CBSE
Class X Science
Sample Paper – 1 (Reference Solutions)
2024-25

SECTION - A

1. Correct option – b: ii and iii
Chlorine is given off at anode and hydrogen is given off at cathode.

2. Correct option – b: Oxidation
Rancidity means having an unpleasant smell or taste usually from chemical change or decomposition.

3. Correct option – a: Carbonyl group
Carbonyl group (C=O) is present in both aldehydes and ketones.

4. Correct option – c: Electrolytic reduction
Aluminium is extracted by the electrolytic reduction of molten aluminium oxide.

5. Correct option – d: Ag_2S
Silver Diya kept in the open for a few days turned black due to formation of silver sulphide.

6. Correct option – b: Combination reaction
A combination reaction is a reaction in which two or more elements or compounds combine to form a single compound.
$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$

7. Correct option – b: Decomposition
Electrical decomposition of water takes place in electrolysis to form hydrogen and oxygen.

8. Correct option – a: A is Kidney - Filters the blood and concentrates the filtrate to make urine.
A is kidney, B is ureter, C is urinary bladder, D is urethra.
The kidneys filter the blood and concentrate the filtrate to make urine. They also help regulate blood pressure.

9. Correct option – b: A: Amylase – Starch, B: Pepsin – Protein, C: Lipase – Fats
Salivary amylase secreted in the mouth digests starch, pepsin secreted in the stomach digests proteins and lipase secreted in the small intestine digests fats.

10. Correct option – d : 100%, 75%
In a monohybrid cross, in F_1 generation all plants bears violet flowers only. In F_2 generation, 75% of the plants bear violet flowers while 25% bear white flowers.

11. Correct option – c : Ethylene
Ethylene is a gaseous plant hormone that plays an important role in inducing the ripening process for many fruits.

12. Correct option – a : A only
A is anther, B is style and C is ovary. Anther is the male reproductive part of a flower which assists in the production of pollen grains.

13. Correct option – d) $\frac{1}{a}+\frac{1}{b}=\frac{1}{c}$
If the 'a' is object distance, 'b' is image distance and 'c' is focal length of concave mirror. Then the mirror formula is written as
$\frac{1}{a}+\frac{1}{b}=\frac{1}{c}$

14. Correct option – a) Correction of myopia
The given ray diagram depicts the correction of myopia. Concave lens is used to correct myopic eye.

15. Correct option – d) 10:1
In an ecosystem, Sun is the ultimate source of energy. Solar energy is utilized by the plants to produce food by the process of photosynthesis. The consumers obtain energy from the producers. The energy is transferred from one trophic level to another. According to the 10% law of energy transfer in a food chain, 90% of captured energy is lost as heat and only 10% is available for use for the next trophic level. Thus, for every 10 units of energy absorbed by producers, only 1 unit is absorbed by the primary consumers.

16. Correct option – c) (ii) and (iii)
In group (ii) plankton and fish belong to the aquatic food chain, whereas man and grasshopper are found in the terrestrial ecosystem. Hence, group (ii) does not constitute an appropriate food chain.
In group (iii) wolf, grass, snake, tiger, there is no herbivore animal to consume grass. Hence, this group also does not constitute a proper food chain.

17. A is true but R is false.
Calcium hydroxide is present in whitewash. It reacts slowly with the carbon dioxide present in air to produce a thin layer of shiny calcium carbonate.

18. Both A and R are true, but R is not the correct explanation of A.
Sexual reproduction provides genetic diversity because the gametes, sperm and the egg produced contain different combinations of genes than the parent organisms. Sexual reproduction increases genetic diversities and plays a role in the origin of new species.

19. Both A and R are true, and R is the correct explanation of A.
Pesticides such as DDT are not metabolized within the bodies of living organisms and get concentrated at each trophic level leading to bioaccumulation. At every trophic level, the concentration of DDT increases and is maximum at the highest trophic level. Since fish-eating birds occupy the topmost trophic level, they are likely to have maximum amount of DDT in their bodies.

20. Correct option – a) Both the assertion and reason are correct, and the reason is the correct explanation for the assertion.
A stronger magnetic field will induce a larger EMF in the armature coils because the rate of change of magnetic flux cutting the coils will be greater. This is due to the increased magnetic flux density. A larger EMF will, in turn, lead to a larger induced current.

