ... m^2

Pressure on sand $= \frac{F}{A_3} =$ .....

Result :

(i) Pressure when length and breadth of cuboid are kept on sand = ...Pa

(ii) Pressure when breadth and height of cuboid are kept on sand = ...Pa

(iii) Pressure when length and height of cuboid are kept on sand = ...Pa

Precautions :

(i) Use an accurate spring balance.

(ii) Record the zero error accurately.

(iii) Record the length, breadth and height of cuboid accurately.

MCQs Based on Practical 4

1. Pressure is measured in :

(a) Nm^2 (b) Nm^{-2}

(c) m/s^2 (d) Newton 'N'

2. Heavy vehicles generally have wide tyres because :

(a) They exert less pressure on the road

(b) Pressure exerted on road will become zero

(c) Pressure exerted on road will become higher

(d) None of the above

3. Thrust per unit area is also called :

(a) Mass (b) Weight

(c) Apparent density (d) Pressure

4. It is easier to cut with a :

(a) Sharp scale (b) Blunt knife

(c) Sharp knife (d) None of the above

5. High rise towers are generally made wider, so that force exerted by the towers :

(a) Is applied on a larger area thereby decreasing pressure

(b) Is applied on a larger area thereby increasing the pressure

(c) Is applied on a smaller area thereby decreasing the pressure

(d) Is applied on a smaller area thereby increasing the pressure

6. To find pressure exerted by two iron cubes, a child took 2 cubes of equal sides and same material. What was her result ?

(a) $P_1 = 2P_2$ (b) $P_1 = P_2$

(c) $P_1 = 3P_2$ (d) $P_2 = 2P_1$

7. A cuboid of mass 5 kg with dimensions 40 cm × 20 cm × 10 cm is kept on a table such that its breadth and height are lying on the table. The pressure exerted is equal to :

(a) 2450 Pa (b) 612.5 N/m^2

(c) 1250 Pa (d) None of the above

8. An iron cuboid is placed on sand. The pressure exerted is minimum when it is placed :

(a) On its biggest face (b) On its smallest face

(c) Pressure is same in all cases (d) Cannot be predicted

9. To observe and compare the pressure exerted by faces of a cuboid on sand, following materials are provided in the lab by the assistant :

I. Iron cuboid of dimension 12 cm × 6 cm × 3 cm

II. Aluminium cuboid of dimension 12 cm × 6 cm × 3 c

III. Wooden cuboid of dimensions 12 cm × 6 cm × 3 c

IV. Coarse sand in a tray

V. Fine sand in a tray

The best choice would be :

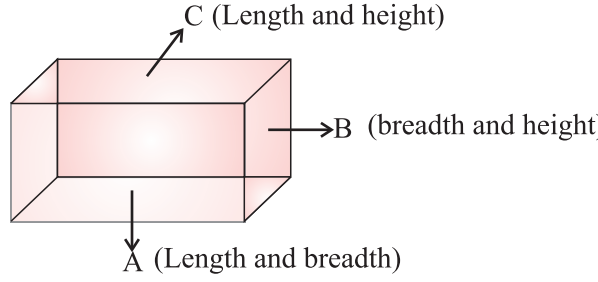
(a) Iron cuboid and coarse sand

(b) Aluminium cuboid and coarse sand

(c) Iron cuboid and fine sand

(d) Any of the three cuboids and any of the two types of sand

10. Amit was asked to study the pressure exerted on sand by a brick of weight 20 N by placing its different faces on sand viz. A, B, C as shown in the figure. Correct observation would be :



(a) Depression on sand will be same irrespective of the faces on which it is placed

(b) Depression will be maximum when placed on face A

(c) Depression will be maximum when placed on face B

(d) Depression will be maximum when placed on face C

11. If 'M' is the mass of the cuboid and it rests on sand on face with area A, then pressure exerted by the cuboid on sand is :

(a) $M/A\ Nm^{-2}$ (b) $Mg/A\ Nm^{-2}$

(c) $MgA\ Nm^{-2}$ (d) $Mg/A^2\ Nm^{-2}$

12. To observe and compare pressure exerted by solid cuboid, student A placed it on loose sand and student B placed it on table top. Who will conclude easily and rightly ?

(a) Student A only (b) Student B only

(c) Both A and B (d) Neither A nor B

13. A student places an iron cuboid of dimensions 1 cm × 4 cm × 10 cm on loose sand with its side of dimensions (i) 1 cm × 4 cm and (ii) 4 cm × 10 cm lie on sand. If pressure exerted by cuboid in two cases is respectively P_1 and P_2, then P_1/P_2 is :

(a) 1/4 (b) 4/1

(c) 1/10 (d) 10/1

14. Pressure increases when :

(a) Length does not change (b) Area decreases

(c) Area increases (d) None of the above

15. Pressure decreases when :

(a) Force increases (b) Force decreases

(c) Both of the above (d) None of the above

Answers

1. (b)	**2.** (a)	**3.** (d)	**4.** (c)	**5.** (a)
6. (b)	**7.** (a)	**8.** (a)	**9.** (c)	**10.** (b)
11. (b)	**12.** (a)	**13.** (d)	**14.** (b)	**15.** (b)

EXPERIMENT NO. 5

Aim : *To find the velocity of pulse propagated through a stretched slinky.*

Materials required : A slinky, stop watch, meter scale.

Procedure :

(i) Take a slinky and spread it on a table or smooth floor as shown in the figure.

(ii) Fix its one end at a fixed point on wall.

(iii) Take the slinky in right hand.

(iv) Jerk your hand from right to left.

(v) A pulse is generated. Calculate the time taken for 50 pulses.

(vi) Let this time taken be T seconds.

(vii) Find the distance between two ends of slinky. Let this be D meters.

(viii) Speed of pulse = $\frac{D}{T/50}$ m/s

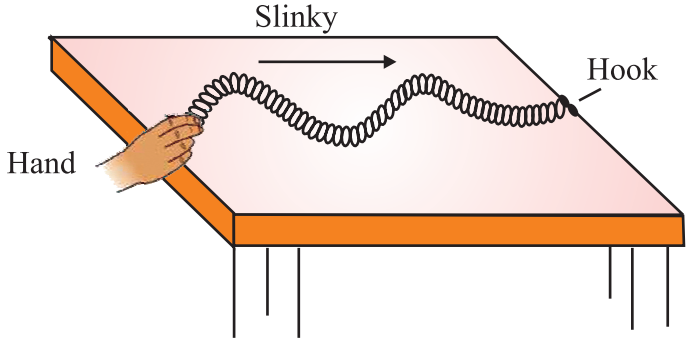
(ix) Repeat the same for 5 times and find the average.

