Nagaland Board
Class X Science
Sample Paper 1 – Solution

1.

(a) (i) Renal artery carries blood to the kidney.

(b) (ii) Central canal of the spinal cord contains cerebrospinal fluid. Pleural fluid is the fluid that surrounds the lungs; interstitial fluid surrounds the cells of multicellular animals and aqueous humour is the fluid present between the lens and the cornea of eye.

(c) (ii)In males, to prevent the transfer of sperm into female vagina, the vas deferens is blocked surgically. It prevents the sperm transfer and ultimately pregnancy does not occur.

(d) (ii) When germ cells take one chromosome from each pair, the number of chromosomes in the progeny will be restored and thus, doubling of chromosomes will be prevented.

(e) (iii) During the chlor - alkali process, hydrogen gas is liberated at the cathode and chlorine gas is liberated at the anode.

(f) (ii) The process in which ores are changed into oxides by heating strongly in limited air is known as calcination.

(g) (iii) During conversion of ethanol into ethene in the presence of conc. sulphuric acid, a molecule of water is lost. In this reaction, conc. sulphuric acid acts as a dehydrating agent.

(h) (iii)Silver undergoes aerial oxidation and corrodes forming a black coating.

(i) (iii)If the refractive indices of two media are equal, then light ray is not refracted and the interface between two media is not visible.

(j) (i)The hydroelectric power plant uses potential energy of stored water to convert it to the kinetic energy of falling water and thereby generate electricity.

2. Potential difference between two points in an electric field is the amount of work done to move a unit charge from one point to other.

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.

4.

(i) Power consumed is

$P = VI$

$\therefore P = 220 \times 3.4 = 748\ W$

(ii) Resistance of the heater is

$V = IR$

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

5. The reaction which takes place when baking soda is heated for cooking is:

$2NaHCO_3$ + H^+ → $CO_2 + H_2O$ + Sodium salt of acid

(Baking soda) (From any acid)

Carbon dioxide produced in this reaction cause bread or cake to rise and make them soft and spongy.

6. Paper bags are biodegradable and get decomposed by the action of microorganisms in due course of time while polythene bags are non-biodegradable.

7. We use fuses to protect the electrical circuit from overloading. A fuse of proper rating is connected in the live wire. If the current exceeds the safe limit, the fuse melts and breaks, the circuit then becomes open and prevents the flow of current into the household circuit thus preventing the electrical appliances in the circuit from being damaged.

8. Fleming's right hand rule is used for finding the direction of induced current in a coil/wire rotated in a magnetic field.
Fleming's right hand rule states that, if the first three fingers of the right hand are stretched mutually perpendicular to each other such that the forefinger points in the direction of magnetic field, the thumb indicating the direction of its motion, then the middle finger would show the direction of induced current.

9. Displacement Reaction: One element takes the place of another element in a compound.

$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

Double displacement Reaction: Two compounds react by an exchange of ions to form two new compounds.

$AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

10. On the basis of presence of feathers in both birds and reptiles, both are said to be closely related. Initially feathers performed the function of protection from cold as in case of reptiles but later on in birds they adapted to help them in flight.

11. The process by which an ovum is released from the ovary is called ovulation. The ovaries are composed of ovarian follicles and each follicle has an ovum covered by follicle cells. From the age of puberty ovary starts releasing one ovum once a month.

12.

(a) 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.

(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.

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.

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 × Gg

Gametes G g G g

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

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

15. 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: Improved mindset which will help stop gender inequality and female foeticide.

16.

(a) Plaster of Paris has the chemical formula $CaSO_4.1/2H_2O$ which is produced by heating gypsum with the chemical formula $CaSO_4.2H_2O$ at 373 K.
The reaction is

$$CaSO_4.1/2H_2O(POP)+1\frac{1}{2}H_2O\rightarrow CaSO_4.2H_2O(gypsum)$$

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

17.

(a) When ethanol reacts with chromic anhydride, only partial oxidation occurs and ethanol is formed. On the other hand, when ethanol is heated with alkaline $KMnO_4$, 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.

