

**Tripura Board
Class IX Science
Sample Paper 1 – Solution**

**Group A
Physics**

1. The gravitational force between the Earth and a body is known as the weight of the body or the force of gravity.
2. When the particle completes 1 revolution, the displacement is zero. Now, in the next half revolution, the displacement is equal to the diameter of the circle. Thus, total displacement of the particle is 5 m
3. In a game of billiards, the player provides kinetic energy to the cue ball by striking it with a cue stick. If the cue ball collides with another ball, it will slow down and the ball it collided with will gain speed as kinetic energy is transferred to it.
4. In the process of lightning, flash and thunder are produced simultaneously. Flash is seen almost immediately because the speed of light is extraordinarily fast but thunder is heard a few seconds later because the speed of sound is less than the speed of light. The speed of light increases with an increase in the density of the medium.
5.
 - (i) Archimedes' principle is used in designing motorboats, ships and submarines.
 - (ii) The working of the lactometer and the hydrometer is based on Archimedes' principle.

6.

Given:

$$m = 40 \text{ kg}; v = 3 \text{ m/s}; t = 1 \text{ s}$$

Kinetic energy is

$$\text{K.E.} = \frac{1}{2}mv^2 = \frac{1}{2} \times 40 \times 3^2$$

$$\text{K.E.} = 180 \text{ J}$$

Now, power is given as

$$P = \frac{E}{t} = \frac{\text{K.E.}}{t} = \frac{180}{1} = 180 \text{ W}$$

7. When we walk on the ground, our foot pushes the ground in the backward direction (action) and the ground pushes our foot in the forward direction (reaction). This reaction helps us to move forward. However, when our foot falls on a peel of banana, the peel cannot push the ground in the backward direction as the friction is reduced. Consequently, no reaction force acts on our foot and we lose balance.

8. According to Newton's II law: $F = ma$

$$F = \frac{m(v - u)}{t}$$

$$Ft = mv - mu$$

$$\text{If } F = 0, v = u$$

i.e. the object continues to move with uniform velocity.

$$\text{If } F = 0 \text{ and } u = 0, v \text{ is also } 0$$

i.e. the object will remain at rest.

This is Newton's first law of motion according to which an object at rest or uniform motion tends to remain at rest or in uniform motion unless an unbalanced force acts on it.

9. Let the acceleration due to gravity be ' g '.

$$g = \frac{Gm_e}{R^2} \rightarrow \text{eq (1)}$$

$$g' = \frac{Gm_e}{(R + h)^2} \rightarrow \text{eq (2)}$$

$$h = \text{height at which } g' = \frac{1}{2}g$$

From eq.(1) and (2)

$$\frac{g'}{g} = \left(\frac{Gm_e}{(R + h)^2} \right) \bigg/ \left(\frac{Gm_e}{R^2} \right) = \frac{R^2}{(R + h)^2}$$

$$\text{Let } g' = 1/2 g \therefore \frac{R^2}{(R + h)^2} = \frac{1}{2}$$

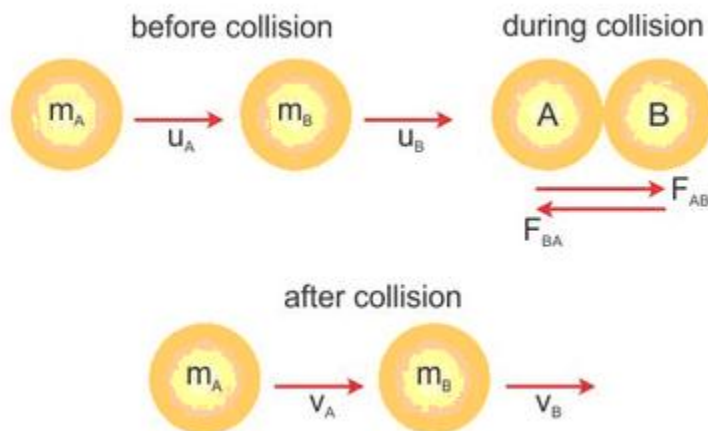
$$2R^2 = (R + h)^2$$

$$R + h = R\sqrt{2}$$

$$\therefore h = R(\sqrt{2} - 1)$$

At a height $h = R(\sqrt{2} - 1)$, the value of acceleration due to gravity would be half of what it is on the surface.

