CBSE
Class X Science
Sample Paper 7 – Solution

Section A

1. In the dry state, HCl gas does not give any H^+ ions. It does not act like an acid. That is why the colour of the litmus paper does not change.

2. Because aluminium has greater affinity for oxygen than for carbon, carbon cannot reduce alumina (Al_2O_3) to aluminium.

3.

(a) The man is suffering from myopia.

(b) i) High converging power of the eye lens.

ii) Elongation of the eye ball.

(c) For the correction of myopia, a concave lens is used. Thus, the nature of the lens is concave.

(d) f = –80 cm (focal length of the concave lens)

f = –80/100 = 0.8 m

Thus, P = 1/f (in metre) = 1/0.8 = –1.25 dioptre

Hence, the power of the lens is –1.25 D.

4.

(a) (1) Glucagon: alpha cells

(2) Insulin: beta cells

(b) Glucagon: In the case of low blood sugar levels, glucagon stimulates the breakdown of glycogen into glucose in the liver and raises the blood sugar level.

Insulin: It controls the high blood sugar level in the body. It promotes glucose utilisation by the body and the conversion of glucose to glycogen in the liver to maintain the normal sugar level.

(c) The pancreas contains exocrine glands, which are duct glands, secreting pancreatic juice in the small intestine which helps in digestion. On the other hand, it also contains the islets of Langerhans which are endocrine glands secreting insulin, glucagon and somatostatin. Therefore, the pancreas is referred to as an exo-endocrine gland.

(d) Insulin is a hormone and is proteinaceous in nature. If taken orally, it may be broken down due to the digestion process in the stomach by digestive juices, so it is not taken orally.

5. iv) Thick and short

The wire used in making an electric fuse must not be thick and short.

OR

iii) 1.4 A

I = q/t

q = 420 C

t = 5 minutes = 5 × 60 = 300 s

I = 420/300 = 1.4 A

6. iii) same at all points

The magnetic field inside a long straight solenoid carrying current is the same at all points.

7. iv) geothermal energy

Geothermal energy is not ultimately derived from the Sun.

8. iv) The population of tiger decreases, and the population of grass increases.

The food chain comprises grass as producer, deer as primary consumer and tiger as secondary consumer. Grass acts as the food for deer which in turn acts as the food for tiger. So, when the population of deer is missing, tigers will have no food to feed on. Hence, their population will decrease. However, in the absence of deer, the grass which is fed upon by deer will increase.

OR

i) UNEP

UNEP took up the issue of ozone depletion in 1976 and adopted a single but effective approach.

9. iv) It is difficult to decide the blood group of the child.

The blood group of the woman is O, which means the woman has gene combination I^OI^O.

The blood group of the child can be determined depending on whether the blood group A of the man has gene combination I^AI^A or I^AI^O.

If the genotype of the man's blood is I^AI^A and that of the woman's blood is I^OI^O, then the child will have blood group A, as gene I^A is dominant over gene I^O.

If the genotype of man's blood is I^AI^o and that of woman's blood is I^OI^O, then there is an equal chance that the genotype of the child's blood group can be either I^AI^O or I^OI^O.

10. (A) The correct chemical equation for the reduction of copper is

$$2Cu_2O + Cu_2S \xrightarrow{Heat} 6Cu + SO_2$$ (1)

11. (D) In a group, the metallic character increases from top to bottom. So, Sr has high metallic character.

12. (B) Propanone is a three-carbon compound with the ketone functional group. (1)

OR

The IUPAC name of the product is methyl ethanoate.

13. i) Both assertion and reason are true, and the reason is the correct explanation of the assertion.

14. (iv) A is false, but R is true.

A convex lens has a real focus as all the light rays actually pass through the focus of the convex lens.

Section B

15.

$$\underset{\text{(water insoluble)}}{\underset{\text{(A)}}{CaCO_3}} + \text{dil. } H_2SO_4 \rightarrow \underset{\text{(B)}}{CaSO_4} + H_2O + CO_2$$

$$\underset{\text{(lime water)}}{Ca(OH)_2} + CO_2 \rightarrow \underset{\substack{\text{(A)}\\ \text{Milky}}}{CaCO_3} + H_2O$$

A - $CaCO_3$ (lime water)

B - $CO_{2(g)}$

16.