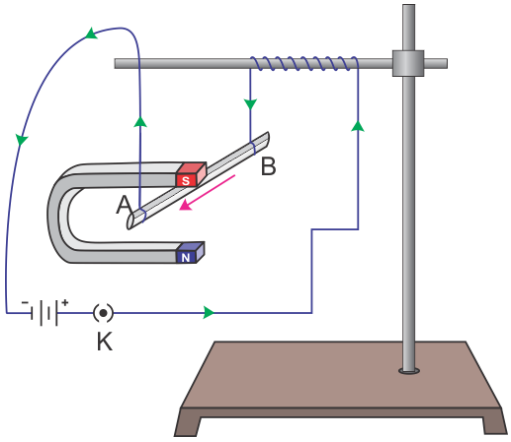
18.

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

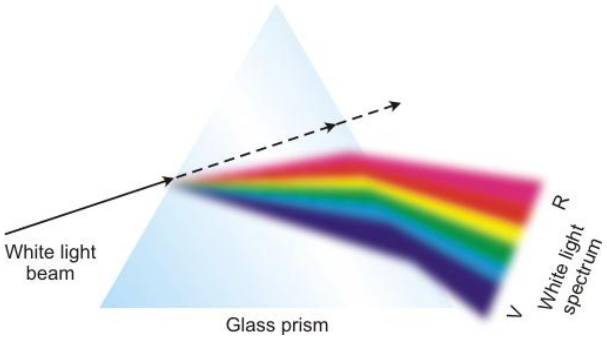
$$\underset{A}{2Al(s)}+\underset{B}{Fe_2O_3(s)}\xrightarrow{heat}\underset{D}{Al_2O_3(s)}+\underset{C}{2Fe(l)}+heat$$

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

19. 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.



20. 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.



21. Object distance, u = –60 cm
Image distance, v = 120 cm
From 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 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 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

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

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

22.

(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

23.

(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 kW = 4000 W
Potential difference of the power supply, V = 220 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

$$E=Pt$$

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

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

24. 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 dioptre, represented as D. One dioptre 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.

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

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.

25.

(a)

(i) Part in which starch digestion starts: Mouth

(ii) Part in which bile is stored: Gall bladder

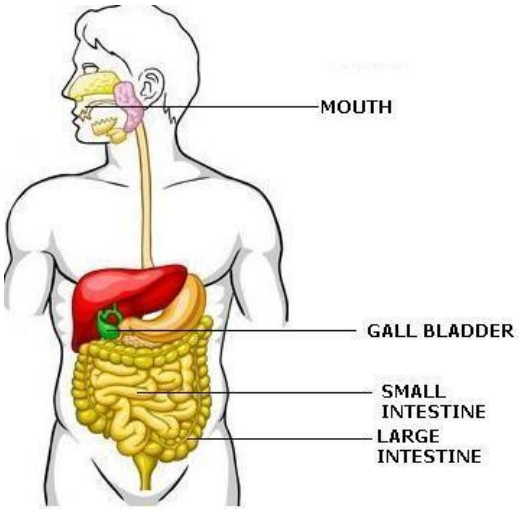
(iii) Part in which nutrients are absorbed: Small intestine

(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)

(i) 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) The steps that take place in chloroplast during photosynthesis are:

(i) Absorption of light energy by chlorophyll.

(ii) Conversion of light energy into chemical energy, and splitting of water into hydrogen and oxygen using light energy.

(iii) Reduction of carbon dioxide by hydrogen to form carbohydrate like glucose by utilizing the chemical energy.

(b) The opening and closing of stomata is controlled by guard cells. When water flows into the guard cells, they swell, become curved and cause the stomata to open. When the guard cells loses water, they shrink, become flacid and straight thus closing the stomata.

(c) Carbon dioxide is made available to plants when stomata are open.

26.

(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 the legislation. Some examples where locals have taken the initiative are as follows –

(i) Chipko Movement - It prevented the workers from felling the trees. 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.