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

SECTION A

1. Work is said to be done when a force acts on an object and as a result of this force, the object gets displaced from its initial position.

2. One atomic mass unit is a mass unit equal to exactly one twelfth $\frac{1}{12}$ th of the mass of one atom of carbon–12.

3.

i. Photosynthesis.
ii. Respiration.

4. Intensity of sound at a point is defined as the amount of sound energy flowing per second normally through unit area around that point.
Loudness is a measure of the amount of sensation produced in the ears of the listener. Intensity does not depend on the listener where as loudness depends on the listener.

5.

(a) Monocots have one cotyledon whereas dicots have two cotyledons.
(b) Bryophytes are called amphibians amongst plants because they live in damp areas because:
   i. The plant body of Bryophytes is devoid of vascular tissues, roots etc.
   ii. Like amphibians of animal kingdom, the sperms require an external supply of water for swimming and reaching the eggs for fertilising the same.

6. The limitations of Thomson's Atomic Model:

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

7.

(a) Wind: Strong winds erode rocks and carry small rock pieces and sand from one place to another.

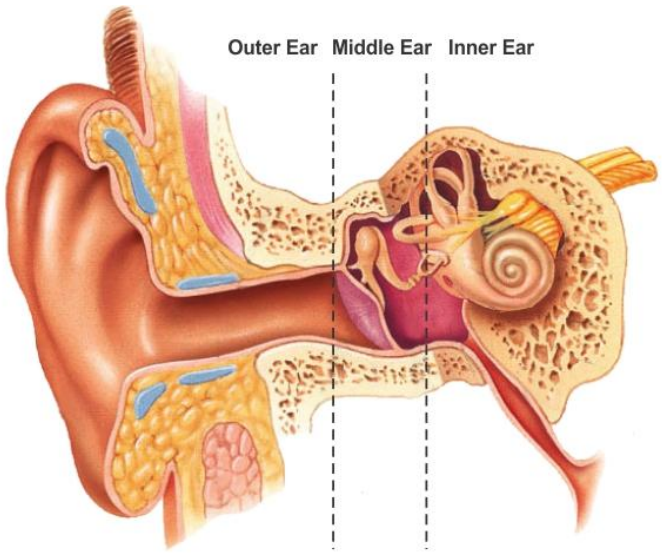
(b) Water:

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

ii. Water expands on freezing. So, when it is deposited in crevices of rocks, it cracks rocks into smaller pieces.

(c) Sun: The sun heats up rocks during the day so they expand. At night, these rocks cool down and contract. This results in the formation of cracks and ultimately, huge rocks break into smaller pieces.

8. Labelled diagram of the human ear is as shown below:



9. During the day, the air above the land gets heated up faster and starts rising. As this air rises, a region of low pressure is created and the air over the sea moves into this area of low pressure. The direction of the wind would be from sea to land.

During night, both land and sea start to cool down. Since water cools down slower than land, the air above the water would be warmer than the air above the land; so, the wind current moves from land to sea.

10. Given that the mass of the man, 'm' =50 kg

The man climbs 30 steps each of height 20 cm.

∴ Total height through which the man climbs, 'h' = 30×20 cm = 600 cm = 6 m

Time taken =30 seconds

We know that potential energy, 'U' = mgh

U = 50 × 10 × 6 = 3000 J

The power used in climbing the stairs:

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

$$P=\frac{3000\ J}{30\ sec}=100\ W$$

$$Or\ P=\frac{100}{1000}kW=0.1kW$$

11.

i. Meghaphone works on the principle of multiple reflections of sound.

ii. Arshi got disturbed due to noise pollution.

iii. Megaphones should not be used in a residential area in order to avoid noise pollution.

12. Given that:

Mass of the car, 'm'= 900 kg

Initial speed of the car, 'u' = 25 m/s

Final speed of the car, 'v' = 0 m/s (as it comes to rest)

The distance travelled by the car till it stops, 's' = 40 m

Acceleration of the car, 'a' = ?

According to the equation of motion:

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

Substituting the values, we get:

$0^2 = 25^2 + 2 \times a \times 40$

$$\Rightarrow a=\frac{-625}{80}=-\frac{125}{16}$$

$$a=-7.8125\ m/s^2$$

Hence, the force exerted, 'F' = m × a

= 900 × -7.8125

= -7031.25 N

∴ The force exerted, 'F' = -7031.25 N

Negative force implies that the direction of the force is opposite to the displacement of the car.

Work done by the brakes, W= F × s = -7031.25 × 40 = -281250 Joules

13.

