

**Goa Board  
Class IX Science  
Term 2  
Sample Paper – 5 Solution**

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**SECTION A**

1. Potential energy is a scalar quantity.
2. 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.
3. Helicobacter pylori is responsible for peptic ulcers.
4.
  - (a) Two examples of longitudinal waves are:
    - i. Sound waves are longitudinal waves.
    - ii. When a freely suspended spring is pulled downwards and released, longitudinal waves are produced.
  - (b) The most essential property of a wave motion is its frequency. Frequency of a wave is its inherent characteristic and does not change by a change in the temperature, pressure or medium.
5.
  - (a) The animals of phylum Echinodermata have spiny skinned body.  
Example - Asterias (star fish), Holothuria (Sea cucumber)  
**(Any one)**
  - (b)
    - i. Sea horse - Pisces.
    - ii. King cobra - Reptilia.

6. There are two types of molecules - molecules of elements and molecules of compounds.

**Molecules of Elements**

- The molecule of an element contains two or more similar atoms combined together.
- They are classified as diatomic, triatomic, tetra-atomic and polyatomic molecules depending upon the number of atoms present.

**Molecules of Compounds**

- The molecule of a compound contains two or more different types of atoms chemically combined together.
- Atoms of different elements join together in definite proportions to form molecules of compounds.

7.

- (a) On the basis of agriculture, soil is categorised into the following two types:

i. **Residual soil:** Residual soil is further divided into:

- a) Black soil
- b) Red soil
- c) Laterite soil

ii. **Transported soil:** Transported soil is further divided into:

- a) Alluvial soil
- b) Desert soil
- c) Mountainous soil

- (b) If all the oxygen present in the environment is converted to ozone then it would be difficult to breathe and survive and all the living forms would be killed.

8.

- (a) Mass of water 'm' = 200 kg

Height 'h' = 6 m

Weight of water = mg

$$= 200 \times 10$$

$$= 2000 \text{ N}$$

Work done = mgh

$$= 2000 \times 6$$

$$= 12000 \text{ J}$$

- (b) Work done is zero because displacement is perpendicular to the direction of force at all points.

9.

- (a) The addition of undesirable substances like fertilizers, pesticides and mercury salts, contaminates water which can cause diseases like cholera.

The removal of desired substances like oxygen from the water adversely affects the aquatic organisms. A sudden change in the temperature of the water bodies would be dangerous and affect the breeding of certain organisms. The eggs and larvae are adversely affected by the change in temperature.

10.

- (a) Frequency of sound is defined as the number of complete oscillations made per unit time by the oscillating body producing sound. Alternately, frequency of sound is also defined as the number of sound waves completed per unit time.

Wavelength of sound is the distance between the centres of two consecutive compressions or centres of two consecutive rarefactions.

- (b) When we stand at some distance from a huge building or a cliff and speak loudly, we are able to hear our voice again after a definite interval of time due to reflection of sound wave from that building or cliff, etc. Such repetition of sound due to reflection is known as echo.

If a reflecting object is situated at a distance 'd', then the time of echo is

$$t = \frac{2d}{v}$$

Where 'v' is the speed of sound in air.

11.

- (a) The speed of sound is defined as the distance which a point on a wave such as compression or rarefaction travels per unit time.

As distance covered by the wave in one time period is called the wavelength of the wave, hence we have

$$\text{Speed of sound 'v'} = \frac{\text{Distance covered in one vibration}}{\text{Time taken to complete one vibration}} = \frac{\lambda}{T}$$

But, the number of vibrations completed per unit time is  $\frac{1}{T} = v = \text{frequency}$

$$\therefore v = \lambda \times \frac{1}{T} = \lambda v$$

So, Speed of sound (v) = wavelength ( $\lambda$ ) × Frequency (v)

- (b) Light waves are an example of transverse waves.

12.

- i. As kinetic energy of an object is directly proportional to its mass, so, if mass is doubled (i.e. it becomes 2 m), then the kinetic energy will also get doubled.
- ii. On the other hand, the kinetic energy of an object is directly proportional to the square of its velocity ( $v^2$ ).  
So, if the velocity is doubled (i.e. it becomes 2 v), then the kinetic energy will become four times. This is because  $(2v)^2 = 4v^2$ .  
Hence, it is clear that doubling the velocity has a greater effect on the kinetic energy of an object than doubling the mass.

