

CBSE
Class IX Science
Term 2
Sample Paper – 3 Solution

SECTION A

1. When an object moves in a circular path, work done is zero because when an object moves in a circular path, its centripetal force acts along the radius of the circle, and it is at right angles to the motion of the body.

2.
 - (a) 2 O stands for two atoms of oxygen.
 - (b) O₂ stands for one molecule of oxygen.

3.
 - Nitrogen 78%
 - Oxygen 21%

4.
 - Archimedes' principle is used in designing motorboats, ships and submarines.
 - The working of the lactometer and the hydrometer is based on Archimedes' principle.

5.
 - (a)
 - Presence of a notochord or a dorsal nerve chord.
 - They are triploblastic and coelomate.
 - (b)
 - i. Class Pisces.
 - ii. Class Reptilia.

6. **Discovery of the Neutron**
 - In 1932, James Chadwick observed that when beryllium was exposed to α - particles, different kinds of particles were emitted.
 - These particles had about the same mass as protons and carried no electrical charge.
 - Hence, Chadwick named these particles as **neutron**.

Properties of Neutrons

Neutron, denoted (n), is a fundamental particle with no charge.

- The mass of the neutron is slightly more than that of proton. i.e. 1.676×10^{-24} g compared to 1.672×10^{-24} g. The relative mass of a neutron is 1 u.
- The absolute mass of a neutron is 1.6×10^{-24} grams.
- Neutron is electrically neutral. It has no charge.
- Atoms of neutrons lead to the formation of isotopes.
- Neutrons are present in the nucleus of all the atoms except hydrogen.

7. The two types of natural resources are:

- Exhaustible resources - The resources which take millions of years to be formed and are depleted at a faster rate due to consumption by human beings are called exhaustible resources.

Examples - coal, petroleum. (**Any one**)

- Inexhaustible resources - The resources which are recycled easily and can be replenished in a very short duration of time are called inexhaustible resources. These are present in unlimited quantity in nature.

Examples - water, air. (**Any one**)

8.

(a) mass of stone, 'm' = 2 kg

Initial velocity of stone, 'u' = 0

Time, 't' = 5 s

Velocity of the stone after 5 s is calculated as follows:

$$\begin{aligned} v &= u + gt \\ &= 0 + 9.8 \times 5 \\ &= 49 \text{ m/s} \end{aligned}$$

Kinetic energy of stone, $E = \frac{1}{2} mv^2$

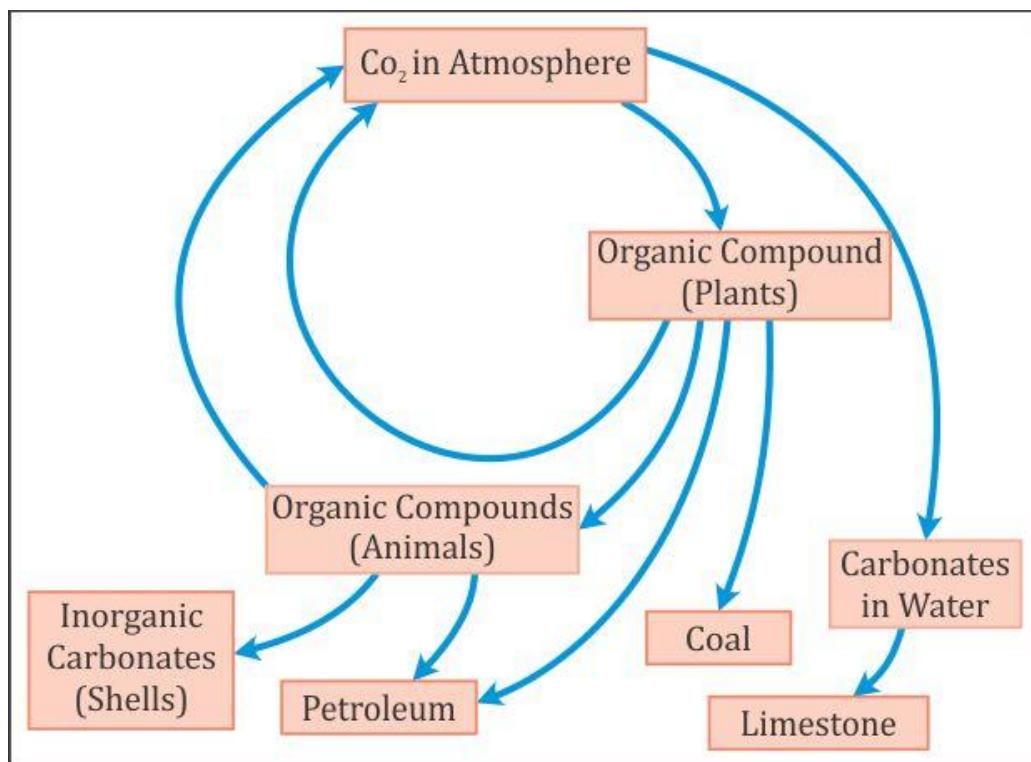
$$E = \frac{1}{2} \times 2 \times (49)^2 = 2401 \text{ J}$$