10.



Consider two balls A and B of masses m_A and m_B , respectively, moving in the same direction along a straight line with velocities u_A and u_B . They collide for time t . After collision, their velocities become v_A and v_B .

Force exerted by A on B is

$$F_{AB} = \text{Rate of change of momentum of B}$$

$$= \frac{m(v_B - u_B)}{t}$$

Force exerted by B on A is

$$F_{BA} = \text{Rate of change of momentum of A}$$

$$= \frac{m(v_A - u_A)}{t}$$

We assume that no other external unbalanced forces are acting on the balls. According to Newton's third law of motion, action and reaction are equal and opposite.

$$F_{AB} = -F_{BA}$$

$$\frac{m_A(v_A - u_A)}{t} = -\frac{m_B(v_B - u_B)}{t}$$

$$m_A(v_A - u_A) = -m_B(v_B - u_B)$$

$$\therefore m_A u_A + m_B u_B = m_A v_A + m_B v_B$$

Thus, total momentum before collision is equal to total momentum after collision

11.

(a) Reverberation is the phenomenon of persistence or prolongation of audible sound after the source has stopped emitting it.

It can be reduced by carpeting the floor, upholstering furniture and creating false ceilings with suitable sound absorbing material.

(b) The sounds of frequency lower than 20 Hz are called infrasonic sounds.

Or

(a) Conditions necessary for work to be done:

- A force should be applied to the body.
- The body should be displaced in the direction of the applied force.

(b) A stone lying on the roof of a building has potential energy due to its position above the ground. When the stone is lifted up, work has to be done on it against the force of gravity which is stored in it in form of potential energy. When the stone is allowed to fall freely to the ground, it has the capacity to do an equal amount of work.

12.

(a) Kinetic energy of a body:

Consider a body of mass, 'm' moving with initial velocity, 'u'. Let it be displaced through a distance 's' when a constant force 'F' acts on it in the direction of its displacement. The work done is

$$W = F \times s$$

The work done on the body will cause a change in its velocity. Let its velocity change from 'u' to 'v'. Let 'a' be the acceleration produced.

We know that

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

$$\therefore s = \frac{v^2 - u^2}{2a}$$

We also know that $F = ma$

Thus, work done is

$$\begin{aligned} W &= ma \times \frac{v^2 - u^2}{2a} \\ &= \frac{1}{2} m(v^2 - u^2) \end{aligned}$$

Thus, we can say that work done is equal to the change in the kinetic energy of the body.

If the object starts from rest, then $u = 0$. Thus, we have

$$W = \frac{1}{2} mv^2 = \text{K.E.}$$

This is the expression for the kinetic energy of the body.

(b) The kinetic energy of a body depends on its mass and velocity.

(c) When a freely falling body hits the ground, its kinetic energy changes to sound and heat energy and gets dissipated in the air.

Or

- (a) Let m be the mass of an object moving with initial velocity u . Let a constant force F act on the object for time t so that its final velocity becomes v .

Then, initial momentum of the object $P_1 = mu$

Final momentum of the object $P_2 = mv$

Change in momentum $= P_2 - P_1$

$$= mv - mu$$

$$= m(v - u)$$

The rate of change of momentum $= m(v - u)/t$

According to Newton's second law of motion, the rate of change of momentum is directly proportional to the force applied.

$$F \propto \frac{m(v - u)}{t}$$

$$F = \frac{km(v - u)}{t}$$

$$F = kma$$

The unit of force is so chosen that the value of the constant k becomes one.

So, $F = ma$

- (b) One newton is defined as the amount of force exerted on a body of mass 1 kg to produce an acceleration of 1 m/s^2 .

(c)

$$F_1 = 0.5 \text{ kg} \times 5 \text{ m/s}^2 = 2.5 \text{ N}$$

$$F_2 = 4 \text{ kg} \times 2 \text{ m/s}^2 = 8 \text{ N}$$

Hence, 4 kg mass at 2 m/s^2 will require a greater force.