SECTION - B

21.

a) When zinc granules react with dilute sulphuric acid, bubbles of hydrogen are produced.
$Zn(s) + H_2SO_4(dil) \rightarrow ZnSO_4(aq) + H_2\uparrow$

b) The chemical reaction between sodium carbonate and dilute hydrochloric acid is characterised by the evolution of carbon dioxide.
$Na_2CO_3(s) + 2HCl(dil) \rightarrow 2NaCl(aq) + CO_2\uparrow + H_2O(l)$

22. The reason for declining females in India is sex-selective abortions of the female foetus through surgeries (female foeticides).
<u>This can be avoided by taking the following measures to achieve 1:1 ratio:</u>

- Ban pre-natal sex determination.
- Educate everyone in society about the equality of gender and the health of women.

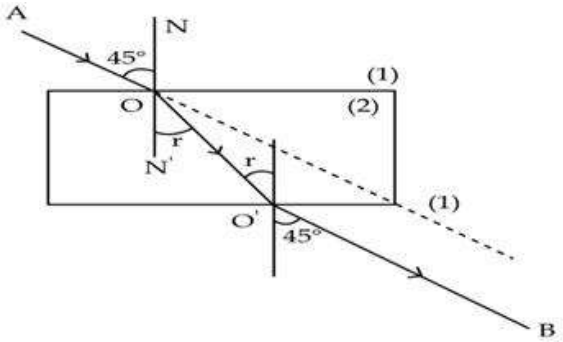
23. Gastric glands in the stomach release hydrochloric acid, enzyme pepsin and mucus. Mucus protects the inner lining of stomach from the action of hydrochloric acid and enzyme pepsin. If mucus is not released, it will lead to erosion of the inner lining of stomach, leading to acidity and ulcers.

OR

<u>The plant will not remain healthy for a long time because:</u>

- No photosynthesis will occur so no glucose will be made. Also, no respiration will take place as no oxygen will be taken in.
- No transpiration will occur, so there would be no upward movement of water or minerals from the soil as there will be no transpiration pull.
- Temperature regulation of leaf surface will be affected.

24.



Using Snell's law, the refractive index of medium (2) with respect to medium (1) is given as

$$n_{21} = \frac{\sin i}{\sin r} = \frac{\sin 45^0}{\sin 30^0} = \frac{1/\sqrt{2}}{1/2} = \sqrt{2} = 1.414$$

If the second medium is water in place of medium (2), the angle of refraction will decrease because water is rarer than medium (2).

25. The phenomenon is called dispersion.

Speed of violet light inside the prism is slowest and that of red is highest. Hence, deviation of violet light is maximum and that of red is minimum.

OR

A concave lens always forms a virtual, erect image on the same side of the object.

v = -20 cm, f = -25 cm, u =?

1/v -1/u = 1/f 1/u = 1/ (-20) - 1/ (-25) 1/u = -1/100

Thus, u = -100cm

Thus, object distance is 100 cm.

26. Harmful pesticides like DDT enter the plant body on being absorbed from the soil. When the plants are eaten by the animals, the pesticides get accumulated in the animal's body as they are neither metabolized nor excreted out of their bodies. The concentration of the harmful chemicals increases at successive trophic levels of the food chain leading to

biomagnification. In this way, wheat and rice, vegetables, and fruits, and even meat which occupy different trophic levels are found to contain varying amounts of pesticide residues.

SECTION - C

27.

(a) Acids ionise in water to produce positively charged hydrogen ions (H^+).
Bases ionise in water to produce negatively charged hydroxide ions (OH^-).

(b) Hydrochloric acid will be a stronger acid than acetic acid because it completely ionises in water to produce a large amount of hydrogen ions. On the other hand, acetic acid partially ionises in water to produce only a small amount of hydrogen ions.

(c) The concentration of hydrogen ions decreases if an acid is diluted by adding more and more water to it.
The concept used to determine the hydrogen ions concentration in solution is 'pH'.

28.