(b) If the force acting on the object is 'F' and the displacement of the object in the direction of the force is 's', then

Work done = Force × Displacement

$$W = F \times s$$

9.



Carbon cycle in Nature

10.

- (a) When a sound wave passes through the air, the layers of the air vibrate back and forth in the same direction in which the sound wave travels. Hence, they are longitudinal waves in the air.

(b) Given:

$$v = 120 \text{ kHz} = 12000 \text{ Hz}$$

Speed of sound, $v = 344 \text{ m/s}$

$$v = v\lambda$$

$$344 = 12000 \times \lambda$$

$$\therefore \lambda = 344/12000$$

$$\therefore \lambda = 0.00287 \text{ m} = 0.287 \text{ cm}$$

11.

Sound waves	Light waves
<ul style="list-style-type: none"> 1. They are longitudinal waves. 2. They cannot travel through vacuum. 3. Their speed in air is 330 m/s. 	<ul style="list-style-type: none"> 1. They are transverse waves. 2. They do not require a medium to propagate. 3. Their speed in air or vacuum is $3 \times 10^8 \text{ m/s}$.

12. The work done is given by the formula

$$W = Fs \cos\theta$$

Case (i) when $\theta = 0^\circ$

$$W = F s (\cos 0)$$

$$W = F s (1) = F s$$

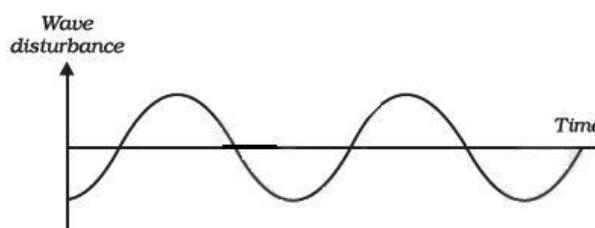
Case (ii) when $\theta = 90^\circ$

$$W = F s (\cos 90)$$

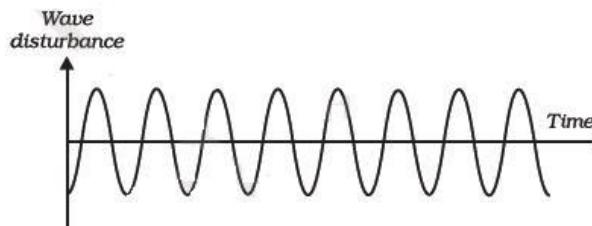
$$W = F s (0) = 0$$

Therefore, in the first case, when the angle between the direction of force and the displacement is zero, the work done will be maximum.

13.



Wave shape for a low pitched sound



Wave shape for a high pitched sound

Thus, a low pitched sound has a lower frequency and a high pitched sound has a higher frequency.

14. Writing the Chemical Formulae

Step 1: Write the symbol of a basic radical (element with positive valency) to the left hand side and that of the acid radical (element with negative valency) to the right hand side.

Step 2: Write the valency number/charge of each of the respective ions at the bottom of its symbol.