Observations :

Length of slinky = ... m

S. No.	Time for 50 pulses T(s)	Speed
1.		
2.		
3.		
4.		
5.		

Average = ...m/s



Precautions :

(i) Choose a slinky of proper length and ductility.

(ii) Tie one end of slinky properly.

(iii) Start the stop watch as you jerk.

(iv) Give a jerk to slinky horizontally.

MCQs Based on Practical 5

1. What kind of waves can be produced in a slinky ?

(a) Transverse waves (b) Longitudinal waves

(c) Both transverse and longitudinal (d) None of the above

2. Each particle in a wave propagated within a slinky or a thread :

(a) Stays on its place

(b) Vibrates

(c) Doesn't vibrate

(d) Moves from one end to another

3. A wave produced for a small interval of time is called :

(a) Pulse (b) Wave

(c) Sound wave (d) None of the above

4. Thread/slinky used in the experiment should :

(a) Not have small amplitude

(b) Should not be stretched near floor

(c) Not have knots in it

(d) All of the above

5. A pulse is :

(a) Generated in a small part of the medium

(b) Generated in a large part of the medium

(c) Produced in vaccum

(d) All of above

6. When the string of a sitar is stretched and left then :

(a) Sitar produces transverse waves and air produces longitudinal waves

(b) Sitar produces longitudinal waves and air produces transverse waves

(c) Both produce longitudinal waves

(d) Both produce transverse waves

7. A wave that travels in the form of compression and rarefaction :

(a) Transverse wave (b) Longitudinal wave

(c) Any frequency wave (d) Light wave

8. Waves produced in water are :

(a) Longitudinal waves

(b) Transverse waves

(c) Half longitudinal half transverse waves

(d) None of the above

9. If a slinky/thread is stretched, then the velocity of wave produced in it :

(a) Decreases (b) Increases

(c) Can't be decided (d) Would be finished

10. Wavelength is the distance between two compressions or two rarefactions in a wave. It is written as :

(a) 2λ (b) $\lambda/2$

(c) $\lambda/4$ (d) λ

11. Which of the following is correct for sound energy ?

I. Vibration

II. Sensitive to hear

III. Reflection of waves

IV. Refraction of waves

(a) Only II (b) III and IV

(c) All I, II, III, IV (d) Only I

12. Waves produced in a slinky are :

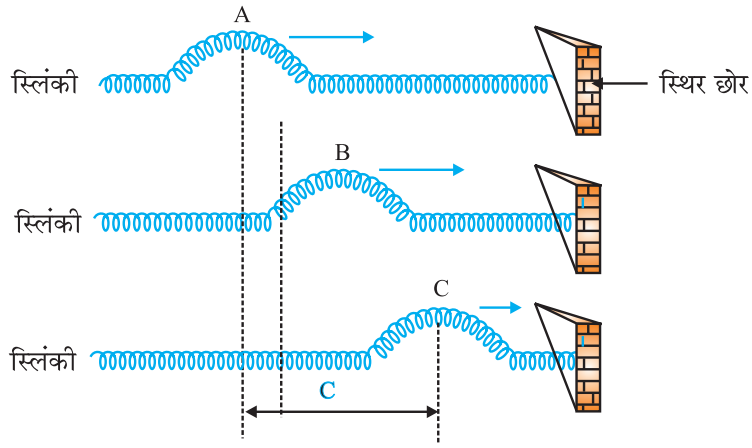
(a) Material waves (b) Sound waves

(c) Light waves (d) Gravitational waves

13. If '*d*' is the distance between 2 points A and C in meters and the pulse takes '*t*' seconds to travel from A to C, then velocity of the pulse will be :

(a) $d \times t$ m (b) d/t m

(c) d/t m/s (d) $d \times t$ ms^{-1}



14. Which one of the following is correct ?

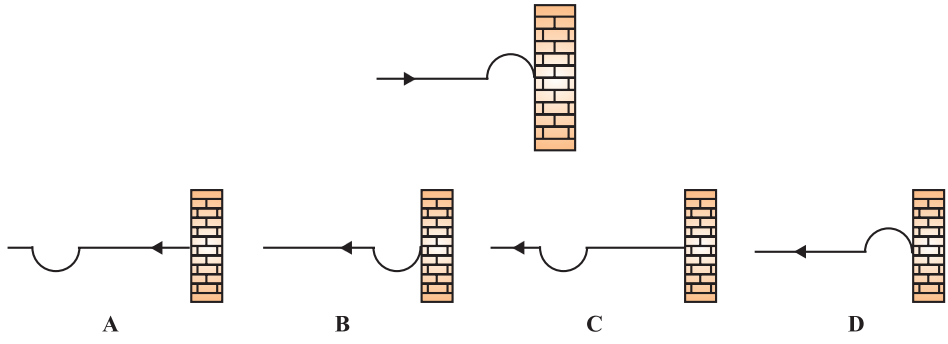
(a) Both sound and light waves are transverse waves

(b) Sound wave is longitudinal and light wave is transverse

(c) Sound wave is transverse and light wave is longitudinal

(d) Both sound wave and light waves are transverse

15. When a pulse strikes a fixed point, then reflected pulse is shown by :



(a) A (b) B

(c) C (d) D

Answers

1. (c)	**2.** (b)	**3.** (a)	**4.** (d)	**5.** (a)
6. (b)	**7.** (b)	**8.** (b)	**9.** (b)	**10.** (d)
11. (c)	**12.** (a)	**13.** (c)	**14.** (b)	**15.** (b)

EXPERIMENT NO. 6

Aim : *To study characteristics of Spirogyra/Agaricus, Moss/Fern, Pinis (male or female cone) and an angiosperm plant and give two identifying features of groups they belong to.*

Materials required : *Spirogyra, Agaricus,* Moss, Fern, *Pinus* male and female cone, angiosperm plant.

Procedure & Observation :

I. Spirogyra sp

Classification : Division : Thallophyta

Class : Chlorophyta

Characteristic features :

(i) It is a filamentous alga which grows in length not in thickness.

(ii) It is slimy to touch.

(iii) It has a large vacuole.

(iv) It has a series of cells joined end to end.

(v) Nucleus is in the centre suspended by cytoplasmic strands.

