

**Goa Board
Class IX Science
Term 2
Sample Paper – 8 Solution**

SECTION-A

1. 1horse power = 746 watts
2. Tetra-atomic molecules: H_2O_2
Penta-atomic molecules: CHCl_3
3. Nitrogen cycle is known as the perfect cycle in biosphere as it maintains the overall amount of nitrogen constant in the atmosphere, water and soil.
4.
 - (a) Upthrust or Buoyant force.
 - (b) An object will float in any liquid if its weight is equal to the weight of the liquid displaced by it.
5. Cotyledons are called seed leaves because in many instances they emerge and become green when the seed germinates.
6.
$$\text{Percentage composition of Boron} = \frac{0.096}{0.24} \times 100$$
$$= 40\%$$
$$\text{Percentage composition of Oxygen} = \frac{0.144}{0.24} \times 100$$
$$= 60\%$$
7.
 - (a) The use of large amount of fertilizers and pesticides is harmful to top soil. It kills the micro organisms and earth worms that recycle the essential nutrients in the soil and make the soil airy.
 - (b) Carbon dioxide, methane and ozone (**Any Two**).

8.

(a) Work done in moving an object is the product of the force applied and the displacement of the body in the direction of the force.

The SI unit of work is joule (J).

(b) We know that,

$$1 \text{ watt} = \frac{1 \text{ joule}}{1 \text{ second}}$$

$$\text{So, 1 kilowatt-hour} = 1000 \times \frac{\text{joule}}{\text{second}} \text{ for an hour}$$

$$\text{Or, 1 kilowatt-hour} = 1000 \times \frac{\text{joule}}{\text{second}} \times 60 \times 60 = 3.6 \times 10^6 \text{ J}$$

$$\therefore 1 \text{ kilowatt-hour} = 3.6 \times 10^6 \text{ J}$$

9.

(a) The speed of sound depends on the following factors:

- i. Nature (elasticity or density) of the material medium through which it travels.
- ii. Humidity of air.
- iii. Temperature of the medium.

(b) Given that: Frequency, $f = 500 \text{ Hz}$

Time interval between successive compressions from the source of sound is equal to the time period of the sound wave produced.

$$\text{Time period} = \frac{1}{f} = \frac{1}{500 \text{ Hz}} = 0.002 \text{ s}$$

Thus, the time interval between successive compressions from the source of sound is 0.002 seconds.

10. Given: Mass of the object = 120 kg, Initial speed of the object, $v_i = 250 \text{ m/s}$

$$\text{We know that, Kinetic energy (K.E)} = \frac{1}{2}mv_i^2$$

Substituting the values, we get:

$$\text{K.E}_i = \frac{1}{2} \times 120 \times (25)^2$$

$$\text{Or, K.E}_i = 37500 \text{ J}$$

The speed of the object is increased to 40 m/s.

$$\therefore \text{The kinetic energy, K.E}_f = \frac{1}{2}mv_f^2 = \frac{1}{2} \times 120 \times (40)^2$$

$$\text{K.E}_f = 96000 \text{ J}$$

Work done = Change in the kinetic energy

$$= 96000 - 37500$$

$$= 58500 \text{ J}$$

Thus, the work done in order to increase the speed of the object is 58500 J.

11.

- (a) A wound-up spring of a clock possesses potential energy due to change in its configuration.
- (b) A stretched bow possesses potential energy due to change in its shape.
- (c) A bullet fired from the gun possesses kinetic energy by virtue of its motion.

12. The law of reflection of sound are as follows:

- Angle of incidence = angle of reflection
- Incident sound, reflected sound and the normal at the point of incidence all lie in same plane.

Applications:

The reflection of sound is utilized in the working of devices like stethoscope and megaphone.

- (a) Stethoscope: It is a medical instrument used by doctors for listening to sounds produced within the body, mostly in the heart or lungs. When using stethoscopes, the sound of the patient's heartbeat reaches the doctor's ears by multiple reflection of sound.
- (b) Megaphones: Megaphones are designed to send sound in a particular direction without spreading it in all directions. In it, a tube followed by a conical opening reflects sound successively to guide most of the sound waves from the source in the forward direction towards the audience.

13.