(a) Uses of bleaching powder:
(i) For bleaching cotton and linen in the textile industry and for bleaching wood pulp in the paper industry
(ii) Used as an oxidising agent in many chemical industries
(iii) Used in the manufacture of chloroform

(b) Uses of baking soda:
(i) Used as an antacid to alleviate stomach acidity. It is weakly basic and hence can neutralise excess acid in the stomach.
(ii) Used in making baking powder which is used in making cakes and breads.
(iii) On heating or mixing baking powder with water, carbon dioxide is evolved which causes breads and cakes to rise, making them soft and spongy.
(iv) Used in soda-acid fire extinguishers.

OR

(a) The balanced chemical equation is:

$$MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$$

(b) (i) Reducing agent: HCl, as it loses electrons and produces chlorine gas (Cl_2).
(ii) Oxidising agent: MnO_2, as it gains electrons and is reduced to manganese chloride ($MnCl_2$).

29.

(a) At the synapse, the electrical signals are converted into chemicals that easily cross the gap and pass on to the next neuron where they again get converted into electrical signals.

(b) Electrical impulse travels through a neuron. But to be transmitted to another neuron, it needs to pass in the form of neurotransmitters. Neurotransmitters are specialized chemicals which can enter a neuron only through specialized channels. Such channels are present in dendrites but not in axons. Neurotransmitters are only produced at the axonal end and can enter a dendrite. Due to this, the flow of signals in a synapse is from the axonal end of one neuron to the dendritic end of another neuron but not the reverse.

30. With respect to seed colour, yellow seed colour (YY) is dominant while green seed colour (yy) is recessive.

Heterozygous yellow seeded plants = Yy

Parents – Yy × Yy

Gametes – Y, y and Y, y

	Y	**y**
Y	YY	Yy
y	Yy	yy

F_1 generation – YY, Yy, Yy and yy

In the F_1 generation, three types of plants are obtained – YY (yellow seeds), Yy (yellow seeds) and yy (green seeds)

Genotypic ratio – 1 : 2 : 1

Phenotypic ratio – 3 (yellow seeds) : 1 (green seeds)

If 100 plants are obtained in the F_1 generation, then according to the phenotypic ratio, 75 plants would bear yellow seeds and 25 plants would bear green seeds.

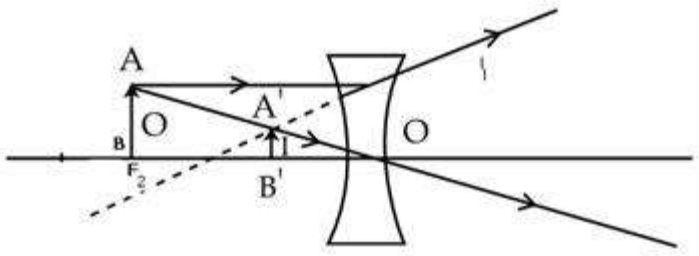
Yellow seeds = 75

Green seeds = 25

31.

(a) We must use concave lens since the image is virtual, erect, diminished.

(b)



(c) The nature of image formed by the convex mirror is virtual, erect and diminished irrespective of the position of the object.

32. For the given circuit,

(i) Resultant resistance is

$R_{eq} = 7 + 5||10$

$\therefore R_{eq} = 7 + \frac{10 \times 5}{10 + 5} = 7 + \frac{50}{15}$

$\therefore R_{eq} = \frac{105 + 50}{15} = \frac{155}{15} = 10.33\ \Omega$

Total current is

$I = \frac{V}{R_{eq}}$

$\therefore I = \frac{6}{10.33} = 0.58\ A$

(ii) Heat energy evolved in this circuit if it is switched on for 30 min.

By Joule's law of heating,

$H = I^2Rt$

$H = 0.58^2 \times 10.33 \text{ x } (30 \times 60)$

$H = 0.3364 \times 10.33 \times 1800$

$H = 6255\ J/s$

33. Power, P = 1.5 kW = 1500 W

V = 220 V

Current drawn, P = V × I

$I = P/V$

$I = \frac{1500}{220}$

$I = 6.81\ A$

Current drawn, I ≈ 7 A

The current drawn by the electrical appliance is 7 A which is beyond the fuse rating capacity in the circuit. Hence, when a very high current of 7 A flows through the 5 A fuse, it will melt and break the circuit. Hence, the fuse wire of 5 A rating would not be suitable for this electrical appliance.