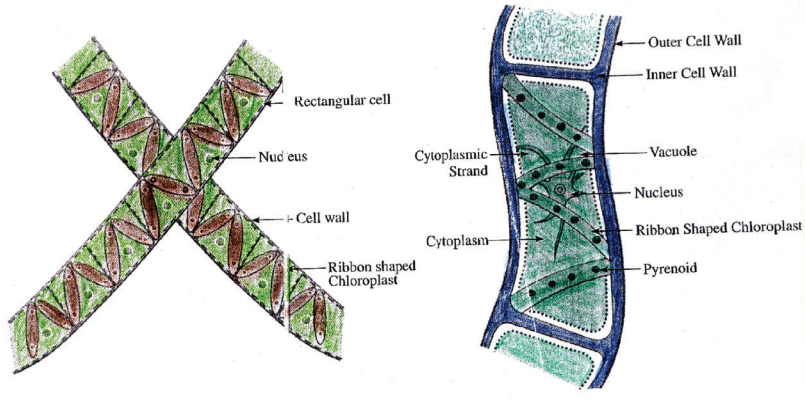
(vi) Pyrenoids are present which store starch (food).

(vii) Chloroplast is ribbon-shaped and are 1-12 in number.

Identifying features of the group :

(i) It is mostly found in fresh water but some varieties are found in sea water and on land.

(ii) Presence of chlorophyll in it is as high as in plants.



II. Agaricus

Classification : Division : Thallophyta

Class : Fungi

Characteristic features :

(i) These do not have chloroplast in the thallus.

(ii) It consists of a stalk and umbrella like cap called pileus.

(iii) The main body of mushroom appears above ground while vegetative part lies in the soil in the form of mycelium.

(iv) It is a saprophyte.

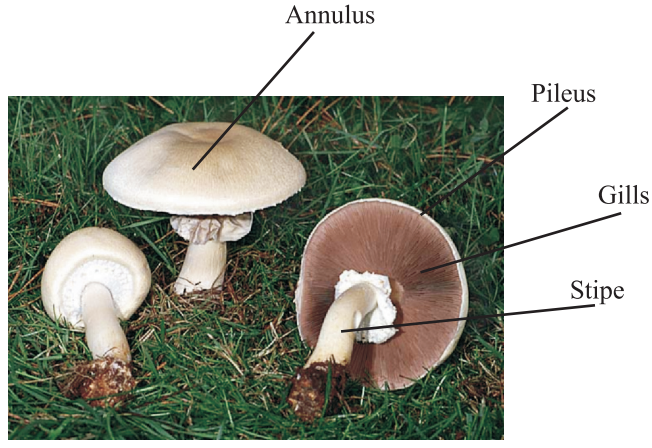
(v) Cell wall is made of a complex sugar chitin.

Identifying features of the group :

(i) Chlorphyll is absent.

(ii) Saprophytic nutrition with intracellular digestion is seen.

(iii) Reserve food material is found in the form of fat, oil and glycogen.



III. Moss (Funaria)

Classification : Sub kingdom : Cryptogamae

Division : Bryophyta

Characteristic features :

(i) The moss plants are commonly found on old walls, ground, moist and shady places.

(ii) The plant is bisexual, both male reproductive organs (antheridia) and female reproductive organs (archegonia) are found on the same plant.

(iii) Plant body is called gametophyte and is well-differentiated into rhizome, stem, leaves.

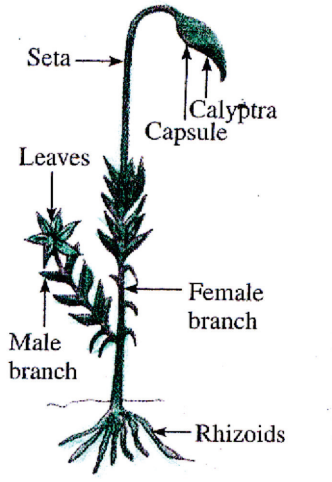
(iv) These plants do not contain vascular bundles to transport materials from one place to another the leaf body.

Identifying features :

(i) These are non-vascular plants.

(ii) These are called bryophytes of plants kingdom as water is essential for fertilization.

(iii) The plant body is generally thalloid.



IV. Fern (Dryopteris)

Classification : Sub kingdom : Cryptogamae

Division : Pteridophyta

Characteristic features :

(i) Plant body is a saprophyte which has true roots, stem and leaves with vascular tissue.

(ii) Reproductive organs are multicellular.

(iii) These are found in damp and dark places.

(iv) Leaves are quite big and are called fronds.

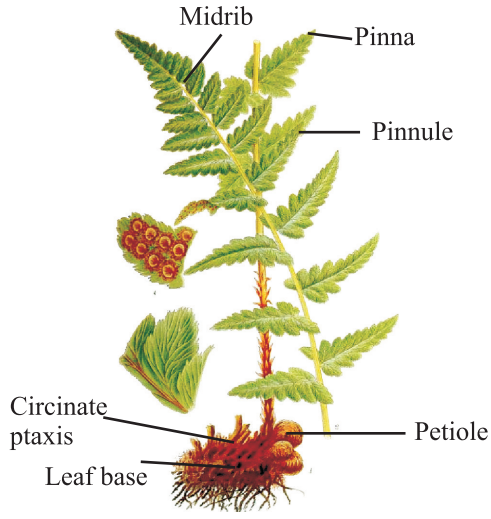
(v) As they have soft, big and beautiful leaves, these plants are used as ornamental plants.

(vi) Immature leaves are coiled like spring.

Identifying features :

(i) They have vascular tissue for conduction of materials within the parts of plant.

(ii) Saprophyte is dominant having true roots, stem and leaves.



V. Pinus (With male and female cone)

Classification : Division : Pteropsida

Class : Gymnospermae

Characteristic features :

(i) It is a gymnosperm (which have naked seeds).

(ii) Flowers are not present.

(iii) Leaves are needle shaped.

Cones are of two types : Male & Female

Male Cone/Staminate :

(i) These cones are brown coloured, egg shaped.

(ii) These are found in groups/bunches.

(iii) Each male cone has larger number of microsporophylls. Each microsphorophyll has 2 microsporangia.

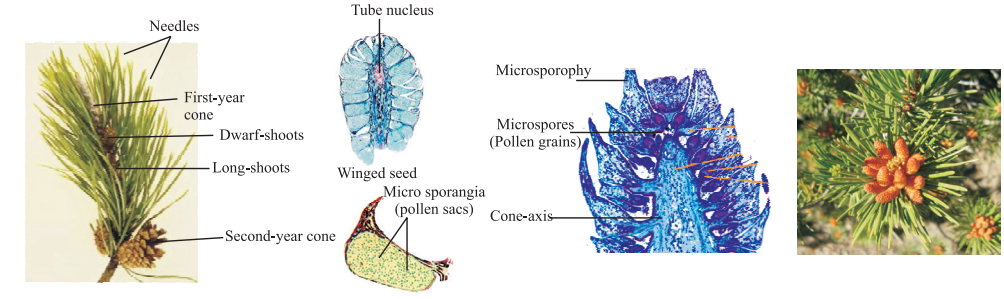
(iv) Each microsporangia has large number of microspores or pollen grains.