(a) 28 g of He

$$\begin{aligned}\text{Number of moles} &= \frac{\text{Mass of He in grams}}{\text{Gram atomic mass}} \\ &= \frac{m}{M} = \frac{28 \text{ g}}{4 \text{ g}} = 7 \text{ mol}\end{aligned}$$

(b) 46 g of Na

$$\begin{aligned}\text{Number of moles} &= \frac{\text{Mass of Na in grams}}{\text{Gram atomic mass}} \\ &= \frac{m}{M} = \frac{46 \text{ g}}{23 \text{ g}} = 2 \text{ mol}\end{aligned}$$

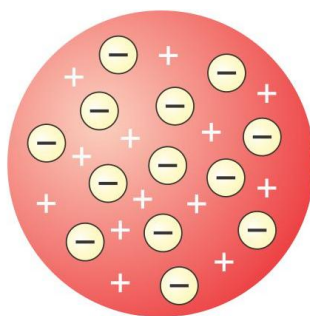
(c) 60 g of Ca

$$\begin{aligned}\text{Number of moles} &= \frac{\text{Mass of Ca in grams}}{\text{Gram atomic mass}} \\ &= \frac{m}{M} = \frac{60 \text{ g}}{40 \text{ g}} = 1.5 \text{ mol}\end{aligned}$$

14. The groups or organisms which have ancient body design and have not changed very much are known as ancient organisms. The other set of organisms that have evolved their particular designs relatively recently are referred as advanced organisms. For example, prokaryotes are primitive to eukaryotes; bryophytes are regarded as more primitive than gymnosperms and likewise amphibians are termed as more primitive than birds.

15.

(a) Julie understood the Thomson's model of atom after looking at the pudding cake. Thomson's model of an atom is popularly known as the 'Plum pudding' or 'Christmas pudding' model of an atom. According to Thomson's Plum pudding model, an atom is a positively charged sphere in which electrons are embedded.



Thomson's Model of an Atom

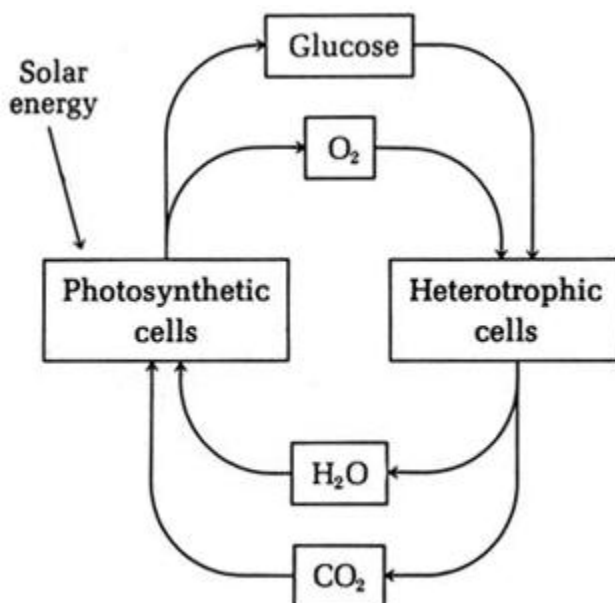
(b) Features of the Thomson's Model

- An atom consists of a positively charged sphere and the electrons are embedded in it.
- The negative and positive charges are equal in magnitude. So, the atom as a whole is electrically neutral.

(c) Limitations of Thomson's Atomic Model

- Although Thomson's atomic model explained why an atom is electrically neutral, it could not explain the distribution of electrons in the atom.
- If we accept that electrons are embedded in the positive charge, then the opposite electric charges should cancel each other out and the charged sphere would become chargeless.
- Thomson's model could not explain why different elements have different chemical properties.

16.



17.

- i. The different causes of a disease are:
 - (a) Due to improper functioning of an organ and tissues.
 - (b) Due to genetic changes.
 - (c) Due to deficiency of any nutrient in the diet.
 - (d) Due to special sensitivity to some specific substances.
- ii. Vectors are the organisms which carry parasite from one host to another, thus, spreading the infection. Example - Anopheles mosquito.

18.

- (a) Time period from the time at which an organism is exposed to the disease causing agent until the appearance of the first symptoms is called incubation period.
- (b) Tetanus and diphtheria.

19.