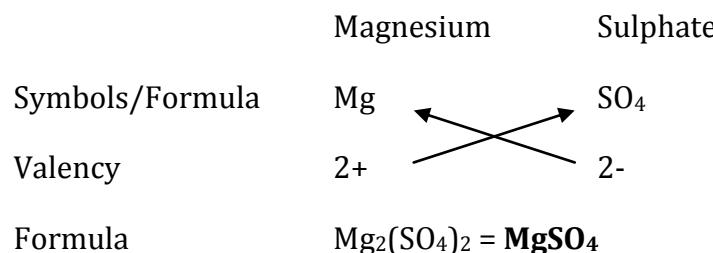
Step 3: Interchange the valency number. Ignore (+) and (-) sign.

Step 4: Write the interchanged number.

Step 5: Write the compound's formula.

Step 6: Cross the reduced valencies. If 1 appears, ignore it. And if a group of atoms receive a valency number more than 1, enclose it within brackets.

For Example, the formula of Magnesium sulphate is given as follows.



Therefore, the molecular formula of Magnesium sulphate is **MgSO₄**.

15.

(a) Gram molecular mass of chlorine = $2 \times 35.5 = 71 \text{ g}$

Therefore, gram molecular mass of 1 mole of chlorine = 71 g

(b) Gram molecular mass of chlorine will contain = 6.022×10^{23} molecules

71 g of chlorine will contain = 6.022×10^{23} molecules

$$1 \text{ g of chlorine will contain} = \frac{6.022 \times 10^{23}}{71} \text{ molecules}$$

$$= 8.48 \times 10^{21} \text{ molecules of chlorine}$$

16.

(a)

- Better social environment.
- Better public cleanliness.

(b) Antibiotics block the biochemical pathways of bacteria due to which they are not able to make their cell walls and they die. This helps in curing bacterial diseases.

17. Water borne diseases occur if the excreta of someone suffering from an infectious gut disease, such as cholera, gets mixed with the drinking water used by the people living nearby. The cholera causing microbes will enter into the body of the new host through the water they drink and cause them the disease. Such diseases are much likely to spread in the absence of safe supplies of drinking water.

18. Classification fills human need to impose order on nature and find hidden relationships. By classifying the organisms and species in groups, the following advantages can be achieved:

- Huge masses of data can be stored and retrieved more easily.
- Knowledge about a species can be saved and recovered in a logical manner.
- A good classification system also helps in determining evolutionary relationships between species and even makes it easier to see when and where new species are arising.
- Classification provides a template for the development of other biological sciences.

19. Phylum Arthropoda:

- Their body is divided into head, thorax and abdomen.
- Appendages are joint.
- They are triploblastic, bilaterally symmetrical organisms having a reduced body cavity.
- Members of Phylum Arthropoda have a complete digestive system and an open circulatory system.
- In Arthropods, respiration takes place via the body surface, gills, trachea or book lungs.
- They have paired excretory glands and some have excretory organs called malpighian tubules.

20.

(a)

- i. When the person is standing at a place holding a suitcase, there is no change in the position of the man or the suitcase.

Therefore, displacement (s) = 0

$$W = F \times s = F \times 0 = 0$$

- ii. When the person is moving holding the suitcase in his hand, he applies force in upward direction and the displacement of suitcase is in the forward direction, i.e. perpendicular to the direction of the force applied.

Therefore, $\theta = 90^\circ$

Since, $W = F \times s \cos \theta$

$$W = F \times s \cos 90^\circ = 0$$

Hence, work done on the suitcase is zero.

$$\begin{aligned}
 \text{(b) Energy consumed} &= 250 \text{ units} = 250 \text{ kWh} \\
 1 \text{ kWh} &= 3.6 \times 10^6 \text{ J} \\
 \therefore \text{Energy consumed} &= 250 \times 3.6 \times 10^6 \text{ J} = 9 \times 10^8 \text{ J}
 \end{aligned}$$

21.

(a) The tendency of a liquid or a gas to push an object immersed in it upward with some force (called upthrust or buoyant force) is called buoyancy.

The buoyant force depends upon the following factors:

- Volume of the body immersed in the liquid.
- Density of the liquid (fluid).
- Acceleration due to gravity.

(b) Archimedes' Principle:

When an object is wholly or partially immersed in a liquid, it experiences a buoyant force or an upthrust which is equal to the weight of the liquid displaced by the object.