13. Speed of sound = 340 m/s;  $g = 10 \text{ m/s}^2$ ;  $u = 0$ ;  $h = 125 \text{ m}$ ;  $t = ?$

$$h = ut + \frac{1}{2}at^2$$

$$125 = 0 + \frac{1}{2} \times 10 \times t^2$$

$$\therefore t^2 = 25$$

$$\therefore t = 5 \text{ s}$$

Let  $t'$  be the time taken by the sound to reach the top after the splash.

$v = 340 \text{ m/s}$ ;  $h = 125 \text{ m}$ ;  $t' = ?$

$$t' = \frac{h}{v} = \frac{125}{340} = 0.37 \text{ s}$$

So, the splash will be heard after  $t + t' = 5 + 0.37 = 5.37 \text{ s}$ .

14.

- (a) The postulate of Dalton's atomic theory which is the result of the law of conservation of mass is - 'Atoms are indivisible particles which can neither be created nor destroyed in a chemical reaction.'
- (b) The term 'Chemical formula' is used for the symbolic representation of a molecule of an element or a compound.  
Example: Chemical formula of sodium carbonate is  $\text{Na}_2\text{CO}_3$ .
- (c) An atom or a group of atoms can exist independently with charge(s). These are formed by loss or gain of electron(s). They are called radicals or more commonly as ions.

15. Molecular mass of  $\text{Cr}_2\text{S}_3 = 2 \times 52 + 3 \times 32 = 200 \text{ g}$

Now, 200 g of  $\text{Cr}_2\text{S}_3$  contains: 104 g of Cr

Hence, 85 g of  $\text{Cr}_2\text{S}_3$  will contain =  $\frac{104 \times 85}{200} = 44.2 \text{ g of Cr}$

Therefore, the number of moles of Cr =  $\frac{44.2}{52} = 0.85 \text{ moles}$

16.

Characteristics	Chondrichthyes	Osteichthyes
<b>Endoskeleton</b>	Commonly known as cartilaginous fish as it has cartilaginous endoskeleton	Commonly known as bony fish as it has bony endoskeleton
<b>Body size</b>	Large-sized fish	Comparatively smaller in size
<b>Mouth position</b>	Ventral	Terminal (anterior)
<b>Type of scale present on the skin</b>	Placoid scales	Scales absent, if present, cycloid scales
<b>Number of gills present</b>	5-7 pairs of gills, not covered by operculum	4 pairs of gills, covered by operculum
<b>Caudal fin</b>	Heterocercal	Homocercal
<b>Excretory waste</b>	Urea	Ammonia

17.

- Once someone gets a disease, his or her body functions get damaged and may never recover completely.
- The treatment of a disease takes time, so the person is likely to be bedridden for some time, even if he or she is given proper treatment.
- The person suffering from an infectious disease can serve as the medium for further spread of infection to other people.

18.

(a) Air borne diseases occur through the little droplets thrown out by an infected person who sneezes or coughs.

Someone standing closely can breathe these droplets, and the microbes get a chance to start a new infection.

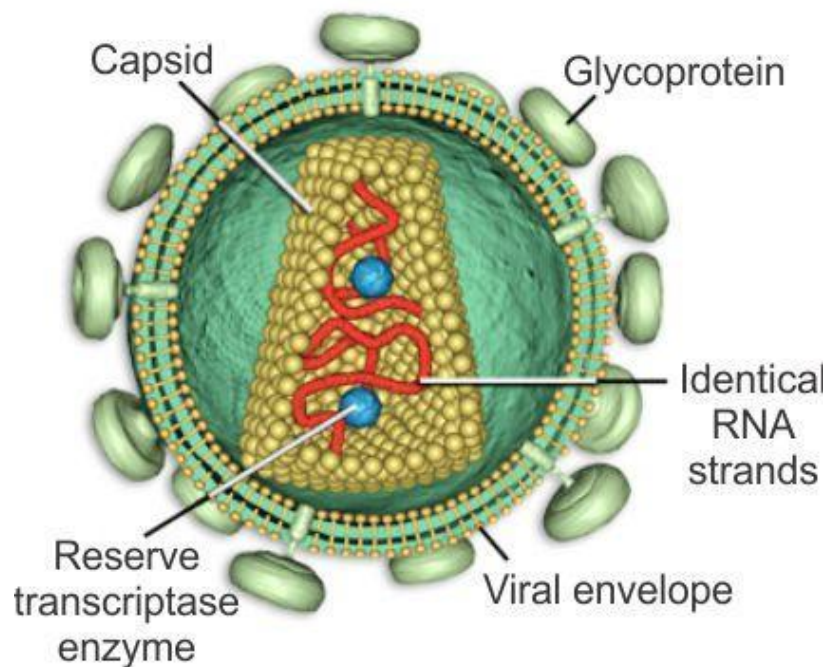
(b) Pathogens.

