

CBSE
Class X Science
Sample Paper – 1 Solution

Section A

1. Asexual reproduction: Single parent is involved.
Sexual reproduction: Two parents are involved.
2. Biomagnification

Section B

3. The respiratory organs of fish are gills. Gills are capable of absorbing dissolved oxygen from water. However, they cannot use the atmospheric oxygen for respiration. Hence, fish die when taken out of water.

OR

Cramps occur when muscle cells respire anaerobically. The partial breakdown of glucose produces lactic acid. The accumulation of lactic acid causes muscle cramps.

4. (a) Power consumed is

$$P = VI$$

$$\therefore P = 220 \times 3.4 = 748 \text{ W}$$

 (b) Resistance of the heater is

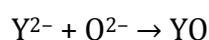
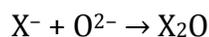
$$V = IR$$

$$\therefore R = \frac{V}{I} = \frac{220}{3.4} = 64.7 \Omega$$

5. Horizontal rows in the periodic table are called periods. Elements in the same period have the same number of orbitals, and electrons are added to the same valence shell.

Vertical columns in the periodic table are called groups. An extra shell is added as we go down the group. However, the elements have the same number of electrons in their respective valence shells, i.e. their valency is the same, and hence, they show similar chemical properties.

- (a) To attain the octet, X needs to lose one electron, so its valency is one, whereas Y needs to lose two electrons, so its valency is 2.



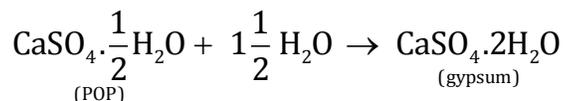
- (b) Valency of X is 1, so the molecular formula of chloride is XCl. The molecular formula of the chloride of Y is YCl₂.

Section C

6.

(a) Plaster of Paris has the chemical formula $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ which is produced by heating gypsum with the chemical formula $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ at 373 K.

The reaction is



Use of plaster of Paris: In surgical bandages for supporting fractured bones in the right position.

(b) The pH of a solution is the negative of the logarithm (exponent) to the base 10 of the hydrogen ion concentration (expressed as moles per litre).

$$\text{pH} = -\log_{10}[\text{H}^+]$$

OR

(a) The cold drink turns blue litmus red because of its acidic nature. It will have no action on red litmus.

(b) $A < C < B$

B will have maximum acid strength because pH is inversely proportional to the concentration of hydrogen ions in a solution.

7.

(a) Glottis gets covered by a small cartilaginous flap of skin called epiglottis which prevents the entry of food particles into wind pipe while swallowing.

(b) Alveoli are covered with blood capillaries so that the exchange of gases can take place between the membranes of the alveoli and surrounding capillaries.

(c) The function of the cartilaginous rings of the trachea is to stabilise the trachea and keep it rigid while allowing the trachea to expand and lengthen when the person breathes.

8.

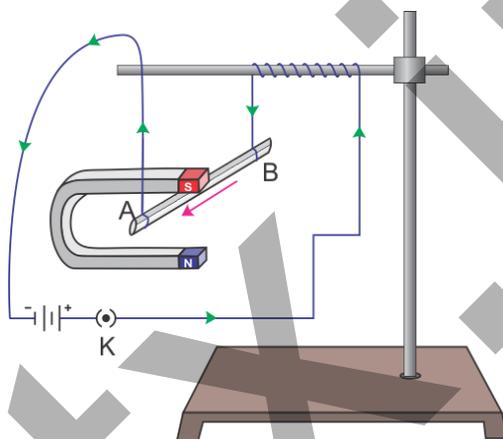
(a) When ethanol reacts with chromic anhydride (CrO_3), only partial oxidation occurs and ethanal is formed. On the other hand, when ethanol is heated with alkaline potassium permanganate (KMnO_4), it produces ethanoic acid due to complete oxidation.

(b) When propanone reacts with hydrogen cyanide, a molecule of H-CN is added across the carbon-oxygen double bond of propanone. Hence, addition reaction occurs.