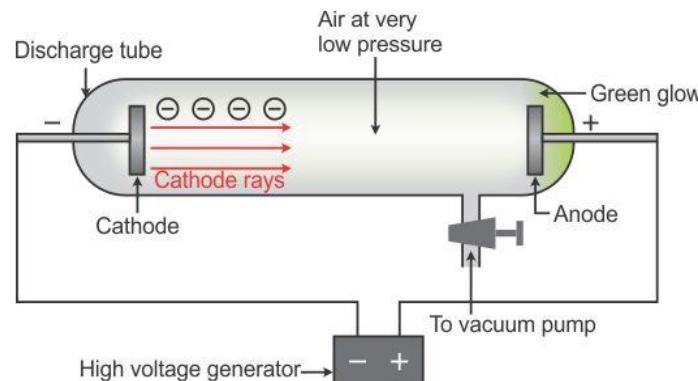
The buoyant force acting on an object = Weight of the liquid displaced by that object

Applications of Archimedes' principle:

- Hydrometers are based on Archimedes' Principle.
- It is used to calculate the relative density of substances.
- Purity of milk is measured using lactometers which are based on the Archimedes' Principle.

22. Discovery of the Electron

- A British scientist J.J. Thomson was the first one to discover electron in the year 1897.
- J.J. Thomson performed an experiment to know the characteristics and the constituents of the cathode rays.
- Thomson passed electricity at a high voltage through the discharge tube containing a gas at a very low pressure; a green fluorescence was seen coming out of the other end of the discharge tube.
- This fluorescence was the result of the rays emitted from the cathode (negative plate) towards the anode (positive plate) in the discharge tube. Hence, these rays are called cathode rays.
- The mass and charge of the cathode ray particles does not depend on the gas taken in the discharge tube.



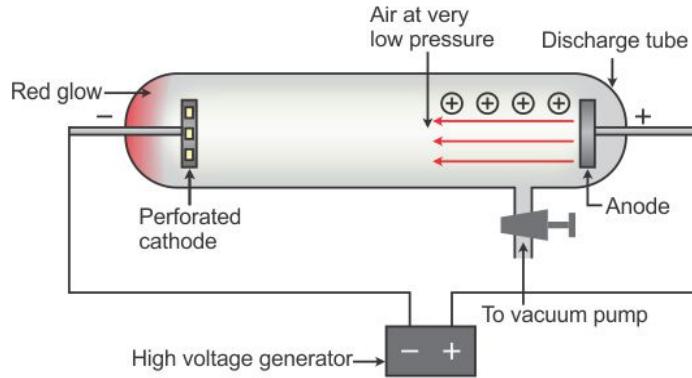
Production of cathode rays

Cathode rays Discharge Tube

- From his experiment, Thomson arrived at the conclusion that, cathode rays are nothing but a stream of negatively charged particles.
- These negatively charged particles are called **electrons**.

Discovery of the Proton

- A German scientist, E. Goldstein in 1886, modified the discharge tube and passed an electric current through it.
- He found that positively charged rays were emitted from the anode in the discharge tube. These rays were called '**canal rays**'.