(a) Diffusion is insufficient to meet the oxygen requirement of multicellular organisms because the volume of the human body is so large that oxygen cannot diffuse into all the cells of the body quickly.

(b) People living in the mountains have more red corpuscles in their blood than people living in the plains because the low air pressure requires more red blood corpuscles to supply the body cells with oxygen.

(c) Amphibians are cold-blooded animals whose body temperature depends on the temperature in the environment. They do not need energy to maintain their body temperature, and hence, their requirement of energy is less.

17.

(a) Electronic configuration of the element is 2, 8, 7 and its valency is 1.

(b) Non-metal

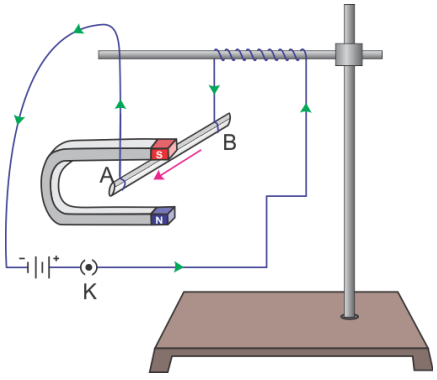
(c) The formula of the compound formed when element X combines with an element Y is YX_3.

18. A current-carrying solenoid acts like a bar magnet. We know that a freely suspended bar magnet aligns itself in the north–south direction. So, a freely suspended current-carrying solenoid also aligns itself in the north–south direction.

OR

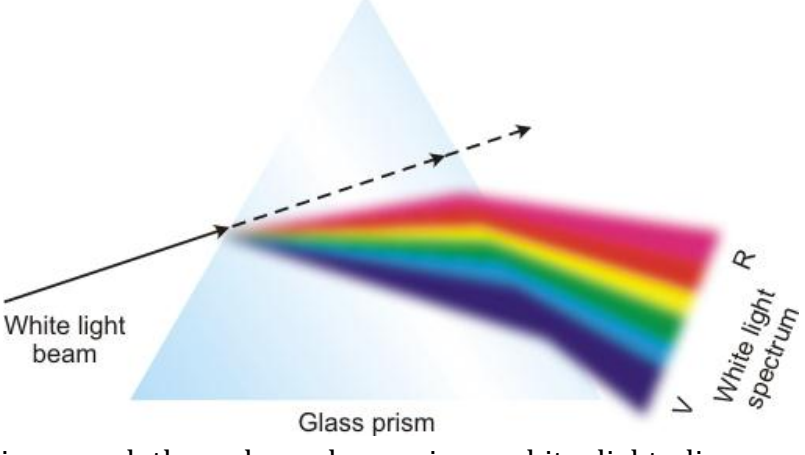
A magnetic field can be produced without a magnet by passing current through the conductor.

Experiment to show that a magnetic field exerts a force on a current-carrying 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.

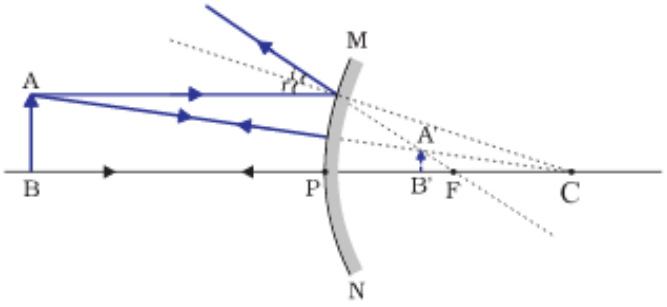
19. The phenomenon due to which we observe a rainbow is called dispersion of light. Splitting of white light into its constituent colours is called dispersion of white light.



When light is 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.

20.



When an object is placed between infinity and the pole of a convex mirror, the image formed is

(a) Behind the mirror at the focus (F)

(b) Virtual and erect

(c) Highly diminished

21.