Example - bacteria, fungi, virus, protozoan

**(Any one)**

19.

(a)



**Structure of AIDS virus**

(b) Modes of transmission of AIDS:

- i. Through sexual contact
- ii. Through blood transfusion
- iii. From mother to child
- iv. Through infected needles or syringes

20.

(a) Mass of water 'm' = 200 kg

Height 'h' = 10 m

Time 't' = 4.9 s

While lifting water, engine works against gravity.

So, work done is

$$W = mgh$$

$$= 200 \times 9.8 \times 10$$

Hence, power is

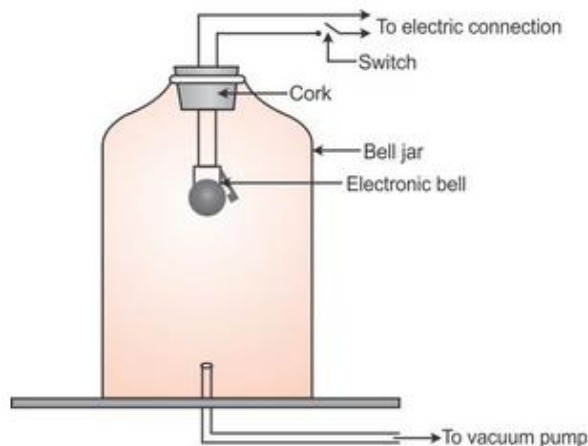
$$P = \frac{W}{t} = \frac{200 \times 9.8 \times 10}{4.9} = 4000 \text{ W}$$

$$\therefore P = \frac{4000}{746} = 5.36 \text{ hp}$$

(b) Elastic potential energy is stored in the spring of a watch.

(c) Tension acts perpendicular to the displacement of the simple pendulum. Hence, work done is zero.

21. Sound waves are produced by the vibrations of the particle of the medium, these are called mechanical waves. Since sound is a mechanical wave, it needs a material medium for its propagation and cannot travel in vacuum. This can be explained as follows:

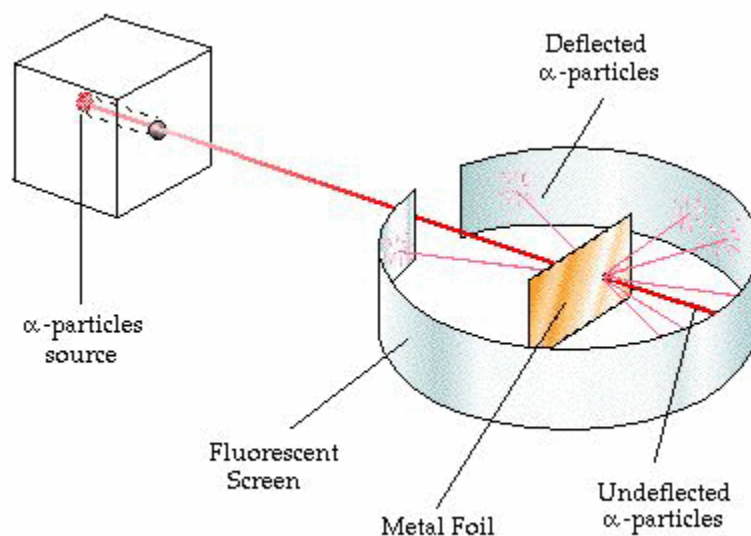


Take an electric bell and an airtight glass bell jar. The electric bell is suspended inside the airtight bell jar. The bell jar is connected to a vacuum pump, as shown in the figure above. If we press the switch, we will be able to hear the bell. Now, we start the vacuum pump. When the air in the jar is pumped out gradually, the sound becomes fainter, although, the same current is passing through the bell. After some time, when less air is left, we will hear a very feeble sound. If the air is removed completely, the sound of the bell is not heard at all. This shows that sound cannot travel in vacuum and needs a material medium to propagate.

22. In 1911, Earnest Rutherford, a scientist from New Zealand, overturned Thomson's atomic model by his gold foil experiment. His experiment demonstrated that the atom has a tiny massive nucleus. It thus rejected Thomson's model of the atom.

