Tripura Board
Class IX Science
Sample Paper 2 – Solution

Group A

Physics

1. The kinetic energy will become 4 times.

2. Work done = m × g × h

3. The slope of the distance–time graph for car B makes a larger angle with the time axis. Thus, its slope is larger than the slope of the distance–time graph for car A. Hence, the speed of car B is greater than that of car A.

4. The density of the cork is less than the density of water and hence, being lighter than water, it floats on water. On the other hand, the density of iron nail is greater than the density of water. So, it is heavier than water and thus, sinks in water.

5. The density of sea water is more due to its salty nature. Hence, the upthrust acting on the swimmer is more in case of sea water. Thus, it is easier to swim in sea water than in river water.

6. When a balloon is filled with hydrogen gas, the density of the balloon becomes less than the density of atmospheric air. Therefore, the buoyant force acting on the balloon is more than the weight of the balloon. Thus, the balloon floats and rises up in the air.

7.
   (i)

$$F \propto \frac{1}{r^2}$$

$$\therefore F_{new} \propto \frac{1}{r_{new}^2}$$

$$\Rightarrow \frac{F_{new}}{F} = \frac{r^2}{r_{new}^2} = \frac{r^2}{\left(r/2\right)^2} = 4$$

$$\therefore F_{new} = 4F$$

That is, the force increases 4 times when the

distance between two objects is reduced to half.

(ii)

$$F \propto m_1 m_2$$

$$\therefore F_{new} \propto m_{1,new} m_2$$

$$\Rightarrow \frac{F_{new}}{F} = \frac{m_{1,new} m_2}{m_1 m_2} = \frac{4 m_1 m_2}{m_1 m_2} = 4$$

$$\therefore F_{new} = 4F$$

That is, the force increases 4 times when the mass of one object is increased to 4 times.

8.

$F_1 = 100$ N

$F_2 = 50$ N

$r_1 = $ original distance

$r_2 = $ new distance

$$F \propto \frac{1}{r^2}$$

$$\frac{F_1}{F_2} = \left(\frac{r_2}{r_1}\right)^2$$

$$= \frac{100}{50} = \left(\frac{r_2}{r_1}\right)^2$$

$$\frac{r_2}{r_1} = \sqrt{2}$$

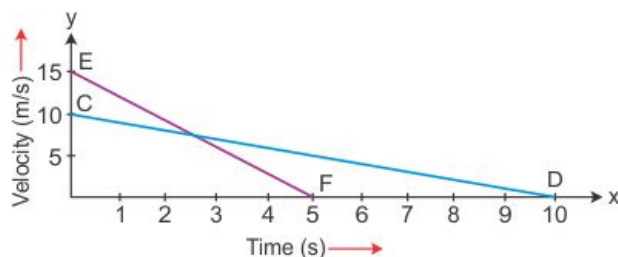$$\therefore r_2 = \sqrt{2}\, r_1$$

9.

For train A :

$u = 54$ km/h $= 54 \times \dfrac{5}{18} = 15$ m/s

$v = 0; t = 5$ s

For train B :

$u = 36$ km/h $= 36 \times \dfrac{5}{18} = 10$ m/s

$v = 0; t = 10$ s

Distance travelled by A = Area under EF $= \dfrac{1}{2} \times 15 \times 5 = 37.5$ m

Distance travelled by B = Area under CD $= \dfrac{1}{2} \times 10 \times 10 = 50$ m

10. Mass of bullet is m_b = 50 g = 0.05 kg

Velocity of bullet is v_b = 150 m/s

Mass of stone is m_t = 60 kg

Velocity of stone is v_t = −10 m/s

Negative, because it is in the direction opposite to that of the bullet.

Momentum of n bullets is $n(m_b v_b)$.

Now, momentum before collision is equal to momentum after collision.

The stone has to be stopped, and the bullets will embed inside the stone.

Hence, the momentum after collision is zero.

$$n\left(m_b v_b\right) + m_t v_t = 0$$

$$\therefore n = \frac{-m_t v_t}{m_b v_b} = \frac{-\left(60 \times -10\right)}{0.05 \times 150} = 80$$

11.

(a) The body with less mass (the lighter body) will have greater velocity.
(b) If the roads go straight up, the angle of the slope will increase due to which the frictional force will increase and the vehicles might slip. Also, more power is required to go up a large slope.
(c) 746W

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) 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 m/s, Kinetic energy, K.E = 25 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.