Production of anode rays

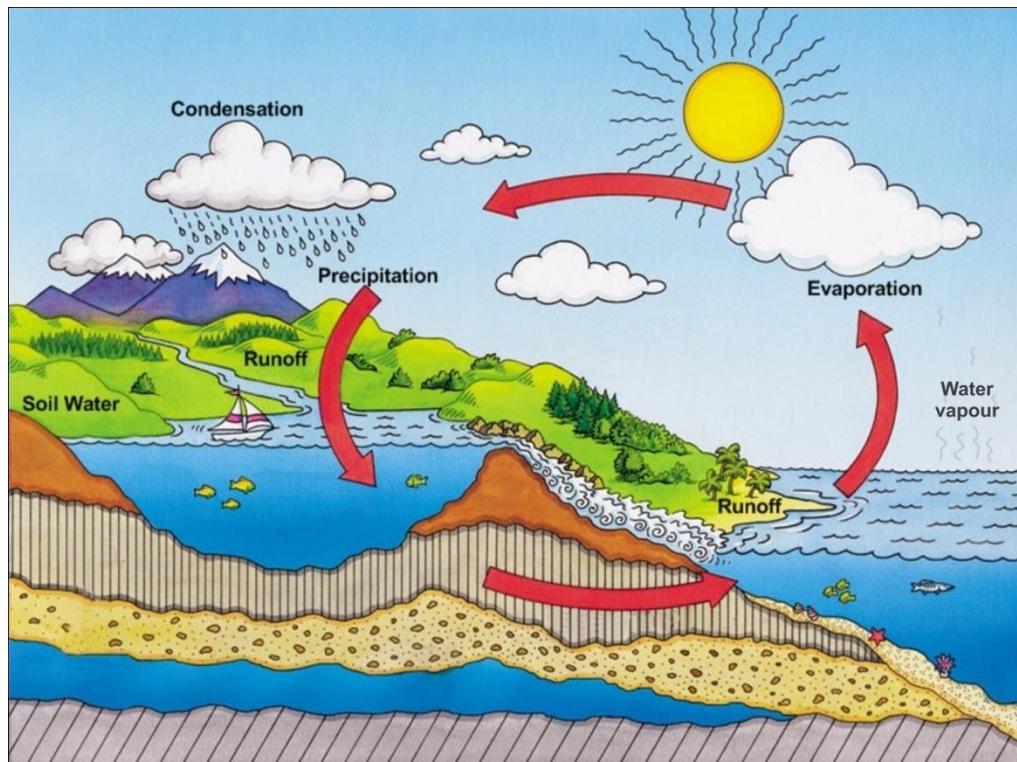
Anode rays Discharge Tube

- When an electric field was applied, these rays deflected towards the negatively charged plate. Thus, Goldstein concluded that an atom contains positively charged particles along with electrons.
- These positively charged particles were named as '**protons**' by a British scientist, Ernest Rutherford.
- Canal rays were also called **anode rays** since they were emitted from the anode (electrode connected to the positive terminal of a high voltage source) in the gas discharge experiments using a perforated cathode.

23.

- (a) Water cycle is the cyclic movement of water, from the water bodies to the atmosphere, and its precipitation and flowing back to the water bodies is called water cycle.

(b)



(c)

- i. Nitrogen fixation is the process of conversion of atmospheric nitrogen into nitrates.
- ii. Nitrogen fixation cannot take place in the presence of oxygen.

24.

(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.

SECTION B
25. (b)

The speed of sound in hydrogen > the speed of sound in helium > the speed of sound in air > the speed of sound in carbon-dioxide

26.(a)

$$\text{Least count} = \frac{25 - 0}{10} = 2.5 \text{ g wt}$$

27.(d)

Actual reading = Observed reading - zero error

100 g = Observed reading - 2 g

Observed reading = 100 g + 2 g = 102 g

28.(b)

$$V = 12.5 \text{ cm}^3$$

$$P = 2.4 \text{ g cm}^{-3}$$

$$M = \rho \times V$$

$$M = 2.4 \times 12.5$$

$$M = 30 \text{ g}$$

So, a spring balance of range 100 g should be preferred.

29.(a)

There are 5 divisions between 0 ml and 5 ml.

$$\text{So, least count of the measuring cylinder} = \frac{5 - 0}{5} = 1 \text{ ml}$$

30.(a)

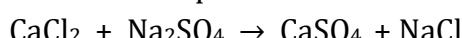
Thrust is the force exerted perpendicularly. Thus, it is the weight of the iron cuboid.

31.(b)

Spirogyra belongs to Thallophytes.

32.(b)

Calcium chloride, CaCl_2 reacts with sodium sulphate Na_2SO_4 to form a white precipitate of calcium sulphate CaSO_4 and a solution of sodium chloride NaCl .


33.(d)

Cockroach belongs to the phylum Arthropoda.

34.Principle: 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

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.

35.(d) The plant in the given diagram belongs to the class angiosperm as it shows the presence of flowers as reproductive organs.

36.(c) Be less louder

If we cover the reflecting surface with a curtain, then the reflected sound will partly be absorbed and partly reflected. The amount of absorption depends on the material of the curtain.