(c) To prevent the misuse of alcohol supplied for industrial purposes, it is made unfit for drinking. This can be done by mixing it with poisonous substances such as copper sulphate, methanol and pyridine. The alcohol thus obtained is called denatured alcohol.

9. A magnetic field can be produced without a magnet by passing current through the conductor.

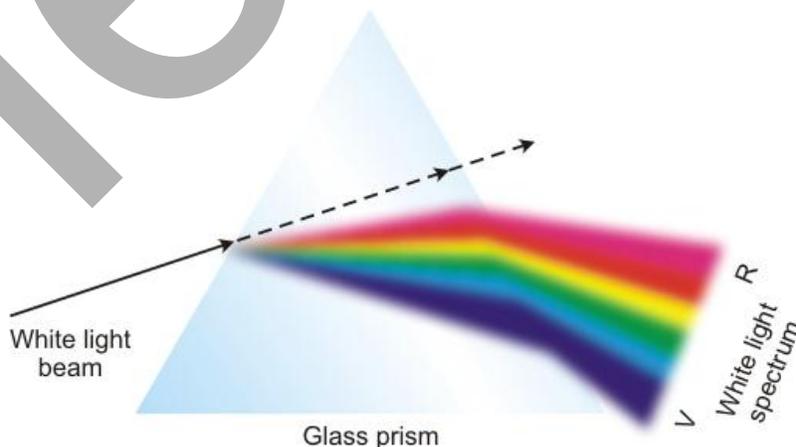
Consider a small aluminium rod suspended horizontally from a stand using two connecting wires. Place a strong horseshoe magnet in a way that the rod lies between the two poles with the magnetic field directed upwards. For this, put the North Pole of the magnet vertically below and the South Pole vertically above the aluminium rod. Connect the aluminium rod in series with a battery, a key and a rheostat. Pass a current through the aluminium rod from one end to the other (B to A). The rod is displaced towards the left. When the direction of current flowing through the rod is reversed, the displacement of the rod is towards the right. This experiment shows that a magnetic field exerts a force on a current-carrying conductor.



10. Splitting of white light into its constituent colours is called dispersion of white light.

When passed through a glass prism, white light disperses into seven colours—violet, indigo, blue, green, yellow, orange and red.

Violet light bends the most, while red light bends the least. This can be seen in the diagram below.



11. Object distance, $u = -60$ cm

Image distance, $v = 120$ cm

From the lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\therefore \frac{1}{f} = \frac{1}{120} - \frac{1}{-60} = \frac{1}{120} + \frac{1}{60}$$

$$\therefore \frac{1}{f} = \frac{3}{120} = \frac{1}{40}$$

$$\therefore f = 40 \text{ cm}$$

Height of the object, $h = 5$ cm

From the magnification formula,

$$m = \frac{v}{u} = \frac{h'}{h}$$

$$\therefore h' = \frac{v}{u} h = \frac{120}{-60} \times 5 = -10 \text{ cm}$$

OR

Focal length of a convex mirror, $f = 200$ cm

Distance of a scooter from the mirror, $u = -400$ cm

From the mirror formula,

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

$$\therefore \frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{200} - \frac{1}{-400} = \frac{1}{200} + \frac{1}{400}$$

$$\therefore \frac{1}{v} = \frac{3}{400}$$

$$\therefore v = 133.33 \text{ cm}$$

Hence, the image is located 133.33 cm from the mirror. As the image distance is positive, it is a virtual image.

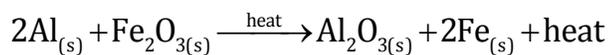
Magnification produced by the mirror is

$$m = -\frac{v}{u}$$

$$\therefore m = \frac{-133.33}{-400} = +0.33$$

12.

(a) 'A' is aluminium, 'B' is iron (III) oxide



A B D C

(b) The reaction is highly exothermic. It is a displacement reaction and redox reaction.

13. Aquatic organisms obtain oxygen dissolved in water. As compared to air, the availability of oxygen in water is low. Hence, aquatic organisms have to breathe faster as compared to terrestrial organisms.