Female Cone :

(i) These are found in between needle shaped leaves in 2-4 in number in bunches.

(ii) In the first year female cone has megasporophyll which is small and green-red in colour.

(iii) Size of megasporophyll increases in second year. In third year megasporophylls separate from each other and zie of the cone also increases.



(a) Long and dwarf shoot of pine (b) Microsporophyll (c) Female cone (d) A branch bearing male cone

VI. Angiosperm Plant :

Classification : Division : Phanerogamae

Class : Angiospermae

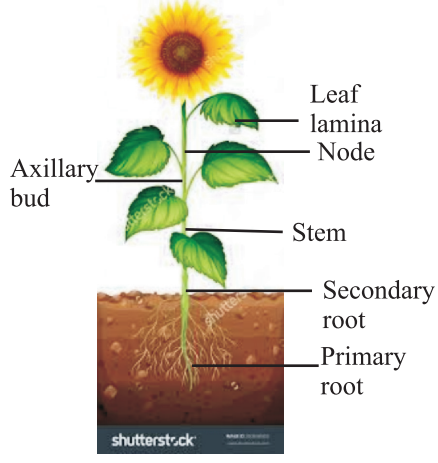
Characteristics :

(i) Plant body is fully differentiated into roots, stem and leaves.

(ii) These are flowering plants.

(iii) Angiosperms are further divided into two groups viz. Monocots (with one cotyledon *e.g.,* rice, maize, wheat) and dicots (with two cotyledons *e.g.,* mustard, mango etc.).

(iv) Dicots have tap root system, reticulate venation whereas monocots have fibrous root system with parallel venation.



MCQs Based on Practical 6

1. Spirogyra is not found in sea because :

(a) There is a lot of water there

(b) Sea water has a lot of salts

(c) Big sea animals are found in sea

(d) Water is pure

2. We see trees with needle like leaves in mountaineous regions. These are called :

(a) Mass (b) Conifer

(c) Algae (d) Fungi

3. Which of the following statements is true ?

(a) Plants are further sub-divided into algae and fungi

(b) Fern, moss, fungi, bacteria, algae are all flowerless plants

(c) Flowered plants may be trees

(d) None of the above

4. Fungi show a network of multicellular thread like structure called :

(a) Mycelium (b) Hyphae

(c) Sporangium (d) Ascocarp

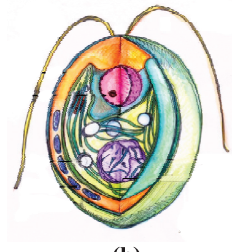
5. Plants which produce flowers, come in which group ?

(a) Bryophyta (b) Pteridophyta

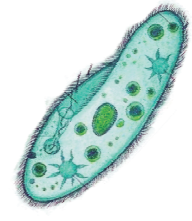
(c) Gymnosperm (d) Angiosperm

6. Which of the following grows on dead and decaying organic matter ?

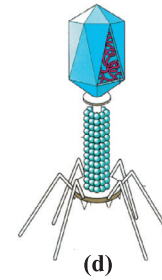
(a)



(b)



(c)



(d)

(a) Mushroom (b) Chlamydomonas

(c) Paramaecium (d) Bacteriophage

7. A pond seems green because :

(a) It has a lot of sea weeds (b) It has algae

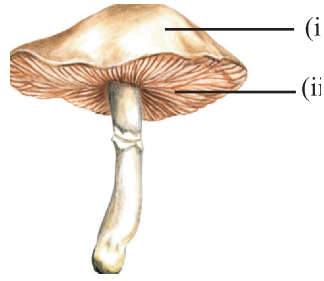
(c) It is polluted (d) None of the above

8. Pick the odd one out :

(a) Virus (b) Yeast

(c) Fungi (d) Mushroom

9. What are (i) and (ii) in the given sketch ?



(a) Gills and annulues (b) Pileus and gills

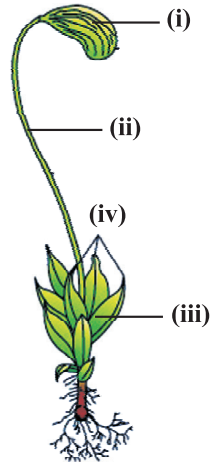
(c) Stipe and annulus (d) Gills and pileus

10. Generally Agaricus is called :

(a) Yeast (b) Mushroom

(c) Fungi (d) Penicillium

11. Identify (i), (ii), (iii) and (iv) respectively in the diagram :



(a) Capsule, seta, female stem, male stem

(b) Seta, capsule, male stem, female stem

(c) Female stem, capsule, seta, male stem

(d) Capsule, female stem, seta, male stem

12. Plants in *Funaria* are divided into :

(a) Root, stem, leaves (b) Rhizoids, stem, leaves

(c) Mycelium, stem, leaves (d) Hyphae, stem, leaves

13. Big megaphylls leaves of fern are called :

(a) Fronds (b) Foliage

(c) Rhizome (d) None of the above

14. Male cone in *Pinus* is :

(a) Microsporangia (b) Megasporangia

(c) Cotyledon (d) Capsule

15. Some students want to make a slide of *Spirogyra.* Where should they look for it ?

(a) In a salty water pond

(b) In a non-salty water pond

(c) In fresh flowering water

(d) In flowing salty water

16. Agaricus is an edible fungi, it is :

(a) Parasitic (b) Autotrophic

(c) Saprophytic (d) Omnivore

Answers

1. (b)	**2.** (b)	**3.** (c)	**4.** (a)	**5.** (d)
6. (a)	**7.** (b)	**8.** (a)	**9.** (b)	**10.** (b)
11. (a)	**12.** (b)	**13.** (a)	**14.** (a)	**15.** (b)
16. (c)				

EXPERIMENT NO. 7

Aim : *To observe the given pictures/charts/models of earthworm, cockroach, bony fish, bird.*

For each organism draw their picture and record of :

(a) one specific feature of its phylum

(b) one adaptive feature with respect to its habitat.

Materials required : The specimen of earthworm, cockroach, bony fish and bird.

Procedure :

(i) Observe the given specimen/chart/model keenly.

(ii) Draw their labelled diagram and write their adaptive features.

A. Earthworm :

Classification : Phylum : Annelids

Specific characteristic features :

(i) They have bilateral symmetry.

(ii) They are long and body is divided into sections.

(iii) They have body length of 6-10 inches.

(iv) Some of the anterior body segments concentrate to form head.

(v) They mainly eat carbonic compounds (humus) mixed in the soil (moist).