SECTION - D

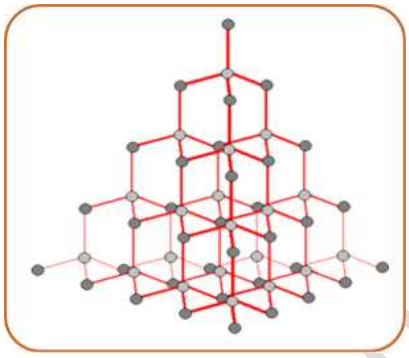
34.

a) Tetravalency of carbon:

Carbon has a valency of four. So, it is capable of bonding with four other atoms of carbon or atoms of some other monovalent element. Compounds of carbon are formed with oxygen, nitrogen, hydrogen, sulphur, chlorine and many other elements, giving rise to compounds with specific properties which depend on the elements other than the carbon present in the molecule.

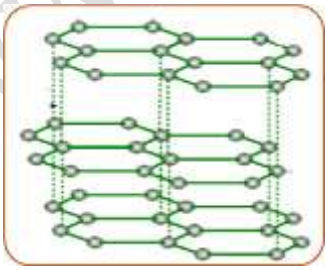
b) Allotropes of carbon:

(i) Diamond:



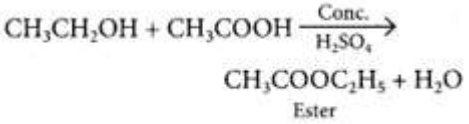
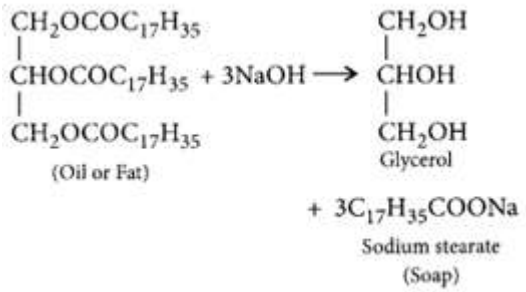
- Network Solid
- Crystalline form
- Each carbon is bonded to 4 other carbons
- Very strong
- High melting point

(ii) Graphite:



- Each carbon is bonded to 3 other carbons; the 4^{th} bond is weak
- Layers of Carbon
- Weak
- Layers "rub off"
- Example: pencil lead

OR

Sr. No.	Esterification	Saponification
1.	The process of addition of alcohol to carboxylic acid in the presence of acid catalyst to form fruity smelling ester is called Esterification reaction.	The reaction in which oils or fats are treated with sodium hydroxide solution to form sodium salts of fatty acids and glycerol is called Saponification reaction.
2.	Chemical reaction: 	Chemical Reaction: 

Use of esters: They are used for making perfumes or used as artificial flavouring substances.

Use of saponification process: This process is used in making soaps.

35.

(a) Number of chromosomes in female gamete is 24.
Number of chromosomes in zygote is 48.

(b) i) The mode of reproduction used by the organism is regeneration.
ii) Regeneration is carried out by specialised cells called regenerative cells which can proliferate and make a large number of cells by cell division.
iii) *Planaria* reproduces by the method of regeneration.

OR

(a) 1 - Frontal lobe
2 - Temporal lobe
3 - Occipital lobe
4 – Cerebellum
5 - Medulla oblongata

(b) Function of Part 4 (Cerebellum) - Coordination of muscular activity and balance of the body.
Function of Part 5 (Medulla oblongata) - Controls the activity of the internal organs such as the heartbeat, and respiration.

(c) The cranium protects the brain from external injuries. Inner to the cranium lie the three layers of the meninges viz. duramater, arachnoid and piamater. The space between the meninges and the cavities of the brain contains the cerebrospinal fluid which protects the brain from mechanical injury.

36.

(a) When the object lies between the optical centre and the focus of the lens, a convex lens forms an erect and virtual image.

(b) When a parallel beam of light falls on a smooth and highly polished surface, the reflected beam is also parallel and directed in a fixed direction. Such reflection of light is called regular reflection.

(c) Concave mirrors are used as shaving mirrors to see a large image of the face. This is because when the face is held within the focus of a concave mirror, an enlarged image of the face is seen in the concave mirror. This helps in getting a smooth shave.

