CBSE
Class X Science
Sample Paper – 7 Solution

Section A

1. Organisms produced by asexual reproduction contain exactly the same number of chromosomes as the parent cells. They resemble their parents in all the characteristics and hence are considered clones.

2. Rose and neem plants belong to the first trophic level as they both are producers and provide food to the entire food chain.

Section B

3. Ventricles have to pump blood to various organs of the body. As a result, the pressure of blood flowing in the ventricles is more than that in the auricles. Therefore, ventricles have thicker muscular walls than auricles.

OR

Hypoxia is the deficiency of oxygen reaching the tissues. It may result due to sitting for long hours in a crowded room with poor ventilation. It may also be experienced at high altitudes where the oxygen content of air is low.

4. Given:
V = 220 V
I = 2 A
To calculate power,
P = VI
= 220 × 2
P = 440 W
The power of the bulb is 440 W.
To calculate resistance,

$$R = \frac{V}{I}$$

$$R = \frac{220}{2} = 110\ \Omega$$

Resistance of the filament is 110Ω.

5. An element's valency is determined by the number of electrons in its outermost shell. Hence, the number of valence electrons obtained from the electronic configuration of the element gives its valency, i.e. the number of electrons lost, gained or shared by the element to attain the noble gas configuration.
The valency of an element of atomic number 9 would be 1; because the number of valence electrons in its outermost shell is 7, it needs only one electron to attain the noble gas configuration.

Section C

6.

$CaCO_3$ + dil. $H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$
(water insoluble)
(A) (B)
$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
(lime water) (A)
Milky
A - $CaCO_3$ (lime water)
B - $CO_{2(g)}$

7.

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

8.

(A) $CH_4 + O_2 \rightarrow CO_2 + H_2O$ + heat and light

(B) $C_2H_5OH \xrightarrow[H_2SO_4]{\text{Hot conc.}} CH_2 = CH_2 + H_2O$

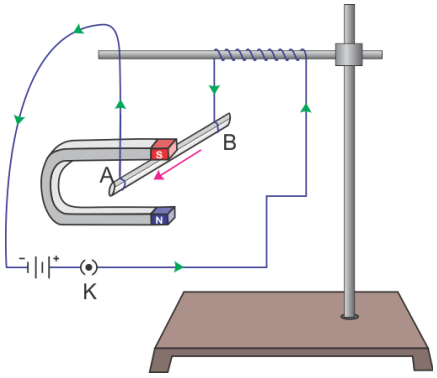
(C) $NaOH + CH_3COOH \rightarrow CH_3COONa + H_2O$

9. A current-carrying solenoid behaves 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

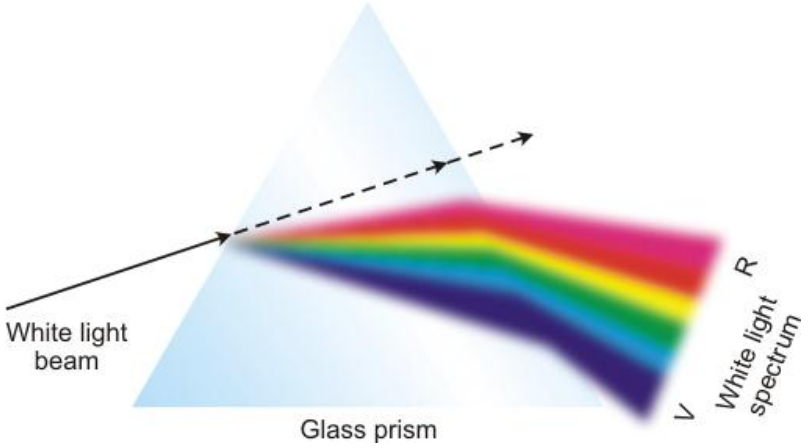
A magnetic field can be produced without a magnet by passing current through the conductor.

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.

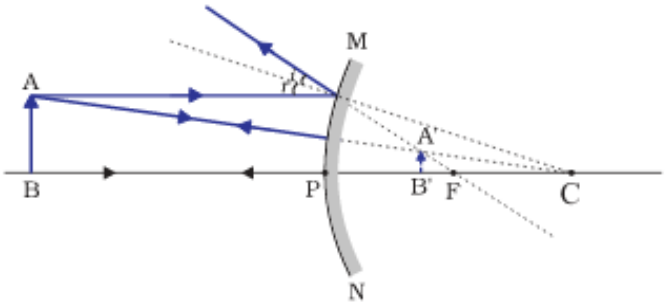
10. The phenomenon due to which we observe a rainbow is called dispersion of light. Splitting of white light into its constituent colours is called dispersion of white light.



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.

11.



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

12.