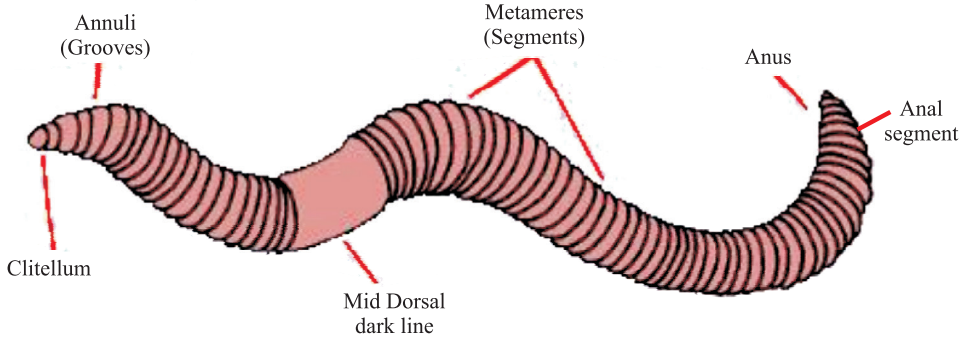
(vi) They have light brown colour.

(vii) Exoskeleton is absent.

Adaptation/Adaptive features :

(i) Earthworm reside in holes.

(ii) Humus in soil is its main food.



B. Cockroach :

Classification : Phylum : Arthropoda

Specific characteristic features :

(i) They have long body, which is bilaterally symmetrical and segmented.

(ii) They have body length of 5-6 cm.

(iii) Colour of their body is red or brownish, therefore they are camouflaged in dark and hence protected from their enemies.

(iv) Their whole body is divided into three parts : head, thorax and abdomen.

(v) Anterior part of body form a distinct head, bearing compound eyes and a pair of antennae.

(vi) Each body segment usually bears a pair of jointed legs.

(vii) Thorax consists of three pairs of jointed legs on its posterior side, therefore it has been kept in the phylum Arthropoda.

(viii) Two pairs of wings are found on anterior side of the thoracic cavity.

(ix) Its abdominal portion is divided into ten fragments covered by exoskeleton of chin.

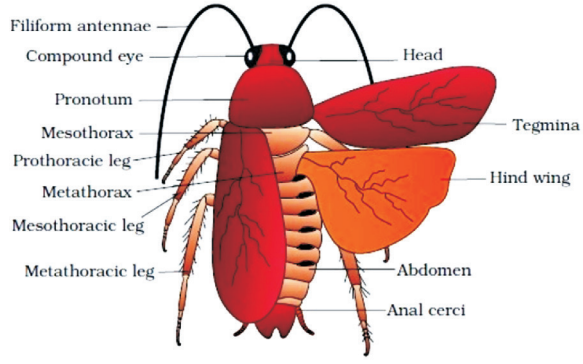
Adaptation/Adaptative features :

(i) For respiration, it has spiracles.

(ii) Three pairs of segmented or jointed legs help it to run fast.

(iii) On its head it has compound eyes and long sensitive antennae, which help it to move in dark.

(iv) It is omnivorous.



C. Bony fish :

Classification : Phylum : Chordata

Class : Osteichthyes

Characteristic features (Specific) :

(i) They have streamlined body which help them to survive in water.

(ii) They have fins to balance themselves and for locomotion.

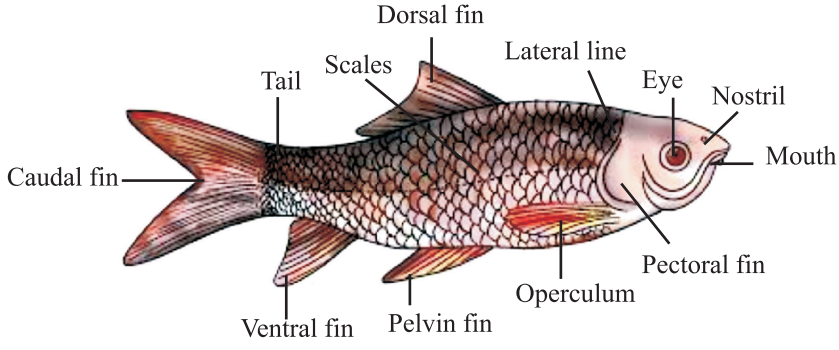
(iii) Respiration occur through gills.

Adaptive features :

(i) To reduce friction inside water, their body is streamlined.

(ii) To get prevented from decaying in water their body is covered with scales.

(iii) They have air bladder.



D. Birds :

Classification : Phylum : Chordata

Class : Aves

Characteristic features (Specific) :

(i) They have streamlined body, which is an adaptive feature to fly in air.

(ii) Body is covered with feathers.

(iii) Forelimbs are modified into wings for flight.

(iv) Hind limbs bear four clawed digits and are adapted for walking, perching or swimming.

(v) Bones of endoskeleton are light and spongy.

(vi) Muscles which help in flying are well-developed and strong.

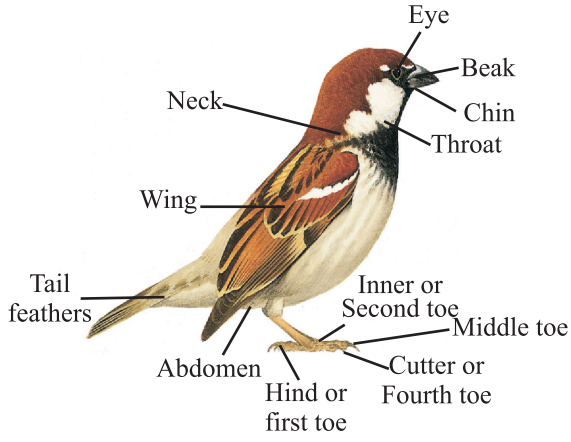
Adaptive features :

(i) Body is streamlined.

(ii) Skeleton is light and hollow.

(iii) Body is covered with feathers.

(iv) Forelimbs are modified into wings.