#### **Rutherford's Scattering Experiment**

- Rutherford selected a gold foil as he wanted a very thin layer.
- The gold foil used by Rutherford was 0.004 millimeters thick. That is, the foil was about 1000 atoms thick.
- In his experiment, fast moving Alpha particles ( $\alpha$ -particles) were made to fall on a thin gold foil.
- Alpha particles are helium ions with +2 charge. Their atomic mass is 4 u, hence, a high velocity beam of  $\alpha$ -particles has a lot of energy.
- These particles were studied by means of flashes of light which they produced on striking a zinc sulphide screen.
- The  $\alpha$ -particles are much heavier than the sub-atomic particles present in the gold atoms.
- Hence, he expected the  $\alpha$ -particles to pass through the gold foil with little deflections and strike the fluorescent screen.

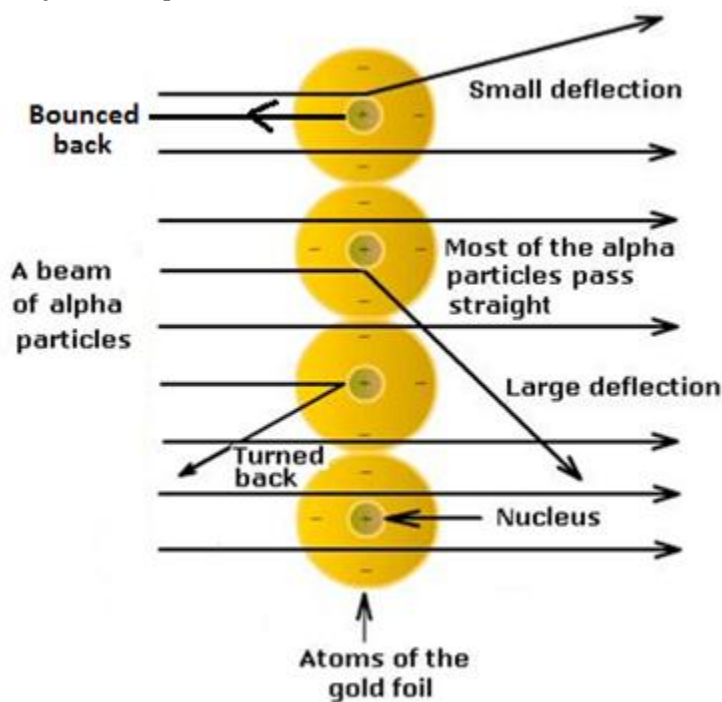


### Rutherford's $\alpha$ -Particle Scattering Experiment

But the observations he made were quite unexpected.

#### Observations made by Rutherford:

1. Rutherford observed that most of the  $\alpha$ -particles passed straight through the gold foil.
2. Some  $\alpha$ -particles were deflected by the foil through small angles while some were deflected through very large angles.
3. One out of every 12000 particles showed  $180^\circ$  reflection i.e. a full rebound.



### Deflection of $\alpha$ -Particles from the Gold foil

Rutherford said that, "This result was almost as incredible as if you fire a 15-inch shell at a piece of tissue paper and it comes back and hits you".

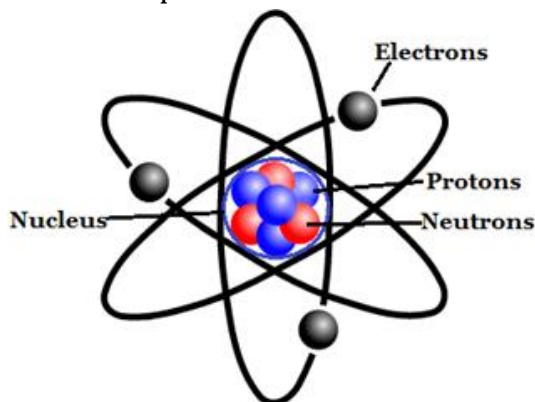


### Explanation of the results of Rutherford's Gold foil experiment

- Rutherford postulated that the atom must contain large empty spaces as most of the  $\alpha$ -particles passed through it without getting deflected.
- The  $\alpha$ -particles, being positively charged, could only be deflected by positive charges present inside the atom.
- As very few  $\alpha$ -particles were deflected, Rutherford concluded that the positively charged particles in an atom must be concentrated in a very small space.
- An even smaller fraction of  $\alpha$ -particles was deflected through an angle of  $180^\circ$ .
- Thus, Rutherford came to the conclusion that all the positive charge of the atom and most of the mass of the atom is concentrated in a very small volume within the atom.
- Rutherford named this small space inside the atom as the "nucleus of the atom" or the "atomic nucleus". When the thickness of the gold foil was doubled, the number of  $\alpha$ -particles reflecting back was also doubled.
- On the basis of these observations, Rutherford calculated that the atomic nucleus is  $10^5$  times smaller than the total area of the atom.
- The radius of the atom is  $10^{-8}$  centimeter while the radius of the nucleus is  $10^{-13}$  centimeter.
- Thus, we can say that the atom is relatively hollow with a heavy nucleus at its centre. The electrons arranged around the nucleus possess negligible mass.
- Based on his observations, he formulated his '**Theory of atom**'.