OR

The plant will not remain healthy for a long time because

- It would not get oxygen for respiration.
- It would not get carbon dioxide to carry out photosynthesis.
- The upward movement of water and minerals would be hampered due to lack of transpiration.

14.

(a) In F_1 , the progeny would be Gg , so all would be green stemmed.

(b) If F_1 plants self-pollinate,

Parents $Gg \times Gg$
Gametes $G \ g \quad G \ g$

	G	g
G	GG (Green)	Gg (Green)
g	Gg (Green)	gg (Purple)

Ratio of $GG:Gg:gg = 1:2:1$

15. The approach of society is baseless. The sex of the child is determined by the type of chromosomes present in the sperm (X and Y) which fuses with the ovum at the time of fertilisation.

Associated value: An improved mindset will help stop gender inequality and female foeticide.

Section D

16.

(a)

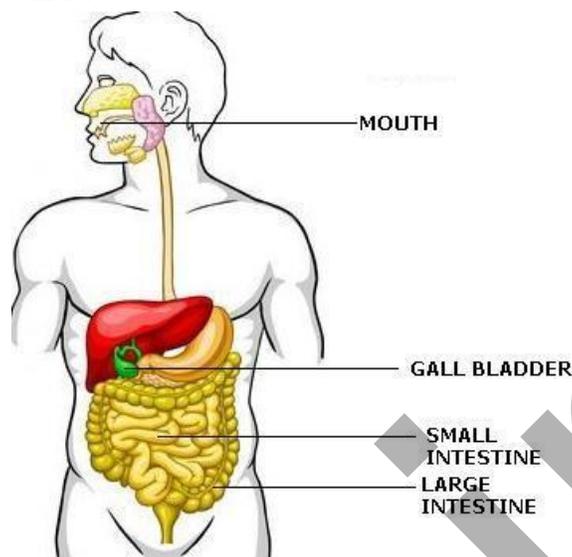
- Part in which starch digestion starts: Mouth
- Part in which bile is stored: Gall bladder
- Part in which nutrients are absorbed: Small intestine

(b) Role of hydrochloric acid in the stomach: It kills bacteria in the stomach and provides an acidic medium for the action of pepsin.

(c)

- Gastric sphincter: It controls the release of food from the stomach to the small intestine.

- (ii) Anal sphincter: It controls the release of undigested waste from the rectum through the anus.



OR

- (a) Gaseous exchange in alveoli
- (b) Air rich in oxygen is present in the bronchiole.
- (c) The pulmonary artery contains deoxygenated blood.
- (d) The pulmonary vein contains oxygenated blood.
- (e) Stomata

17. Power of a lens gives the degree of convergence or divergence of light rays achieved by the lens. It is the reciprocal of its focal length. It is represented by the letter P. The power P of a lens of focal length f is

$$P = \frac{1}{f \text{ (in metres)}}$$

Its SI unit is called diopetre, represented as D. One diopetre is the power of a lens with a focal length of 1 metre.

Focal length of the lens used by the first student is $f = +50$ cm. Hence, the lens is a convex lens. Focal length of the lens used by the second student is $f = -50$ cm. Hence, the lens is a concave lens.

$$\text{Power of lens 1 is } P_1 = \frac{1}{50 \times 10^{-2}} = 2 \text{ D}$$

$$\text{Power of lens 2 is } P_2 = \frac{1}{-50 \times 10^{-2}} = -2 \text{ D}$$

A concave lens always gives a virtual, erect and diminished image. Hence, the lens used by the second student is the one which will give such an image.

OR

(a) Define:

- i. The centre of curvature of a spherical mirror is the centre of the hollow sphere of glass of which the mirror is a part.
- ii. The centre of the spherical surface (reflecting) of the mirror is called its pole.