MCQs Based on Practical 7

1. What is the scientific name of cockroach ?

(a) Periplanita Americana (b) Rana tigrina

(c) Australian acacia (d) Solanum tuberosum

2. Name the scientist who introduced binomial nomenclature.

(a) Carolus Linnaeus (b) Charles Darwin

(c) Aristotle (d) Robert Brown

3. The body of birds is covered with feathers because :

(a) It help them in flying

(b) It keeps the body warm

(c) Both (a) and (b)

(d) They get converted into wings later on

4. Which of the following doesn't belong to mammalia ?

(a) Bat (b) Duck-billed platypus

(c) Shark (d) Whale

5. To which class does earthworm belong ?

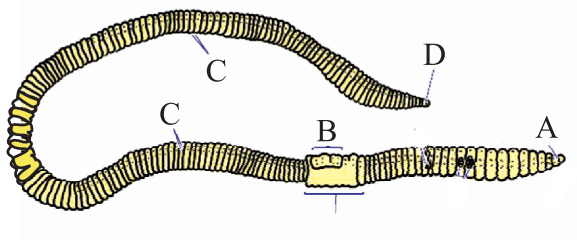
(a) Unicellular with notochord

(b) Unicellular without notochord

(c) Multicellular with notochord

(d) Multicellular without notochord

6. Label A, B, C, D in the following diagram.



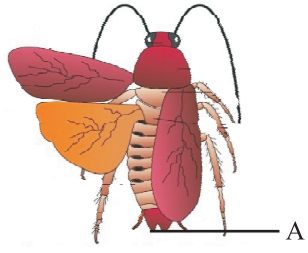
(a) Mouth, Segment, Clitellium, Anus

(b) Mouth, Anus, Segment, Clitellium

(c) Mouth, Clitellium, Segment, Anus

(d) Clitellium, Mouth, Segment, Anus

7. Identify the labelled part A in the following diagram :



(a) Antennae (b) Anal cerci

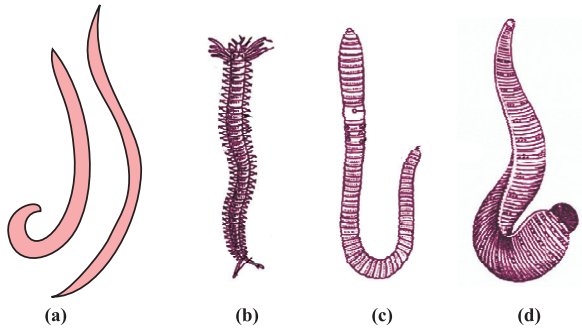
(c) Anal style (d) Anus

8. Immature cockroaches are also called :

(a) Nymph (b) Tadpole

(c) Pupa (d) Groove

9. Out of the following pick the odd one out :



10. Which one of the following is not the adaptation of fishes ?

(a) Long, streamlined body (b) Presence of gills and fins

(c) Presence of spiracles (d) Presence of lungs

11. Identify the respiratory organs in cockroach.

(a) Lungs and skin (b) Trachea

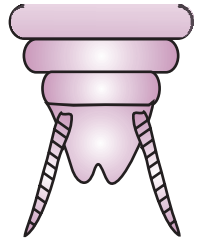
(c) Spiracles and trachea (d) Gills and operculum

12. In which of the following metameric segmentation is found :

(a) Earthworm (b) Cockroach

(c) Birds (d) Bony fish

13. A student saw the back portion of a male cockroach and draw the diagram as below :



(a) Anus (b) Anal style

(c) Brood pouch (d) Antennae

14. The diagram given shows an important characteristic of which phylum ?

(a) Eye (b) Clitellium

(c) Segments on the body (d) Anus

15. What is the phylum of earthworm ?

(a) Annelida (b) Arthropoda

(c) Osteichthyes (d) Aves

16. Body of cockroach is divided into how many parts ?

(a) 1 (b) 2

(c) 3 (d) 4

17. How many pairs of legs are found in cockroach ?

(a) One pair (b) Two pairs

(c) Three pairs (d) Four pairs

Answers

1. (a)	**2.** (a)	**3.** (b)	**4.** (c)	**5.** (d)
6. (c)	**7.** (c)	**8.** (a)	**9.** (a)	**10.** (d)
11. (c)	**12.** (a)	**13.** (b)	**14.** (c)	**15.** (a)
16. (c)	**17.** (c)			

EXPERIMENT NO. 8

Aim : *To verify the law of conservation of mass in a chemical reaction.*

Materials required : Physical balance, conical flask, ignition tube, thread, cork (rubber), barium chloride and sodium sulphate.

Principle : Law of Conservation of Mass : Matter is neither created nor destroyed. Therefore in a chemical reaction the total mass of the substance remain conserved.

Procedure :

(i) Make aqueous solution of barium chloride and sodium sulphate.

(ii) Barium chloride solution should be taken in an ignition tube and sodium sulphate solution is taken in a conical flask.

(iii) The ignition tube containing barium chloride is hanged with the help of a thread inside the conical flask having sodium sulphate in it and a cork is applied on the mouth of the conical flask.

(iv) The whole apparatus is now weighed carefully.

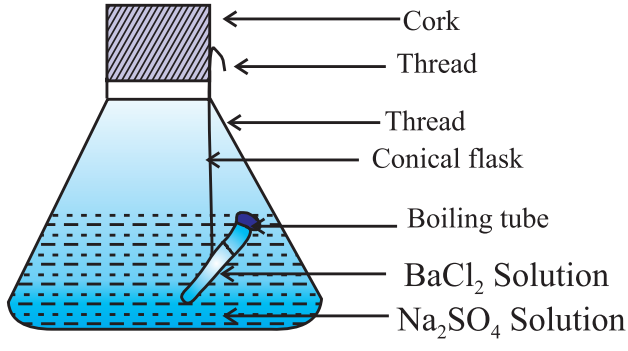
(v) Now tilt the conical flask in such a way that the two solutions get mixed well into each other.

(vi) After the chemical reaction, a white coloured precipitate is formed in the conical flask.

(vii) Now again weigh the apparatus in the physical balance.

Inference : The total mass inside the conical flask remain same even after the chemical reaction.

Result : The mass of the substances don't change and it remains conserved. Therefore, it can neither be created nor be destroyed.



MCQs Based on Practical 8

1. 2 g hydrogen reacts with 16 g oxygen to give 18 g water. Which law is proven by it ?

(a) Law of conservation of mass

(b) Law of constant proportions

(c) Law of mathematical proportions

(d) None of the above

2. Ratio between hydrogen and oxygen in water is :

(a) 1 : 8 (b) 8 : 1

(c) 1 : 2 (d) 2 : 1

3. Ratio between carbon and oxygen in CO_2 is :

(a) 3 : 8 (b) 8 : 3

(c) 3 : 4 (d) 4 : 3

4. Dalton proposed :

(a) Liquid is made of small particles called atoms

(b) Atom is indivisible, it can neither be created nor destroyed

(c) All atoms of an element are entirely similar

(d) All of the above

5. In a chemical reaction, mass can neither be created nor destroyed, what law is verified by it ?

(a) Law of conservation of mass

(b) Law of constant proportions

(c) Law of mathematical proportions

(d) All of the above

6. A chemical reaction is balanced to satisfy which law ?

(a) Dalton's atomic theory

(b) Law of constant proportions

(c) Law of mathematical proportions

(d) Law of conservation of mass

7. 12 g magnesium combines with 16 g oxygen to give 28 g of magnesium oxide. Which law is proven from it ?