GROUP B CHEMISTRY

- 13.** In an open ground, the high speed of wind increases the rate of evaporation, and hence, wet clothes dry up faster.
- 14.** Dry ice is stored under high pressure because on decreasing the pressure on dry ice, it gets converted directly into carbon dioxide gas.
- 15.** A group of atoms carrying a positive or negative charge on them are called polyatomic ions; Example - ammonium ion NH_4^+ , hydroxide ion OH^- , sulphate ion SO_4^{2-} .
- 16.** The logical explanation of the laws of chemical combination is that matter must be made up of minute 'unit particles,' which take part in chemical combinations in fixed whole numbers.

- 17.** The number of atoms present in one molecule of an element is called its atomicity. For example.

Name	Formula of molecule	Atomicity	
Helium	He	1	Monoatomic
Hydrogen	H ₂	2	Diatomic
Ozone	O ₃	3	Triatomic
Phosphorous	P ₄	4	Tetra-atomic
Sulphur	S ₈	8	Poly-atomic

18.

$$\begin{aligned}\text{Percentage composition of Boron} &= \frac{0.096}{0.24} \times 100 \\ &= 40\%\end{aligned}$$

$$\begin{aligned}\text{Percentage composition of Oxygen} &= \frac{0.144}{0.24} \times 100 \\ &= 60\%\end{aligned}$$

- 19.** During the burning of a candle, both physical and chemical changes take place.

- **Physical Change**

When a candle is lit, the heat of the flame melts the solid wax to liquid wax. This signifies a physical change from the solid state to the liquid state. Also, as the wax melts, the size of the candle decreases. It then solidifies and takes a different shape.

- **Chemical Change**

The wax acts as a fuel when we light the candle and is basically carbon. The carbon combines with oxygen to form another chemical substance—carbon dioxide—and water. Also, the unburnt carbon is deposited as a black substance called soot. This signifies a chemical change.

- 20.** The sedimentation and decantation methods are used to separate a mixture containing an insoluble solid in a liquid. In this method, the mixture is allowed to stand undisturbed for some time. The insoluble solid substance settles down and a clear liquid is left standing. This clear liquid is called a supernatant liquid. The solid substance which settles down is called sediment. This entire process is known as sedimentation. The clear water

(supernatant liquid) is then poured out carefully into another beaker, leaving the sediments undisturbed. This process is known as decantation.

- 21.** Fractional distillation is the method used for the separation of components of a mixture containing two miscible liquids which boil without decomposition and have sufficient difference in their boiling points.

Two conditions essential for using this method are

- 1) The two liquids must be miscible, i.e. they totally mix with each other.
- 2) The difference between the boiling points of the liquids should be greater than 25 K.

22.

Molecular mass of $S_8 = 8 \times \text{Atomic mass of sulphur} = 8 \times 32 = 256 \text{ g}$.

256 g of sulphur (S_8) = 1 mole

$$\therefore 16 \text{ g of solid sulphur} = \frac{1 \times 16}{256} = \frac{1}{16} \text{ moles}$$

According to Avogadro's law,

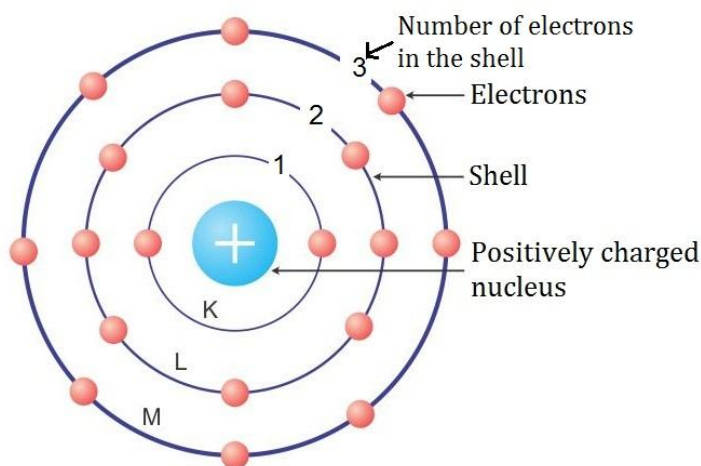
1 mole of sulphur (S_8) contains 6.022×10^{23}

$$\therefore \frac{1}{16} \text{ moles of sulphur } (S_8) \text{ contain} = 6.022 \times 10^{23} \times \frac{1}{16} \text{ molecules}$$

Hence, 16 g of solid sulphur has $0.376 \times 10^{23} = 3.76 \times 10^{22}$ molecules.