(b) Mirror formula: $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

Magnification, $m = -\frac{v}{u}$

where f is the focal length of the mirror v is the image distance u is the object distance

(c) Given:

 $v = -45$ cm (real and inverted image) $f = -20$ cm (concave mirror)

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

$$\frac{1}{u} = \frac{1}{f} - \frac{1}{v}$$

$$\frac{1}{u} = \frac{1}{-20} - \frac{1}{-45} = \frac{-9+4}{180} = \frac{-5}{180}$$

$$u = -36$$
 cm

The object should be placed at a distance of 36 cm in front of the concave mirror.

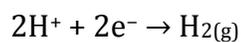
18.

(a) Metals have free electrons which help them in the conduction of electricity, whereas non-metals have no free electrons which make them a poor conductor of electricity.

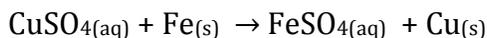
Moreover, when electricity is passed through a metallic wire, these free electrons move in a particular direction to conduct the flow of charges which helps in the conduction of electricity.

However, there are exceptions. Graphite being a non-metal is a good conductor of electricity and is also used as an electrode.

(b) A non-metal cannot supply electrons to convert H^+ to H_2 , whereas metals can provide electrons.



(c) When an iron nail is placed in a copper sulphate solution, the blue colour of $CuSO_4$ fades away slowly and a reddish brown copper metal is formed.



However, if a strip of copper metal is placed in iron (II) sulphate, no reaction occurs because copper is less reactive than iron and therefore cannot displace iron from iron (II) sulphate.

- (d) Sodium is a highly reducing metal ($\text{Na} \rightarrow \text{Na}^+ + \text{e}^-$, $E^\circ = +2.71$); thus, it will give away its electrons to atoms of elements less reducing than itself (which is most substances).

The practical upshot of this is that it will react with moisture in the air:



and with oxygen:



Sodium is kept in liquids which are not so easily reduced (long-chain hydrocarbons like kerosene, where the carbon is already in a very low formal oxidation state) which also expels moisture.

- (e) The two metals sodium and magnesium are more reactive than carbon. They are above carbon in the reactivity series and thus have a high affinity to oxygen than carbon and thus cannot be reduced by it.

OR

- (a)
- (i) Ionic compounds have very strong inter-ionic attractive forces, whereas covalent compounds have comparatively weaker attractive forces between the constituent elements.
 - (ii) Ionic compounds are soluble in water and not in organic solvents. Covalent compounds are insoluble in water and soluble in organic solvents. Some covalent compounds are soluble in water which can form H-bonding with water molecules.
 - (iii) Ionic compounds conduct electricity as they dissociate into ions, while covalent compounds do not conduct electricity as they do not dissociate into ions. Graphite is an exception and can conduct electricity despite being covalent in nature.

(b)

Roasting	Calcination
1. Ore is heated in the presence of excess of oxygen or air.	1. Ore is heated in the absence of or limited supply of oxygen or air.
2. This method is employed in case of sulphide ores.	2. This method is employed in case of carbonate ores.
3. Sulphur dioxide is produced along with metal oxide.	3. Carbon dioxide is produced along with metal oxide.
4. Example: Balanced chemical equations for the roasting of ZnS and Cu ₂ S: $2\text{ZnS} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{SO}_2$ $2\text{Cu}_2\text{S} + 3\text{O}_2 \rightarrow 2\text{Cu}_2\text{O} + 2\text{SO}_2$	4. Example: Balanced chemical equation for the calcination of ZnCO ₃ : $\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$

The roasting method is used in case of sulphide ores. It is advantageous to roast a sulphide ore to its oxide before reduction as metal oxides can be reduced to metal by carbon and hydrogen much more easily than sulphides. Oxides of a substance are easy to purify than other forms. Hence, for purification, all the ores are first converted to their oxides. Thus, sulphide ores are converted to their oxides by roasting.

19.

(a) Resistance of a conductor depends on

- (i) its length,
- (ii) its area of cross-section and
- (iii) on the nature of its material.