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

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

Work done = Change in the kinetic energy

$$= 96000 - 37500$$

$$= 58500 \text{ J}$$

Or

(a)

	Sound Waves	Light Waves
1.	Sound waves need a material medium for their propagation.	Light waves do not need a material medium for their propagation. They can travel even through vacuum.
2.	Sound waves are longitudinal.	Light waves are transverse.
3.	Sound waves have a very low speed of about 350 m/s in air at room temperature.	Light waves have a very high speed of 3×10^8 m/s in vacuum or air.
4.	Sound waves are sensed by our ears.	Light waves are sensed by our eyes.

(b)
- When an object vibrates, it sets the particles of the medium around it vibrating.
- In transmission of sound through air, the air particles do not actually move from the air to our ear. The layer of air in contact with the vibrating object first gets displaced from its mean position and vibrates back and forth.
- Then, it transfers the sound energy to the adjacent air particles. Due to this, the adjacent particles get displaced from their position of rest.
- After displacing the adjacent particles, the layer of particles returns back to its original position of rest. This process continues till the vibrations (sound) reach our ears. In this way, the sound produced by a vibrating object in a medium reaches our ears.

GROUP B
CHEMISTRY

13. 1 mole of Al atom's weight = Gram atomic mass of Al = 27 g. So, 4 moles of Al atoms will weigh = 27×4 = 108 g

14. The atomic number of sulphur is 16. Electronic distribution in the shells will be:
K shell = 2, L shell = 8, L shell = 6. Electronic configuration will be (2, 8, and 6).

15. Evaporation is called a surface phenomenon because some of the particles from the surface of the liquid gain enough energy to overcome the forces of attraction present between them and escape from the surface in the form of vapour.

16. When the liquid is heated, its temperature increases. Due to this, particles of liquid get enough kinetic energy to go into the vapour state. This increases the rate of evaporation.

17. Mercury, oil and water are immiscible liquids and have different densities. The mixture of mercury, oil and water will be put in a separating funnel and allowed to stand for some time. The mixture separates into three layers according to the densities of mercury, oil and water. On opening the stop cock of the separating funnel, the lower layer formed by mercury comes out first and is collected in a beaker leaving behind the other two layers. Similarly, again on opening the stop cock of the separating funnel, the lower layer of water comes out first and is collected in the beaker leaving behind the oil in the funnel.

18. The applications of chromatography are
   (i) To separate colours in a dye or pigment from natural colours.
   (ii) To separate drugs from blood.
   (iii) To separate small amounts of products of chemical reactions.

19. Isobars are atoms of different elements with the same mass number but different atomic numbers.

For example, in the two elements calcium $^{40}_{20}\text{Ca}$ and argon $^{40}_{18}\text{Ar}$, the number of electrons in these atoms is different, but the mass number of both these elements is 40. That is, the total number of nucleons is the same in the atoms of this pair of elements.

20. Gram molecular mass of CO2 = 44 g

i.e. 1 g molecule of CO2 has mass = 44 g

So, 0.72 g molecule of CO2 will have mass = 44 × 0.72 g= 31.68 g

21.

$$\text{Number of moles of Mg} = \frac{\text{Given mass}}{\text{Molar mass}} = \frac{6\,\text{g}}{24\,\text{g}} = 0.25$$

If Na and Mg have same number of atoms so, they will the have same number of moles also.

So, the number of moles of Na = 0.25

$$\text{Number of moles of Na} = \frac{\text{Given mass}}{\text{Molar mass}}$$

$$0.25 = \frac{\text{Mass of Sodium}}{23}$$

Hence, mass of Sodium = 23 × 0.25 = 5.75 g

22. The postulates of Dalton's Atomic Theory:

(i) All matter is made up of very tiny particles called atoms.

(ii) Atoms are indivisible particles, which can neither be created nor destroyed in a chemical reaction.

(iii) Atoms of a given element are identical in mass and chemical properties.

(iv) Atoms of different elements have different masses and chemical properties.

(v) Atoms combine in the ratio of small whole numbers to form compounds.

(vi) The relative numbers and kinds of atoms are constant in a given compound

23.

(i) Metals: Iron. They are lustrous and good conductors of electricity.

(ii) Non-metals: Oxygen. They are non-lustrous and poor conductors of electricity.

(iii) Metalloids: Germanium. They show intermediate properties between those of metals and non-metals and are semiconductors.

24.

(a) (i) Bromine, (ii) Oxygen

(b) Metalloid: Silicon

(c) Malleability and ductility are properties which enable us to give metals the desired shape.

(d) Mercury is liquid at room temperature.