23.

(a)



Bohr's Model of an Atom

- (b) Number of electrons in a fully filled K shell = 2
 Number of electrons in a fully filled L shell = 8
 Number of electrons in a fully filled M shell = 8
 Therefore, total number of electrons = $2 + 8 + 8 = 18$

The total number of electrons in an atom having fully filled K, L and M shells will be 18.

- (c) The maximum number of electrons present in a shell is given by the formula $(2n^2)$, where n is the orbit number or shell number.

24. Bohr's Model of an Atom

Niels Bohr revised Rutherford's atomic model and put forth the following suggestions:

- Neils Bohr proposed that electrons possess a specific amount of energy which allows them to revolve around the nucleus.
- An atom contains discrete orbits which correspond to specific amount of energy. Hence, these orbits are also known as energy levels.

The energy levels of an atom are represented as K, L, M, N, and so on or the numbers $n = 1, 2, 3, 4$, and so on.



Energy levels in an Atom

- The electrons are confined to these energy levels. While revolving in these discrete orbits, electrons do not radiate energy. Hence, these orbits are also known as 'stationary orbits' or 'stationary shells'. The smaller the size of the orbit, the smaller is its energy.
- As we move away from the nucleus, the energy of the orbit increases progressively.
- Transfer of an electron from one orbit to another is always accompanied with absorption or emission of energy.
- When an electron jumps from a lower energy level to higher energy level, it absorbs energy.
- When an electron returns from a higher energy level to a lower energy level, it emits energy.

Distribution of Electrons in Orbits

- The distribution of electrons in different orbits of an atom was suggested by Bohr and Bury.
- According to Bohr's model, electrons occupy certain stable orbits or shells. Each shell has definite energy.
- These orbits or shells are represented by the letters K, L, M, N or the numbers 1, 2, 3, 4.

- The maximum number of electrons present in the shell is given by the formula **(2n²)**, where n is the orbit number or the shell number.
- First orbit or K shell will be = $2 \times 1^2 = 2$, Second orbit or L shell will be = $2 \times 2^2 = 8$, Third orbit or M shell will be = $2 \times 3^2 = 18$, Fourth orbit or N shell will be = $2 \times 4^2 = 32$ and so on.

Shell designation	Shell number (n)	Formula 2n ²	Maximum number of electrons in each shell
K-shell	1	$2 \times (1)^2$	2
L-shell	2	$2 \times (2)^2$	8
M-shell	3	$2 \times (3)^2$	18
N-shell	4	$2 \times (4)^2$	32

- The maximum number of electrons which can be accommodated in the outermost orbit is 8.
- The orbits or shells are filled in a step-wise manner.
- Electrons are not accommodated in a given shell unless the inner shells are filled.

Octet rule

It states that 'The maximum number of electrons which the outermost shell of an electrically neutral and chemically stable atom can have is 8'.

Exception: If the atom has only one shell, it can hold only 2 electrons. For example, Hydrogen and Helium can have only 2 electrons (**Duplet**).

Or

Electrovalency

- According to the Electronic theory of valency, we can classify compounds on the basis of the manner of formation of the bond between them.
- When one atom transfers one or more electrons to another atom, the bond formed between them is known as an electrovalent bond.
- The compounds thus formed, are known as electrovalent compounds.