(a)

Acute Diseases	Chronic Diseases
(i) They last for few days.	(i) They last for very long periods.
(ii) There are no bad effects on our general health.	(ii) They may cause long term bad effects such as loss of weight.
(iii) The patients recover completely after the cure.	(iii) The patient does not recover completely.

- (b) Chronic diseases cause more damage to our body because it lasts for a long time, even for whole life.

20.

(a) The energy possessed by a body due to its position or due to a change in its configuration is known as potential energy.

(b) The potential in both the cases will be the same, that is, P.E = mgh.

This is because potential energy depends on the height, that is, the difference between the initial and the final position of the object and not on the path along which it is moved.

(c) Given:

Velocity of the object, $v = 5 \text{ m/s}$, Kinetic energy, $K.E = 25 \text{ J}$

The kinetic energy of an object, $K.E = \frac{1}{2}mv^2$

Substituting the values, we get:

$$= \frac{1}{2} \times 120 \times (25)^2$$

Or, $K.E_i = 37500 \text{ J}$

The speed of the object is increased to 40 m/s .

\therefore The kinetic energy, $K.E_f = \frac{1}{2}mv_f^2 = \frac{1}{2} \times 120 \times (40)^2$

$K.E_f = 96000 \text{ J}$

Work done = Change in the kinetic energy

$$= 96000 - 37500$$

$$= 58500 \text{ J}$$

21.

(a) The human ear and brain are sensitive to sound waves confined to the frequency range of about 20 Hz to 20 kHz . This range is called the audible range.

(b)

i. Given that:

Mass of the object in air = 30 g

Mass of the object in liquid = 26 g

Relative density of the liquid = 0.8 g cm^{-3}

$g = 980 \text{ cm s}^{-2}$

Let the volume of the object be ' V '

According to the Archimedes' principle:

Loss in weight of the object = Weight of liquid displaced by the object

$(30 - 26) \text{ g} = V \times \text{Relative density of the liquid} \times g$

$$4 \times 980 = V \times 0.8 \times 980$$

$$\therefore V = \frac{4}{0.8} = 5 \text{ cm}^3$$

ii.

$$\text{Density of the solid} = \frac{\text{Mass}}{\text{Volume}} = \frac{30}{5} = 6 \text{ g cm}^{-3}$$

$$\therefore \text{Relative density of the solid} = \frac{\text{Density of solid}}{\text{Density of water}} = \frac{6 \text{ g cm}^{-3}}{1 \text{ g cm}^{-3}} = 6$$

22. 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 $(2n^2)$, where n is the orbit number or 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 shell will be $= 2 \times 4^2 = 32$ and so on.

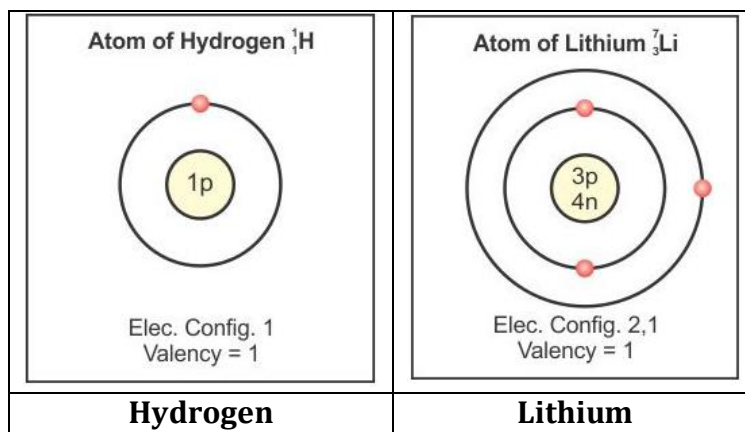
Shell designation	Shell number (n)	Formula $2n^2$	Maximum number of electrons in each shell
K-shell	1	$2 \times (1)^2$	2
L-shell	2	$2 \times (2)^2$	8
M-shell	3	$2 \times (3)^2$	18
N-shell	4	$2 \times (4)^2$	32

- The maximum number of electrons that can be accommodated in the outermost orbit is 8 according to the octet rule.

Octet rule

- It states that "The maximum number of electrons that 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**)
- 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.