(a) Law of conservation of mass

(b) Law of constant proportions

(c) Law of mathematical proportions

(d) All of the above

8. 170 g silver nitrate reacts with sodium chloride to give 14**3.**5 g silver chloride and 85 g sodium nitrate. Wht is the mass of sodium chloride ?

(a) 5.85 g (b) 58.5 g

(c) 385 g (d) None of the above

9. In a reaction, 5.3 g sodium carbonate and 6 g ethanoic acid react to make 2.2 g carbon dioxide, 8.2 g sodium ethanoate and 0.9 g water. Which law is proven ?

(a) Law of conservation of mass

(b) Law of constant proportions

(c) Law of mathematical proportions

(d) All of the above

10. Hydrogen and oxygen combine together in a ratio of 1 : 8 to make water. What amount of oxygen is required to react completely with 3 g hydrogen gas ?

(a) 24 g (b) 2.4 g

(c) 48 g (d) 4.8 g

11. Which of the following statements is true ?

(i) New substances are formed in all chemical reactions.

(ii) Mass can neither be created nor destroyed.

(iii) Mass can only be destroyed in a reaction where gases are involved.

(iv) Mass can be formed during formation of new substances.

(a) Only (i) (b) Only (ii)

(c) (i) and (ii) both (d) (i) and (iii) both

12. In the experiment to verify the law of conservation of mass :

(a) Measuring the mass of only reactants is enough

(b) Measuring the mass of only products is enough

(c) Measuring the mass of both reactants and products is essential

(d) No need to measure mass of contents

13. Which of the following reaction is used to verify law of conservation of mass ?

(a) Precipitation reaction (b) Condensation reaction

(c) Combination reaction (d) Displacement reaction

14. Name the precipitate formed in the following reaction :

$$\mathbf{BaCl_2\,(aq) + Na_2SO_4\,(aq) \rightarrow BaSO_4\,(s) + 2NaCl\,(aq)}$$

(a) NaCl (b) $BaSO_4$

(c) $BaCl_2$ (d) Na_2SO_4

15. What is the amount of 'X' in the following reaction :

$\mathbf{CH_4\,(g)}$	+	$\mathbf{2O_2\,(g)}$	$\rightarrow$	$\mathbf{CO_2\,(g)}$	+	$\mathbf{2H_2O\,(\mathit{l})}$
16 g		**64 g**		**X g**		**36 g**

(a) 28 g (b) 32 g

(c) 44 g (d) 40 g

Answers

1. (a)	**2.** (a)	**3.** (a)	**4.** (d)	**5.** (a)
6. (d)	**7.** (a)	**8.** (b)	**9.** (a)	**10.** (a)
11. (c)	**12.** (c)	**13.** (a)	**14.** (b)	**15.** (c)

EXPERIMENT NO. 9

Aim : *To study the external features of root, stem, leaf of a flower of a monocot and dicot plant.*

Materials required : A chart showing different parts of a plant or a plant plucked.

Theory : Angiosperms with the cotyledon are called monocots and angiosperms with 2 cotyledons are called dicots.

Procedure : Take the plant specimen or chart and observe its parts.

Observations :

I. Root :

(i) Roots in dicots are tap roots *i.e.,* one main root and many lateral roots coming out of it.

(ii) Roots in monocots are fibrous roots *i.e.,* all are coming out as a tuft.

(iii) Roots absorb water and minerals from soil.

II. Leaf :

(i) A leaf is attached to the stem with the help of a structure called petiole.

(ii) Leaves are generally green in colour which do photosynthesis.

(iii) The flat part of the leaf is called lamina.

(iv) Arrangement of veins in leaves is called venation. Monocots have parallel venation whereas dicots have reticulate venation.

III. Stem :

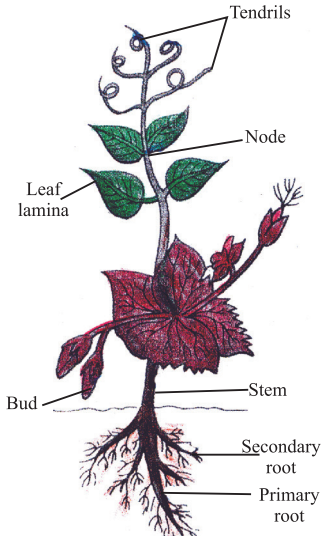
(i) Stems help in transporting food from leaves to all parts of plant and water and minerals from soil to all plant parts through root with the help of vascular bundles viz. xylem and phloem.

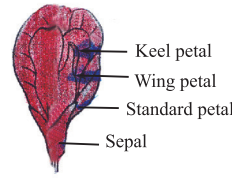
IV. Flower :

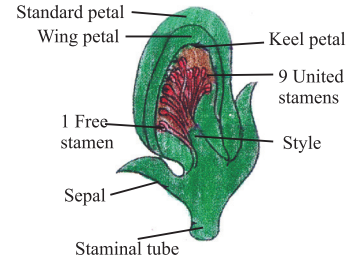
(i) Flowers are present in monocots and dicots both.

(ii) Flowers in monocots are generally trimerous whereas those in dicots are pentamerous.

(iii) All generally have sepals, petals, stamens and pistils.







MCQs Based on Practical 9

1. Which one of the following produces seed without flower ?

(a) Cycas (b) Paddy

(c) Fern (d) Grapes

2. What kind of flowers do monocot plants have ?

(a) Bimerous (b) Trimerous

(c) Tetramerous (d) Pentamerous

3. A plant was pulled out to see fibrous roots, so the plant is :

(a) Monocot (b) Dicot

(c) Gymnosperm (d) None of these

4. Which one of the following is an angiosperm ?

(a) Mustard (b) Pinus

(c) Cycas (d) Morpankh

5. Four students A, B, C, D observed a plant of gram/chana :

A's observation : Flowers are trimerous and monocots.

B's observation : Flowers are trimerous and dicots.

C's observation : Flowers are pentamerous and monocots.

D's observation : Flowers are pentamerous and dicots.

Which student's observation is correct ?