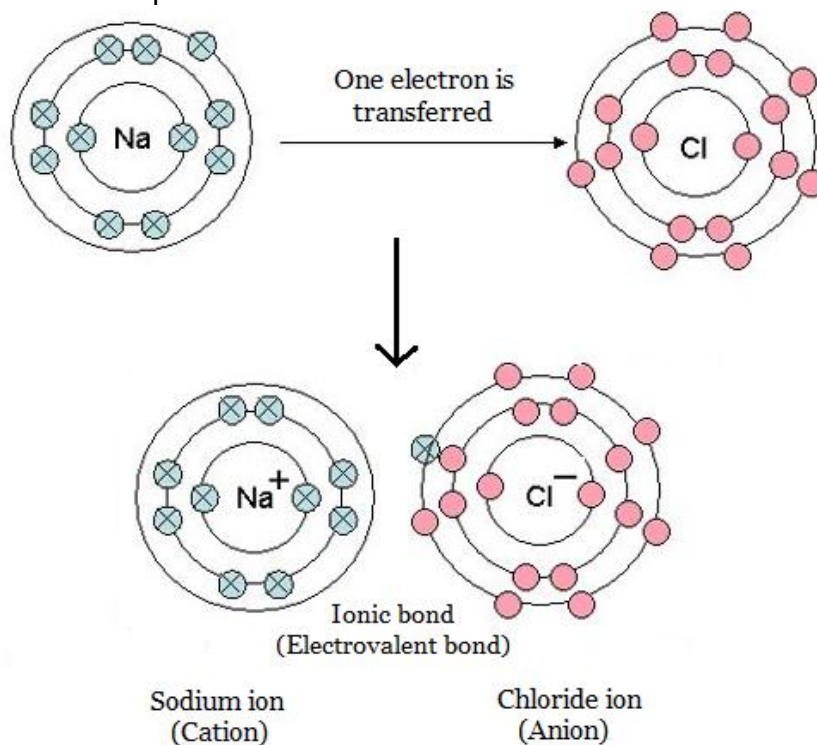
Formation of an Electrovalent Bond

- When one atom loses electrons, it acquires a positive charge. Conversely, when an atom accepts electrons, it acquires a negative charge.
- An atom possessing electrical charge is known as an ion.
- A positively charged ion is known as a cation while a negatively charged ion is called an anion.
- Being oppositely charged, the cation and the anion are attracted towards each other and form a bond held together by electrostatic attraction.

Let us consider the example of formation of the compound sodium chloride to understand this better.

Formation of sodium chloride molecule

- When a sodium atom and a chlorine atom combine, the sodium atom loses an electron and forms a sodium ion.
- The sodium ion is a cation i.e. it carries a positive charge.
- The chlorine atom which already has seven electrons in its outermost orbit accepts the electron lost by the sodium atom and gets converted to a chloride ion.
- The chloride ion is an anion i.e. it carries a negative charge.
- The Sodium ion and the Chloride ion being oppositely charged are attracted towards each other. The linkage or the bond formed between these ions will be the electrovalent or ionic bond.
- The compound, thus formed, NaCl or Sodium chloride is known as the electrovalent compound.



Formation of Sodium chloride Molecule

- The formation of electrovalent bonds is mainly observed between metals and non-metals.
- Metals generally have up to three electrons in their valence orbit while non-metals generally have five to seven electrons in their valence shell.

Biology Section A

1. Photosynthesis and Respiration play an important role in oxygen cycle.
2. *Helicobacter pylori* are responsible for peptic ulcers.
3. When the cell is damaged, lysosomes burst to release the lytic enzymes which digest the entire cell. Hence, lysosomes are called suicidal bags of the cell.

Section B

4. Farmers use beekeeping as an additional income-generating activity because beekeeping needs low investment and beehives are a source of wax which is used in various medicinal preparations.
5. The river lift system is one kind of irrigation system. It is used in areas where canal flow is irregular due to insufficient reservoir release. This type of irrigation is carried out for areas which are close to the river. Water is directly taken from the rivers to supplement the water requirement of the areas.

6.

Gymnosperms	Angiosperms
i. The seeds are naked.	i. The seeds are enclosed by a fruit wall.
ii. The microspores and megaspores are produced by male and female cones.	ii. The microspores are produced in anthers while the megaspores are produced in the ovules of the ovary in flowers.

7. Cotyledons are called seed leaves because in many instances they emerge and become green when the seed germinates.
8. Each and every organism is given a biological name, which consists of two components, one is the genus name, and the other is the species name
Or