(a) A = Ethyl alcohol, C_2H_5OH

(b) B = Ethanoic acid, CH_3COOH

(c) $\underset{\text{'A'}}{CH_3\text{-}CH_2OH} \xrightarrow[\text{Oracidified } K_2Cr_2O_7 + \text{Heat}]{\text{Alkaline } KMnO_4 + \text{Heat}} \underset{\text{'B'}}{CH_3COOH}$

OR

(a) Soaps, being basic in nature, react with the acidic dye of a woollen garment and hence are not effective for washing woollen garments.

(b) Detergents are called 'soapless soaps' because although they act like soaps with cleansing properties, they do not contain sodium stearate.

(c) Common salt is used in the soap-making process to precipitate out all the soap from the aqueous solution.

22. When we eat more food or spicy food, our digestive system has to work more by releasing more enzymes for digestion. The stomach releases more HCl to digest more food because of which a lot of acid is formed; this may cause acidity. Acidity can also cause diarrhoea, i.e. vomiting and loose motions.

OR

Most of the CO_2 produced in a tissue enters RBCs by diffusion. RBCs consist of a pigment called haemoglobin. This pigment binds with CO_2 and gets transported to the lungs through blood from where it is released out through the nostrils.

23.

(a) In the F_1 generation, all the plants would be tall.

(b) Tall : Dwarf = 3 : 1

(c) Dwarf plants are found in the F_1 generation but appear in the F_2 generation. This is because the trait for tallness is dominant over the trait for dwarfness.

24. Functions of female reproductive organs:

(a) Ovary: It is the site of production of germ cells or eggs and is also responsible for the production of female hormones.

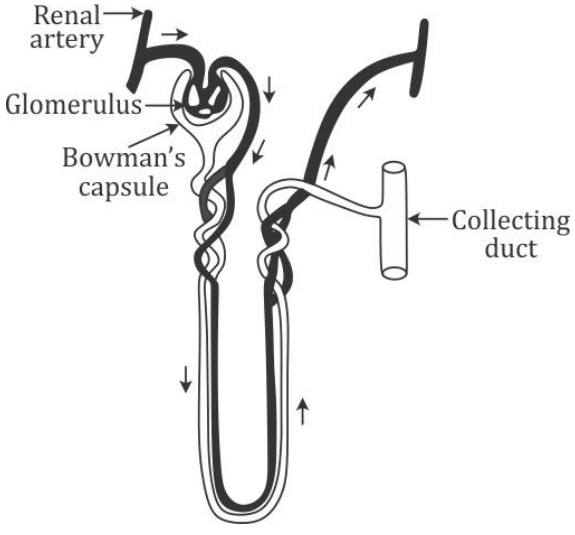
(b) Fallopian tube: It transports the male sperm cells to the egg, provides a suitable environment for fertilisation and transports the egg from the ovary.

(c) Uterus: It is the site for implantation of fertilised ova and also helps in the growth and development of the foetus.

Section C

25.

(a) Excretory unit of the human kidneys



(b) The structural and functional unit of the kidneys is the nephron. Its functions are filtration of blood, reabsorption and secretion.

(c) Functions of an artificial kidney: (Any one)

- Helps to remove harmful wastes, extra salts and water
- Controls blood pressure
- Maintains the balance of sodium and potassium salts in a patient whose kidneys have failed

26. 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.

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.

The focal length of the lens used by the first student is f = +75 cm. Hence, the lens is a convex lens. The focal length of the lens used by the second student is f = –75 cm. Hence, the lens is a concave lens.

Power of lens 1 is $P_1 = \frac{1}{75 \times 10^{-2}} = 1.33 \text{ D}$

Power of lens 2 is $P_2 = \frac{1}{-75 \times 10^{-2}} = -1.33 \text{ D}$

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.

27.

(a) Amphoteric oxides show properties of both acids and bases to form salt and water.

Examples: Aluminium oxide (Al_2O_3), zinc oxide (ZnO)

(b) Metals such as sodium and potassium are kept immersed in kerosene because they are very reactive, have high affinity towards oxygen and will violently react with atmospheric oxygen on contact with air.