(a) A (b) B

(c) C (d) D

6. Which one of the following has fibrous roots ?

(a) Pea (b) Wheat

(c) Raddish (d) Neem

7. Which part of plant is modified into sweet potato ?

(a) Stem (b) Root

(c) Leaves (d) Fruit

8. That part of a plant on which leaves, flowers and fruit are attached is called :

(a) Primary root (b) Stem

(c) Secondary root (d) None of these

9. Loss of water from different pores of a plant is called :

(a) Transpiration (b) Photosynthesis

(c) Condensation (d) Evaporation

10. Flower is a modified :

(a) Stem (b) Root

(c) Leaf (d) Is the basic structure

11. Out of which of the following doesn't show flowers ?

(a) Capscium (b) Banana

(c) Lemon (d) Sugarcane

12. A plant in which stem modifies for storage of food :

(a) Ginger (b) Potato

(c) Onion (d) All of these

13. Out of which of the following shows exchange of gases :

(a) Stomata (b) Lenticels

(c) Surface of roots (d) All of these

14. Arrangement of veins in a leaf is called :

(a) Venation (b) Vascularisation

(c) Stamen (d) Pistil

15. Female part of a flower :

(a) Calyx (b) Corolla

(c) Stamen (d) Pistil

Answers

1. (b)	**2.** (d)	**3.** (a)	**4.** (a)	**5.** (d)
6. (b)	**7.** (b)	**8.** (b)	**9.** (a)	**10.** (a)
11. (d)	**12.** (d)	**13.** (d)	**14.** (a)	**15.** (a)

EXPERIMENT NO. 10

Aim : *To study the life cycle of mosquito.*

Materials required : A chart showing life cycle of a mosquito.

Principle or Theory :

Kingdom : Animalia

Phylum : Arthropoda

Class : Insecta

Order : Diptera

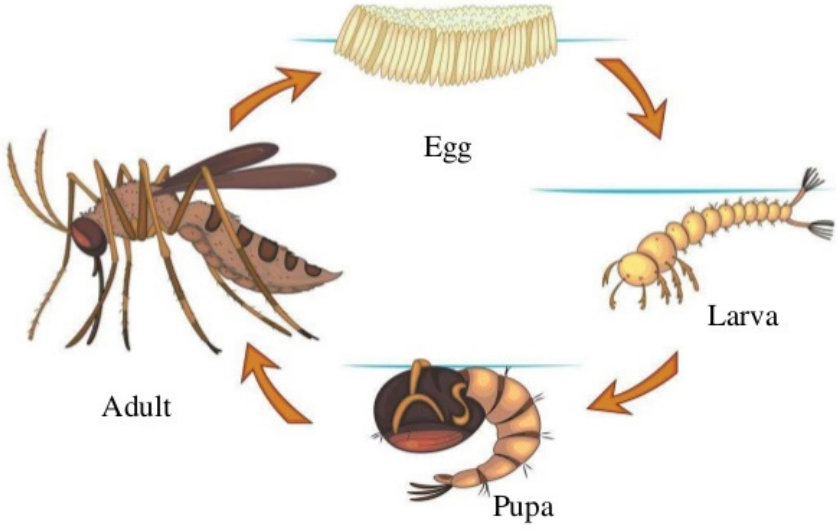
The mosquitoes have mouth parts called proboscis which are used to insert inside the epidermis of plants and animals. Female mosquito require nutrients from the blood before laying eggs.

Explaining the life cycle and explanation of identifying features :

1. **Egg :**
   (i) Spherical to oblong in shape.
   (ii) All eggs are clamped together.
2. **Larvae :**
   (i) Head is clearly visible.
   (ii) Mouth brushes are used for feeding by applying pressure.
   (iii) Thorax part is quite large but with no legs.
   (iv) Abdomen is segmented.
   (v) On 8th abdominal stage spiracles are present for respiration.
3. **Pupa :**
   (i) A big comma shaped structure.
   (ii) Circulated abdomen is present.
   (iii) Head and thorax portions merged together.
4. **Adult (Imago) :**
   (i) On head a pair of compound eyes is present.
   (ii) A pair of antennae is also present on the head.
   (iii) In female, elongated proboscis is present.
   (iv) Thorax consists of a pair of legs and a pair of narrow forewings.

(v) The mosquito takes as little as 5 days to be developed into adult from pupa.

(vi) Life cycle of female mosquito is 1-2 weeks while that of adult male is about 1 week.



Result : Life cycle of a mosquito is thus studied.

MCQs Based on Practical 10

1. During life cycle of mosquito the stage in which the appearance is like a worm is :

(a) Egg (b) Pupa

(c) Larva (d) Adult

2. The blood sucking part of mosquito found in its mouth part is called :

(a) Canines (b) Tongue

(c) Proboscis (d) Antennae

3. .....is a suitable breeding site for mosquito.

(a) Moist soil (b) Dry soil

(c) Hard soil (d) Running water

4. Correct order of development stage of the life cycle of mosquito is :

(a) Egg → Larva → Pupa → Adult

(b) Larva → Pupa → Egg → Adult

(c) Egg → Pupa → Adult → Larva

(d) Egg → Pupa → Larva → Adult

5. Vector of malaria is :

(a) Male anopheles mosquito

(b) Female anopheles mosquito

(c) Housefly

(d) All of the above

6. Malaria occurs due to which of the following ?

(a) Virus (b) Bacteria

(c) Fungus (d) Protozoa

7. Which of the following stage doesn't need any food ?

(a) Adult (b) Larva

(c) Pupa (d) Eggs

8. Usually, eggs hatch into larvae within :

(a) 2 min. (b) 2 hrs.

(c) 2 days (d) None of these

9. Anopheles mosquito can fly upto :

(a) 4 hrs. (b) 8 hrs.

(c) 12 hrs. (d) Can't fly at all

10. Nandu saw some small creatures moving in water of a desert cooler. These small creatures represent which stage of life cycle of mosquito ?

(a) Larva (b) Pupa

(c) Adult (d) Eggs

11. The phylum for mosquito is :

(a) Nematoda (b) Arthropoda

(c) Annelida (d) None of these

12. The malarial fever has following symptoms :

(a) Vomitting (b) High temperature

(c) Muscular fatigue (d) All of these

13. Adult mosquitoes are mainly :

(a) Aquatic (b) Terrestrial

(c) Aerial (d) None

14. Four students A, B, C, D are observing the developmental stages in the life cycle of a mosquito. They observe that the stage in which the organism is very reactive and require a lot of blood is :

(a) Eggs (b) Larva

(c) Pupa (d) Adult

15. Why is it necessary for the mosquito eggs to stay on water surface ?

(a) Eggs should remain moist

(b) Egg like to swim over water

(c) Eggs have to receive oxygen from air

(d) None of these

Answers

1. (c)	**2.** (c)	**3.** (a)	**4.** (a)	**5.** (b)
6. (d)	**7.** (c)	**8.** (c)	**9.** (a)	**10.** (a)
11. (b)	**12.** (d)	**13.** (c)	**14.** (b)	**15.** (c)