### Rutherford's Atomic Model

- Based on the results of the  $\alpha$ -particles scattering experiment, Rutherford put forth his atomic model.
- An atom contains a positively charged centre called as the nucleus of the atom. Almost all the mass of the atom is concentrated in the nucleus.
- Electrons of the atom revolve around the nucleus in fixed, circular orbits.
- The size of the nucleus is many times smaller than the size of the atom. The nucleus of an atom is 10,000 times smaller than the atom.
- If we consider that an atom is equal to the size of a football stadium, then the nucleus would be the size of a pea!



Rutherford's Atomic Model

**23.**

- (a) Since availability of fresh water is dwindling day by day and during every summer, most places in the country have to face an acute shortage of water. Hence, Municipal Corporations are trying for water harvesting to improve the availability of water.
- (b) The fossil fuels like coal and petroleum contain small amounts of nitrogen and sulphur. When these are burnt, nitrogen and sulphur produce their gaseous oxides. These gases dissolve in water (present in the atmosphere) to give acid rain.
- (c)
  - i. Nitrifying bacteria: Nitrosomonas bacteria
  - ii. Denitrifying bacteria: Pseudomonas

**24.**

- (a) Whales can swim in water like the fishes but are not fish as they respire with lungs and have four chambered heart and mammary glands, so, they are mammals.
- (b) When the body of an organism can be cut into two similar halves which are mirror images of each other, only by one plane then the organism is said to have bilateral symmetry.
- (c)
  - i. Just like amphibians, bryophytes require water for fertilization as their gametes require aqueous medium for movement.
  - ii. There are three layers of cells, from which differentiated tissues can be made. This allows inside and outside body lining 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.

**SECTION B**

**25.(b)** The pulse travelled faster in B.

Velocity = distance/ time

Since the time taken by pulse in case of slinky B is less, its velocity is higher.

**26.(b)** A polished metal sheet.

Sound waves can be reflected most efficiently by a smooth and hard surface.

**27.(b)** 2 mL; 84 mL.

Least Count =  $10/5 = 2$  mL

Volume =  $80 + (2 \times 2) = 84$  mL

**28.(b)** The density of the object is  $3.1 \text{ g/cm}^3$ .

Loss of weight = Weight of liquid displaced

$45 \times g = \text{volume of the water displaced} \times \text{density of water} \times g$

$45 \times g = \text{volume of the object} \times 1 \times g$

volume of the object =  $45 \text{ cm}^3$

Density of the object =  $\frac{\text{mass}}{\text{volume}} = \frac{140}{45} = 3.1 \text{ g/cm}^3$

**29.(c)** Mixing of salts.

Mixing of salts causes the density of sea water to rise.

**30.(c)** Upward thrust exerted by the liquid.

Due to the upward thrust exerted by the liquid, there is an apparent loss in the weight of the body.

**31.(d)** The plant body is differentiated into root, stem and leaves.

Ferns belong to the group pteridophyta, and show the presence of well differentiated root, stem and leaves.

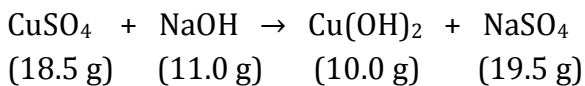
**32.(b)** White

The colour of the precipitate, barium sulphate, is white.

**33.(b)** Pteridophyta

Pteridophyta is a group of plants which shows the presence of vascular bundles, but lacks seeds and flowers, and reproduces by the means of spores.

34. In an experiment, 18.5 g of copper sulphate reacted with 11.0 g of sodium hydroxide to form 10.0 g of copper hydroxide and 19.5 g of sodium sulphate.



From the given data, we get,

Total mass of the reactants = (18.5 g + 11.0 g) = 29.5 g

Total mass of the products = (10.0 g + 19.5 g) = 29.5 g

Hence, law of conservation of mass is valid here.

It states that mass can neither be created nor destroyed in a chemical reaction.

Total mass of the reactant is equal to the total mass of the product.

35.

(a) No reflection of sound takes place.

(b) No reflection of sound will take place from the porous surface as it absorbs the sound.

36.(d)



The diagram given above is of a liver fluke, which belongs to the phylum platyhelminthes.