Species of cattle reared in India are

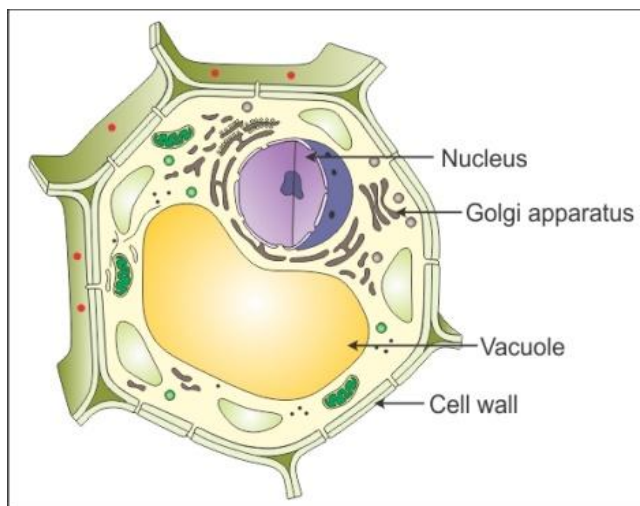
- (i) Cow - *Bos indicus*
- (ii) Buffalo - *Bubalus bubalis*

9.

Manures	Fertilisers
Manure is a natural substance obtained by the decomposition of plant residues and animal wastes.	Fertiliser is an inorganic salt or an organic compound, based on the source from where it has been made.
The amount of essential nutrients such as nitrogen, phosphorus and potassium is less in manures.	Fertilisers are rich in essential nutrients which are required for the growth of plants.
Manures add large amount of organic matter to the soil.	Fertilisers add large amount of chemicals to the soil, instead of organic matter.
Absorption of manures is slow in plants as manures are not soluble in water.	Absorption of fertilisers is fast as they are soluble in water.
Manures remove the general deficiency of nutrients in the soil.	Fertilisers remove the specific deficiency of nutrients in the soil.
They are cheap and can be made at home.	They are costly and cannot be made at home.

10.

(a) Plant Cell:

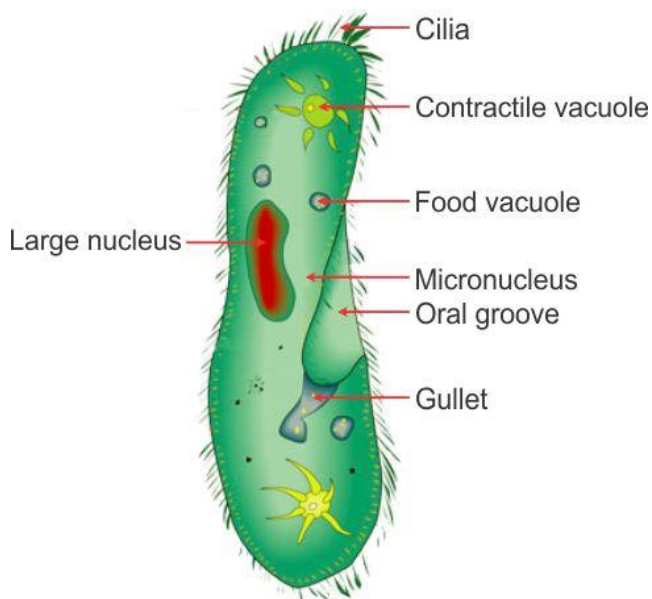


(b) Adenosine triphosphate (ATP) is the energy currency of the cell. Mitochondrion releases the energy.

11. Precautions that can be taken in your school to prevent the incidence of infectious diseases are:

- (a) Prevention of water logging to avoid mosquito breeding.
- (b) Provision of safe drinking water.
- (c) Periodic cleaning of toilets.

Or



Paramecium belongs to the kingdom Protista.

12.

(a)

- i. Just like amphibians, bryophytes require water for fertilisation as their gametes require aqueous medium for movement.
- ii. There are three layers of cells from which differentiated tissues can be made. This allows the inside and outside body linings as well as some organs to be made. There is thus some degree of tissue formation.
- iii. Coelom is a true internal body cavity in which well-developed organs can be accommodated.

(b) The animals which lay eggs are known as oviparous animals.

(c) Chordata.

Or

(i) Management practices to enhance broiler production:

- (a) Maintenance of appropriate temperature
- (b) Provision of hygienic conditions in housing and poultry feed
- (c) Prevention and control of diseases and pests

- (ii) The broiler's feed must be rich in proteins, fats, vitamin A and vitamin K. This type of feed increases the growth rate, helps to develop more muscles and maintains feathering and carcass quality.
- (iii) Pasturage is the flowers available for nectar and pollen collection. It helps the honeybees to collect plenty of honey.