Transverse Waves	Longitudinal Waves
i. Transverse waves consist of crests and troughs.	i. Longitudinal waves consist of compressions and rarefactions.
ii. There are no pressure variations.	ii. There is a pressure variation throughout the medium.
iii. They can be produced only in solids and liquids but not in gases.	iii. They can be produced in all three media: solids, liquids as well as through gases.
iv. In transverse waves, the particles of the medium vibrate at right angles to the direction of wave propagation.	iv. In longitudinal waves, the particles of the medium vibrate parallel to the direction of wave propagation.
v. There is no change in the density of the medium.	v. There is a change in the density throughout the medium.
vi. Light wave is an example of a transverse wave.	vi. Sound wave is an example of a longitudinal wave.

14.

$1\text{ mole of sulphur dioxide, } SO_2 = \text{Mass of S} + \text{Mass of } O_2$

$= 32 + 2 \times 16$

$= 64\text{ grams}$

$\text{Therefore, } 16\text{ g of sulphur dioxide} = \frac{1}{64} \times 16\text{ moles}$

$= \frac{1}{4}\text{ moles}$

Now, $\frac{1}{4}$ moles of sulphur dioxide will have the same number of molecules as $\frac{1}{4}$ moles of oxygen.

Therefore, convert $\frac{1}{4}$ moles of oxygen into mass in grams.

$1\text{ mole of oxygen } O_2 = \text{Mass of 2 O atoms}$

$= 2 \times 16$

$= 32\text{ grams}$

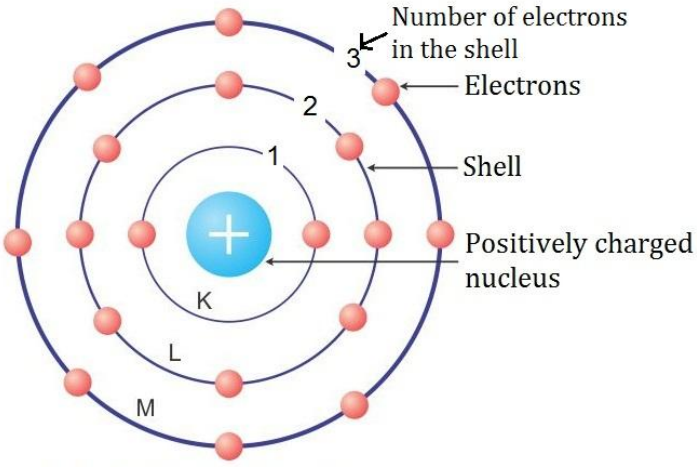
$\text{Therefore, } \frac{1}{4}\text{ moles of oxygen} = 32 \times \frac{1}{4}$

$= 8\text{ grams}$

Thus, 8 grams of oxygen will contain the same number of molecules as 16 grams of sulphur dioxide.

15.

(a)

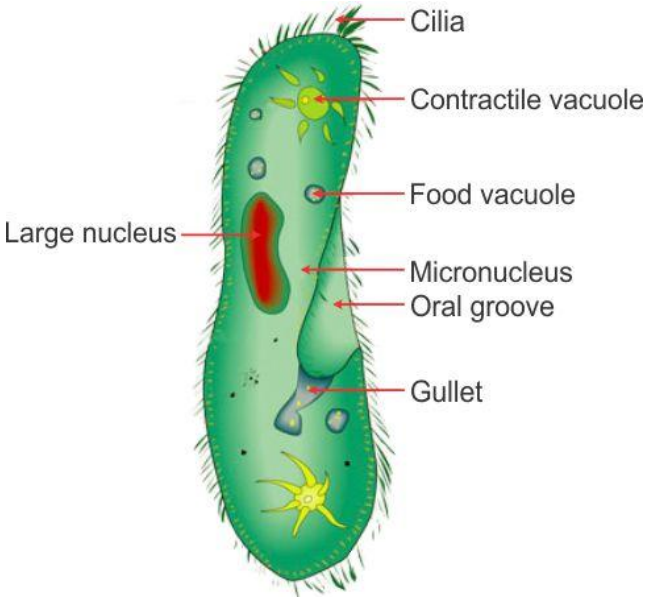


Bohr's Model of an Atom

(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.

16.



Paramecium

Paramecium belongs to the kingdom Protista.

17.

(a) Edward Jenner discovered vaccines.

(b) Antibiotic is a chemical substance which kills pathogens. They are secreted by microorganisms such as fungi and bacteria.
Example - Penicillin and streptomycin.

18. Intrinsic factors:

i. Malfunctioning of some vital body organs and the immune system.
ii. Genetic disorder.
iii. Hormonal imbalances.

Extrinsic factors:

i. Unbalanced or inadequate diet.
ii. Disease causing microorganisms.
iii. Environmental pollutants.
iv. Bad food and drinking habits.