(b) Power rating of the heater, $P = 4 \text{ kW} = 4000 \text{ W}$ Potential difference of the power supply, $V = 220 \text{ V}$

(i) Power is

$$P = VI$$

$$\therefore I = \frac{P}{V} = \frac{4000}{220} = 18.18 \text{ A}$$

(ii) Resistance and power are related as

$$P = \frac{V^2}{R}$$

$$\therefore R = \frac{V^2}{P} = \frac{220^2}{4000} = 12.1 \Omega$$

(iii) Energy consumed by the heater is

$$E = Pt$$

$$\therefore E = 4 \text{ kW} \times 2\text{h}$$

$$\therefore E = 8 \text{ kWh}$$

20.

(a)

- (i) Underground water does not evaporate.
- (ii) Underground water percolates, which enriches the water table and reaches groundwater resources.
- (iii) Water stored underground is protected from contamination by human and animal wastes and does not promote breeding of pests.

(b) Since forests are useful to animals as well as humans, it is the responsibility of every individual to conserve forests and not just the legislation. Some examples where locals have taken the initiative are as follows:

- (i) Chipko Movement: It prevented the workers from felling trees. The Chipko Movement quickly spread across communities and media and forced the government to rethink their priorities in the use of forest produce. This type of participation by people led to efficient forest management.
- (ii) Another example of people's participation in the management and conservation of forests was seen in the Sal forests of West Bengal. A.K. Banerjee, a forest officer, got the villagers involved in protecting 1.272 hectares of badly degraded forests. Due to this active participation of locals, the Sal forests underwent a remarkable recovery.

21.

- (a) A is propanol.
- (b) B is propene.
- (c) Reaction which occurs when A is converted to B: Dehydration reaction
- (d) C is propane.
- (e) Reaction which occurs when B is converted to C: Addition reaction

Section E

22. Asexual reproduction called binary fission is observed in *Amoeba*. The steps observed are

- (a) In the beginning, pseudopodia are withdrawn and the body becomes rounded.
- (b) Nucleus divides amitotically, followed by the division of the cytoplasm.
- (c) A furrow or constriction develops at the point of fission in the main body.
- (d) The furrow becomes narrow and two daughter cells are formed.

23.

- i. Pea seeds are taken in a Petri dish.
- ii. The seeds are soaked in water overnight.
- iii. The excess water is drained, and the seeds are covered with a wet cotton cloth.
- iv. The soaked seeds are cut and the different parts are observed.

Absorption of water increases with time up to its maximum limit. So, the order of percentage absorption will be $P_A < P_B > P_C$.

24. Carbon dioxide gas gets liberated.

When a pinch of sodium hydrogen carbonate is added to acetic acid in a test tube, a brisk effervescence is produced because of the liberation of carbon dioxide.

When this gas is passed through lime water, it turns lime water milky. This shows that the gas liberated is carbon dioxide.

The chemical reaction can be represented as



25. When barium chloride solution is added to sodium sulphate solution, white precipitate of barium sulphate is observed in the test tube instantly along with sodium chloride solution.



The type of reaction is double displacement reaction—a reaction in which two compounds react with an exchange of ions to form two new compounds.

OR

Ca^{2+} and Mg^{2+} ions of tap water form insoluble precipitate with soap, but in the presence of Na_2CO_3 , these ions are precipitated. Hence, soap can form lather to a greater extent.

26. When resistors are connected in series, the equivalent resistance increases. When they are connected in parallel, the equivalent resistance decreases. Hence, the current shown by an ammeter in a series connection is less than that of a parallel connection. So, $I_1 < I_2$. The voltmeter in both connections however shows the same reading.

27. The angles of incidence and refraction are related by Snell's law.

$$\frac{\sin i}{\sin r} = \mu$$

For glass, $\mu = 1.5$

$$\therefore \frac{\sin i}{\sin r} = 1.5$$

This ratio is maintained for the reading of student C who measures the refracting angle as 25° .

l_1 and l_2

OR

$l_1 = 15$ cm and $l_2 = 15$ cm. The nature of image formed by both concave mirror and convex lens is inverted. In each case, the distances l_1 and l_2 give the focal length of the mirror and lens, respectively.