Or

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 = 2×1^2 = 2, Second orbit or L shell will be = 2×2^2 = 8, Third orbit or M shell will be = 2×3^2 = 18, Fourth orbit or shell will be = 2×4^2 = 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)
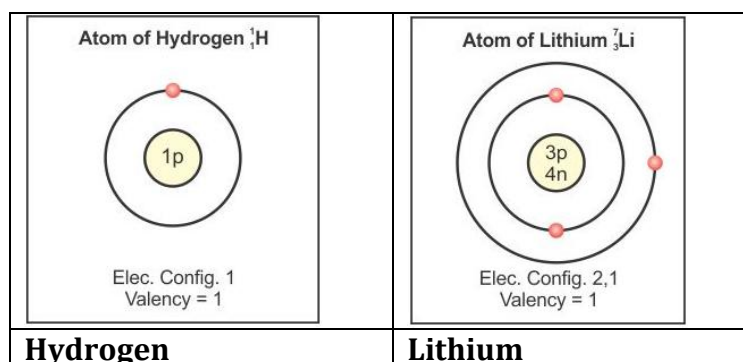
Hydrogen	Lithium

- 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	-	-

Biology
Section A

1. The addition of undesirable substances like fertilizers, pesticides and mercury salts contaminate water which can cause diseases like cholera.

2. 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.

3. The deeply folded inner membrane of mitochondria provides a large surface area for ATP-generating chemical reactions.

Section B

4. Advantages of organic farming:
   (i) It prevents pollution of any component of our environment because there is no use of chemical fertilisers.
   (ii) Besides providing nutrients, the use of biopesticides with a healthy cropping system helps in pest, insect and weeds control.

5.
   (i) Excessive irrigation may cause soil erosion.
   (ii) Excessive irrigation changes the composition of soil by solubilising some of the minerals from the soil.
   (iii) Over-irrigation leads to water pollution.

6.
   (i) Hydra possesses tentacles around the mouth.
   (ii) Possess body cavity called coelenterons.

7. The animals of phylum Echinodermata have spiny skinned body. Example - Asterias (star fish), Holothuria (Sea cucumber)

8. The Thallophytes, Bryophytes and Pteridophytes are included in Cryptogams as they have hidden reproductive organs

SECTION-C

9.
   (i) Monerans have prokaryotic cells.
   (ii) Prokaryotes do not have membrane bound organelles. They have naked genetic material called nucleoid. They can be autotrophic or heterotrophic.

10.

Bryophyta	Pteridophyta
(a) Plant body is gametophyte.	(a) Plant body is sporophyte.
(b) True root, stem and leaves are not present.	(b) True root, stem and leaves are present.
(c) True vascular system is absent.	(c) True vascular system is present.

11. Composite fish culture is a technique in which fish with different feeding habits are kept together for increased production at the same cost. Fast-growing compatible species are selected so that there is little competition between them and all ecological zones are exploited to achieve maximum yield.

Conditions necessary for composite fish culture technique:

(i) Fast-growing compatible fish should be selected.

(ii) Selected fish should have different feeding habits so that all the available food is effectively consumed with little competition between them.

Limitations of composite fish culture technique:

Many fish of composite fish culture breed only during the monsoon season. It is difficult to get good quality of fish seed as it could be mixed with that of other species as well, even if the fish seed is collected from the wild.

Or

The structural features of bone tissue are

a. The matrix of the bone tissue is in the form of thin concentric rings called lamellae.

b. Osteocytes are present between the lamellae in fluid-filled spaces called lacunae.

c. All lacunae communicate with each other by a network of fine canals called canaliculi.

SECTION-D

12.

(a) The organisms which decompose the dead remains of plants and animals are called decomposers.

(b)
 • Decomposers help in the cycling of nutrients in the biosphere.
 • Decomposers convert the nutrients available in the usable form
 • Decomposers help in complete disposal of dead animals or living things.
(Any two points)

(c) Rhizobium bacteria.

(d) Carbon in elemental form occurs as diamond and graphite. Carbon in combined state occurs as carbon dioxide, carbonates and hydrogen carbonate salts in various minerals. It occurs in carbon containing molecules like carbohydrates, fats, proteins, nucleic acids and vitamins etc.

Or

(a) The general ways of preventing infections:

For airborne diseases: We can prevent exposure by providing living conditions that are not overcrowded.

For waterborne diseases: We can prevent exposure by providing safe drinking water.

For vector borne infections: By providing clean environment which will not allow mosquitoes to breed.

(Any two points)

(b) A person is most likely to fall sick under condition mentioned at (iii).

Reason:

After recovering from malaria she is on a four day fast. Fasting weakens the body's immune system and she is likely to get chicken pox as chicken pox is a contagious disease which spreads through direct contact with the patient.