19. Infectious diseases can be spread through the following agents:

i. **Through air:** Cough or sneeze of an infected person may cause infection to a healthy person if he inhales the droplets containing microbes. Diseases such as common-cold, tuberculosis, pneumonia etc. spread through air.
ii. **Through water:** Consumption of water contaminated with the spores of bacteria or disease causing microbes can cause diseases such as cholera, amoebiasis.
iii. **Through sexual contact:** Unsafe sexual contact with an infected partner may lead to many sexually transmitted diseases. For example, syphilis, AIDS, genital warts etc.
iv. **Through vectors:** Vectors (animals or microorganisms) carry the infecting agents from a sick person to another potential host. They act as a carrier of a disease or an infection. Malaria is a very good example of this type of transmission.

20.

(a) The energy possessed by a body by virtue of its position or shape is called potential energy.
Examples: water stored in a dam has potential energy, a stone lying on the roof of the building also possesses potential energy.

(b) Given that:
Two bodies of masses m_1 and m_2 have the same kinetic energy. Let KE_1 and KE_2 be the kinetic energies of the two bodies.
$KE_1 = KE_2$
Let u_1 and u_2 be the velocities of the bodies respectively

$$\therefore \frac{1}{2}m_1u_1^2 = \frac{1}{2}m_2u_2^2 \text{ ----------(1)}$$

The force applied on the two bodies to bring them to rest, $F_1 = F_2 = F$ is the same.

Let t_1 and t_2 be the time taken to stop the masses m_1 and m_2 respectively,

the retardation produced in each case is:

$$a_1 = \frac{0 - u_1}{t_1} = \frac{u_1}{t_1}$$

$$a_2 = \frac{u_2}{t_2}$$

We know that F =ma

$$\therefore F = m_1 a_1 = m_2 a_2$$

$$\Rightarrow a_1 = \frac{F}{m_1} = \frac{u_1}{t_1} \text{ ----------(2)}$$

$$a_2 = \frac{F}{m_2} = \frac{u_2}{t_2} \text{ ---------- (3)}$$

From (1) and (2) we get that:

$$t_1 = \frac{u_1 m_1}{F} \text{ and } t_2 = \frac{u_2 m_2}{F}$$

$$\Rightarrow \frac{t_1}{t_2} = \frac{u_1 m_1}{u_2 m_2} \text{ ----------(4)}$$

From (1) we get that:

$$\frac{u_1}{u_2} = \sqrt{\frac{m_2}{m_1}} \text{ ----------(5)}$$

Substituting (5) in (4) we get:

$$\frac{t_1}{t_2} = \frac{m_1}{m_2}\sqrt{\frac{m_2}{m_1}} = \sqrt{\frac{m_2}{m_1} \times \frac{m_1^2}{m_2^2}}$$

$$\Rightarrow \frac{t_1}{t_2} = \sqrt{\frac{m_1}{m_2}}$$

As $m_1 > m_2$, $t_1 > t_2$

The heavier body will take longer to stop than the lighter body.

21.

(a) According to Archimedes' principle, when an object is wholly or partially immersed in a liquid, it experiences a buoyant force which is equal to the weight of the liquid displaced by the object. Two applications of Archimedes' principle are:

i. It is used in determining the relative density of a substance.

ii. It is used in designing ships and submarines.

(b) Volume of the iron block = 5 cm × 5 cm × 5 cm = 125 cc = 1.25×10^{-4} m^3

Mass of the iron block = volume × density = 125 cc × 7.8 g/cc

= 975 g = 0.975 kg

Weight of the iron block = 0.975 kg x 10 m/s^2 = 9.75 N

According to Archimedes' Principle:

Upthrust = Weight of the water displaced

= Volume of the water displaced × density of water × g

= Volume of the iron bock × density of water × g

= (1.25×10^{-4} m^3) × (1000 kg/m^3) × (10 m/s^2)

= 1.25 N

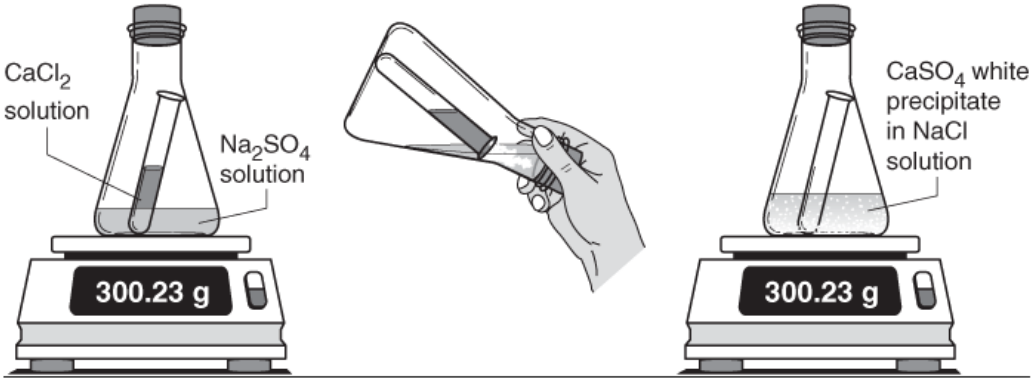
Thus, apparent weight of the iron block = 9.75 N - 1.25 N = 8.5 N

22. Law of Conservation of Mass

Principle: The law of conservation of mass states that mass can neither be created nor destroyed in a chemical reaction.