OR

(a) Having two eyes has the following advantages over having just one eye:

(i) Reduces the degree of parallax from our field of view

(ii) Allows us to see farther into the distance with higher resolution

(iii) Provides us with proper eyesight even if one of our eyes is damaged

(iv) Gives organisms a wider field of view and the perception of depth

(b) The iris controls the size of the pupil. Thus, when our eye encounters bright light, the iris contracts the pupil and protects the retina from damage.

(c) If a person is wearing spectacles of power +1 D, the lens has a positive focal length which indicates that he is wearing a convex lens. Hence, it can be concluded that he is suffering from hypermetropia or long-sightedness.

For a person wearing spectacles of power –1 D, the lens has a negative focal length which indicates that he is wearing a concave lens. Hence, it can be concluded that he is suffering from myopia or short-sightedness.

SECTION - E

37.

a) 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. This is because iron is more reactive than copper.

The reaction is given as,

$CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$

b) Soham will observe that the blue colour of the copper sulphate solution fade and the zinc strip get a shiny brown coating of copper since zinc is placed above copper in reactivity series.

OR

(b) Correct option is (C) Iron nails of garden gate.

Aluminium and copper are less reactive metals than iron. Hence, Iron items would corrode before Aluminium bucket and copper plate.

Cast iron is an alloy of iron with high carbon content which prevents it from corrosion. Hence cast iron too does not get corrode easily.

Iron nails of garden gate are frequently exposed to air and moisture.

Therefore, Iron nails of garden gate will get corroded first.

38. The cross is depicted as under:

WW = Purple, ww = White

Parents :	WW Purple	×			ww White	
		↓				
F1		Ww (Purple)				
	Ww (Purple)	×			Ww (Purple)	
		↓				
F2	WW (Purple)	:	Ww (Purple)	:	ww (White)	
	1	:	2	:	1	

a) Ratio of purple flowered plants in F_2 generation is:

Purple : White = 3 : 1

b) The genotype of F_2 individuals is:

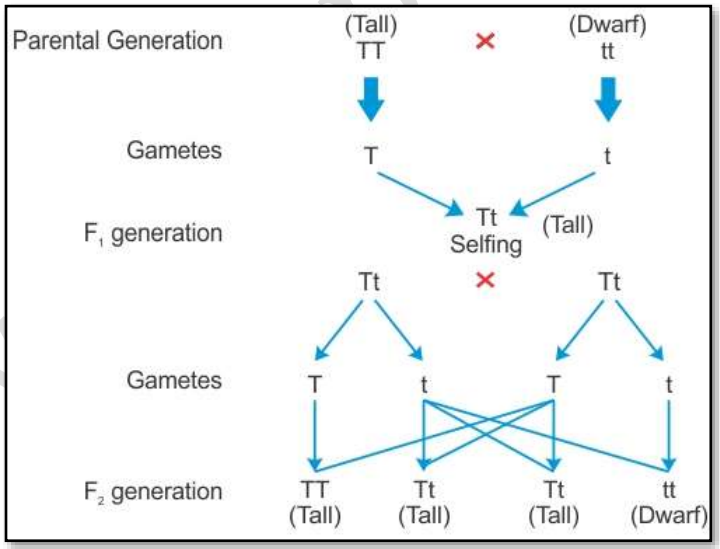
WW (Purple) : Ww (Purple) : ww (White) = 1 : 2 : 1

c) Homozygous is a genetic condition where an individual inherits the same alleles for a particular gene from both parents.

In the above cross, the pure homozygous individuals have the genotype WW (Purple) and ww (White). So, if there are 400 individuals obtained in the F_2 generation, then there would be 100 individuals each with genotype WW and ww. Thus, there would be a total of 200 flowers which are pure homozygous.

OR

c) The cross is depicted as under:



With respect to height of the plant, the trait for tallness is dominant over trait for dwarfness. Thus, the phenotypic ratio of tall and dwarf plants in F_2 generation would be 3 : 1. Hence, out of 100 individuals, 25 individuals would have been dwarf and 75 would have been tall.

39.

a) A closely wound cylindrical coil of insulated metallic wire.

b) The magnetic field strength in case of uniform magnetic field is same at all points.

c) Inside the solenoid the magnetic field remains uniform.

OR

c)

A) Electromagnet is strongest one

B) The field lines around a current – carrying solenoid is similar to that produced by a bar magnet.