Examples: (Distribution of electrons)



- The symbol of hydrogen is H. The atomic number is 1. The total number of electrons is 1. Therefore, the electronic configuration is also 1. Since, it has only one electron, it will occupy the K-shell.

K	L	M	N
1	-	-	-

- The symbol of lithium is Li. The atomic number is 3. Therefore, the electronic configuration is 2, 1. This means that there are two electrons in the K-shell and one electron in the L-shell.

K	L	M	N
2	1	-	-

23.

(a) Photosynthesis helps to balance oxygen and carbon dioxide in the air. Oxygen gas is produced during photosynthesis which animals breath in, and breath out carbon dioxide and the plants need this carbon dioxide for photosynthesis. So, the levels of carbon dioxide and oxygen are balanced in the air.

Nitrogen gas is also circulated continuously between living and non-living components of biosphere. It also enters through the producer level through various processes and gets transferred to other tropic levels. Finally, decomposers act on death bodies of living organisms and inorganic nitrogen enters the nature again.

(b)

Nitrification	Denitrification
(i)The process of conversion of nitrites into nitrates is called nitrification.	(i)The process of converting free nitrogen is called denitrification.
(ii)This is an intermediate step of nitrogen cycle in which nitrogen is converted into another usable form.	(ii)This is the last step in which nitrogen is released back into its source, the atmosphere.

(c) The interaction and interdependence amongst various biotic and physical components of the environment has caused balance in nature.

24.

(a)

- Lichens: Some fungal species live in permanent mutually dependent relationships with blue-green algae. Such relationships are called symbiotic and the symbiotic life forms are called lichens.
- Cryptogamae: The reproductive organs of the thallophytes, the bryophytes and the pteridophytes are very inconspicuous and are therefore called 'Cryptogamae'. It means plants with hidden reproductive organs.
- Phanerogams: The plants with well differentiated reproductive organs that ultimately make seeds, are called 'phanerogams'.

(b) Monera shows the most primitive and simplest characters; like single cells and prokaryotic nature. Hence, they are considered to be the first evolved kingdom.

(c) Fungi are regarded as saprophytes because they feed on dead and decaying organic matter.

SECTION-B

25.(c) No reflection of sound takes place.

Porous surface absorbs sound.

26.(a) A

The source of sound should be placed at point A. Sound waves that originate from the source of sound A, reflect at C and then reach B.

27.(d) 0.8 g cm^{-3}

Volume of the stone = $11 - 6 = 5 \text{ cm}^3$

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{4 \text{ g}}{5 \text{ cm}^3} = 0.8 \text{ g cm}^{-3}$$

28.(d) Their body is differentiated into root, stem and leaves.

The body of a fern is differentiated into root, stem and leaves.

29.(d) Filamentous, Presence of cytoplasmic strands, presence of pyrenoids

The structure of spirogyra is filamentous characterized by the presence of cytoplasmic strands and pyrenoids.

30.(c) A

A transverse wave is formed when slinky is moved up and down.

31.(d) Overflow can

On immersion of a solid, an overflow can lets the displaced water flow out and get collected in a beaker so that its volume can be measured.

32.(c) Nm^{-2}

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}} = \frac{\text{N}}{\text{m}^2} = \text{Nm}^{-2}$$

33.(c) Law of conservation of mass

Law of conservation of mass is confirmed from the reaction since mass of reactants is equal to mass of products.

34.(d) $(L/10) \text{ ms}^{-1}$

Total time taken by the wave = $55 - 5 = 50 \text{ s}$

Total distance covered by the wave = $5 \times L$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{(5 \times L) \text{ m}}{50 \text{ s}} = \frac{L}{10} \text{ m/s}$$

35.(b) (A) Rhizoids (B) Foot (C) Seta (D) Capsule.

A represents Rhizoids which are hair like outgrowths to absorb water and minerals from the substratum; **B** represents foot which has spirally arranged leaves; **C** is seta which is a stalk like structure and **D** is a capsule for asexual reproduction.

36.Reaction:



6.4 g 2.88 g 3.52 g

Mass of the reactant = 6.4 g

Mass of the products = (2.88 + 3.52) g = 6.4 g

Since mass of reactant is equal to the mass of the products, these results are in agreement with the law of conservation of mass.

6.4 g of MgCO_3 on heating gave 2.88 g MgO and 3.52 g CO_2 .