Total Mass of the Reactant = Total Mass of the Product

Diagram:



Technique: Take a solution of calcium chloride in a flask labeled A, and a solution of sodium sulphate in a test tube labelled B.

Tie a thread to the test tube and carefully lower it in the flask. Cork the flask to make it airtight.

Weigh the flask on a balance. It weighs 300.23 grams.

Tilt and swirl the flask and allow the contents of the test tube to come in contact with the contents of the flask.

Observation: Calcium chloride reacts with sodium sulphate to form a white precipitate of calcium sulphate and a solution of sodium chloride.
Weigh the flask again. There will be no change in the weight of the flask. It again weighs 300.23 grams.
Conclusion: Scientists noticed that if chemical reactions were carried out in a closed container, there is no change in the mass.
The total mass of the reactants is equal to the total mass of the products.

23.

(a) Characteristics possessed by chordates.
   i. They have a notochord which is replaced by vertebral column in adults.
   ii. They have a dorsal nerve cord.
   iii. They are triploblastic.

(b) The fungi and the bacteria lack chlorophyll and are heterotrophic but are still considered as plants because of the presence of cell wall and the absence of centrioles. They absorb the food in solution form.

(c) The notochord is a long rod-like support structure which runs along the back of the animals, separating the nervous tissue from the gut. It provides a place for the muscles to attach for ease of movement.

24.

(a) An increase in the percentage of carbon dioxide in the atmosphere would cause the average temperature of the world to go up, leading to global warming.

(b)
   i. Biogeochemical cycle or nutrient cycle is the pathway by which a chemical element or molecule moves through both the biotic (biosphere) and the abiotic (lithosphere, atmosphere and the hydrosphere) components of the earth.
   Examples of biogeochemical cycles are water cycle, nitrogen cycle, carbon cycle, sulphur cycle, phosphorous cycle.
   (Any two)
   ii. Nitrogen cycle is considered as a perfect cycle in nature because overall amount of nitrogen in the atmosphere and water bodies is always constantly maintained. The use of chemical fertilisers also maintains its concentration in the biosphere.

SECTION B

25. (c) (C)
There will be a 180° change in the phase.

26. (a) Both the pipes are hollow.
A solid pipe absorbs the sound. So, a hollow pipe is used so that an intense sound wave comes out of it.

27. (b) B
Eye level should be on the same level with the water and horizontal.

28. (d) Step iv
Water drops left on the copper piece will show more weight on the spring balance.

29. (b) Iron cuboid
The more the density, the larger is the mass. The larger the mass, the larger is the force. Pressure is directly proportional to the force applied. So, iron cuboid is most effective because its density is the highest.

30. (c) C
The solid should be attached to the spring balance with the help of a thread. It should be fully immersed in water without touching the base or the side walls.

31. (c) Chitin
The exoskeleton of a cockroach is made up of chitin.

32. (c) Stipe
The correct labeling for part A shown in the diagram is stipe.

33. (c) Mass can neither be created nor destroyed.
According to the 'Law of conservation of mass', mass is neither created nor destroyed in a chemical reaction. The total mass of the reactants is equal to the total mass of the products.

34. (c) Terminally placed
The mouth of a bony fish is always terminally placed.

35.

(a) Option (D) Calcium oxide and potassium nitrate

The combination of calcium oxide and potassium nitrate is not used in the activity to describe the law of conservation of mass.

(b) **Observation -** Calcium chloride reacts with sodium sulphate to form a white precipitate of calcium sulphate and a solution of sodium chloride.

There will be no change in the weight of the flask before and after the reaction takes place.

Conclusion - Scientists noticed that if chemical reactions were carried out in a closed container, there is no change in the mass.

The total mass of the reactants is equal to the total mass of the products.

36. Given : The mass of the body = 62. 4 g

Volume of the body = 24.4 -16.4 = 8 mL = 8 cm^3

$$\text{Density of the material of the body} = \frac{\text{Mass}}{\text{Volume}} = \frac{62.4}{8} = 7.8\ g/cm^3$$

$$= \frac{7.8 \times 100 \times 100 \times 100}{1000} = 7800\ kg/m^3$$