(c) Aluminium reacts readily with steam to give aluminium oxide and hydrogen gas. The reaction does not always occur because of a thin but strong layer of aluminium oxide being coated onto the metal.

$$\underset{\text{Aluminium}}{2Al_{(s)}} + \underset{\text{Steam}}{3H_2O_{(g)}} \rightarrow \underset{\text{Aluminium oxide}}{Al_2O_{3(s)}} + \underset{\text{Hydrogen}}{3H_{2(g)}}$$

(d) (i) Non-metal which is a liquid at room temperature: Bromine

(ii) Non-metal which is lustrous: Iodine

OR

(a)

(i) Zinc

(ii) Sodium

(iii) Manganese

(iv) Mercury

(b) Carbonate and sulphide ores are usually converted to oxides because it is easier to obtain metals from their oxides (by reduction) than from carbonates or sulphides.

28.

(a) A continuous conducting path consisting of wires and other resistances (like electric bulb etc.) and a switch between the two terminals of a cell or a battery along which an electric current flows is called an electric circuit.

(b) Given:

I = 1 A

t = 1 sec

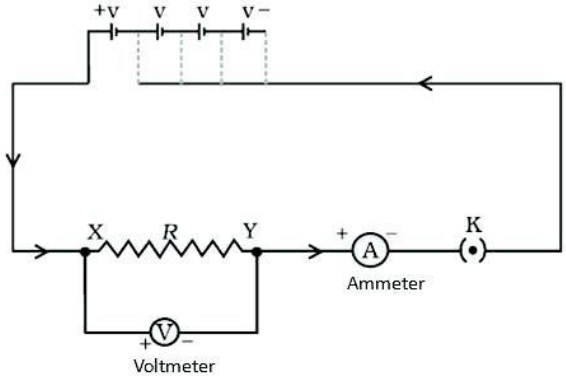
Q = 1 C

1.6×10^{-19} C is the charge on 1 electron.

1 C is the charge on electrons = (6.25×10^{18}) electrons.

6.25×10^{18} electrons flow per second to constitute the current of one ampere.

(c)



OR

(a) Parallel combination

(b) Let V be the voltage applied.

i. Current flowing through 10 Ω resistor is

$$I_1 = \frac{V}{R_1} = \frac{V}{10} \text{ A}$$

ii. Current flowing through 15 Ω resistor is

$$I_2 = \frac{V}{R_2} = \frac{V}{15} \text{ A}$$

(c) Equivalent resistance of the circuit, R, is given as

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R} = \frac{1}{10} + \frac{1}{15}$$

$$\frac{1}{R} = \frac{1}{6}$$

$$R = 6\ \Omega$$

Ammeter reading, $I = \frac{V}{R} = \frac{V}{6}$ A

(d) The SI unit of current is Ampere.

29.

(a) Forests are renewable natural resources which are essential to maintain the ecological balance of the ecosystem. They maintain biological diversity, preserve foods and safeguard the future of tribals, besides providing valuable products for human welfare and raw materials for industries. Hence, it is important to conserve our forests.

<u>Causes of deforestation:</u>

- Indiscriminate felling of trees for the purpose of timber, fuel and industrial demand of wood
- Over-grazing by a large livestock population

(b) Prejudice against the traditional use of forest areas has no basis. This can be explained with the help of an example. The Great Himalayan Park contains alpine meadows which were grazed by sheep in summer. Nomadic shepherds drove their flocks up from the valley every summer. When the National Park was formed, this practice was banned. In the absence of grazing, the grass grew very tall and fell over on the ground preventing fresh growth. Hence, the traditional use was helpful for forest maintenance.

OR

(a) Watershed management emphasises scientific soil and water conservation in order to increase biomass production. It is helpful to ecosystems by developing primary resources of land and water to produce secondary resources of plants and animals for use in a manner which will not cause ecological imbalance.

(b)

i. Groundwater does not evaporate.
ii. It is helpful in maintaining the water levels of wells.
iii. Groundwater provides water to a large amount of vegetation.

30.

(a) Neutral: Solution D with pH 7

(b) Strongly alkaline: Solution C with pH 11

(c) Strongly acidic: Solution B with pH 1

(d) Weakly acidic: Solution A with pH 4

(e) Weakly alkaline: Solution E with pH 9

pH is inversely proportional to hydrogen ion concentration. Hence, the pH can be arranged in the increasing order of the concentration of hydrogen ions as $11 < 9 < 7 < 4 < 1$.