(a) A = Ethyl alcohol, C_2H_5OH
(b) B = Ethanoic acid, CH_3COOH
(c) $CH_3 - CH_2OH \xrightarrow[\text{Or acidifled } K_2Cr_2O_7 + \text{Heat}]{\text{Alkaline } KMnO_4 + \text{Heat}} CH_3COOH$
'A' 'B'

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.

13. When we eat more food or spicy food, our digestive system has to work more by releasing more amount of enzymes for digestion. The stomach releases more HCl to digest more food because of which a lot of acid is formed, which 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 the RBCs of blood 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.

14.

(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.

15.

(a) AIDS belongs to the category of viral diseases. It is caused by a retrovirus called human immunodeficiency virus (HIV).

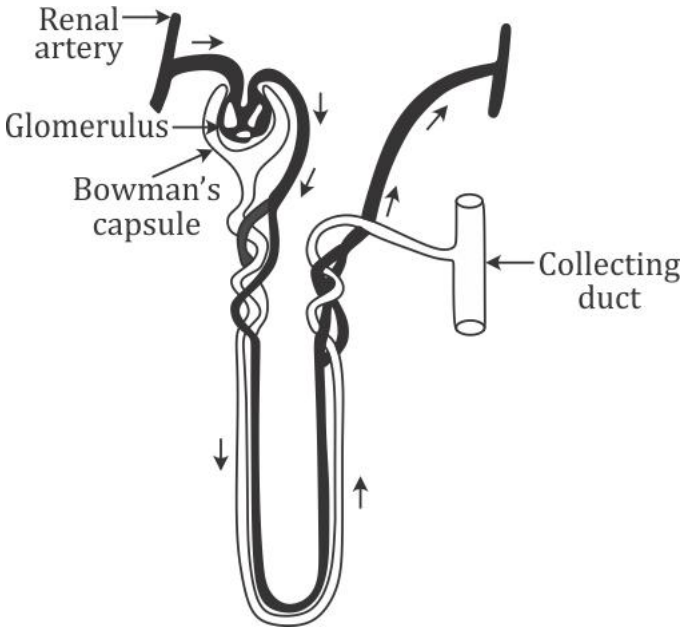
(b) No, it was not the right decision of the company to terminate Sanjeev because it is possible for any person to contract AIDS. We should not discourage people or isolate them just because they are suffering from AIDS. It is against human values.

(c) Society should show empathy, compassion and sensitivity towards people with HIV and AIDS.

Section D

16.

(a) Excretory unit of the human kidney



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

(c) <u>Function of an artificial kidney</u>: (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

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.
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.

18.

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

(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.

19.

(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

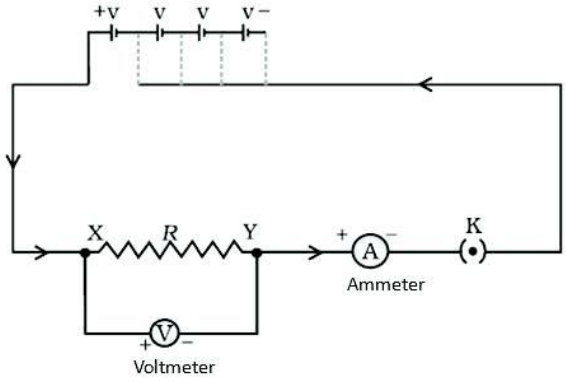
Q = 1 C

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

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

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

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

$$R = 6\ \Omega$$

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

(d) The SI unit of current is Ampere.

20.

(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.

Causes of deforestation:

- 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 first grew very tall and then fell over on the ground preventing fresh growth. Hence, the traditional use was helpful for forest maintenance.

OR

(a) Water shed 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.

21.

(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.

Section E

22. The student would observe a rise in the water level in the bent tube in the beaker. The rise in the level of water indicates that CO_2 is produced by germinating seeds during respiration.

23.

(a) Remove the peel from the ventral surface of the leaf.
(b) Drop it in the water in a petri dish and add a drop of safranin stain.
(c) Transfer the stained peel to the clean glass slide and add a drop of glycerine.
(d) Cover the material with a cover slip.

OR

To determine the boiling point of water, pumice stone is added to spread the heat uniformly.

24.

(a) CO_2
(b) $NaHCO_3 + CH_3COOH \rightarrow 3CH_3COONa + H_2O + CO_2$

OR

(a) Because it turns blue litmus paper red.
(b) It reacts with sodium bicarbonate to liberate CO_2.

25.

(a) $Mg + 2HCl \rightarrow MgCl_2 + H_2$
(b) $CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$

26. When resistors are connected in series, the equivalent resistance increases.
When resistors 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.

OR

$$\text{Least count} = \frac{0.5 - 0}{20} = 0.025 \text{ V}$$

Thus, the least count of the voltmeter is 0.025 V.

27. The ratio of the angles of incidence and refraction is given by Snell's law:

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

For glass, $\mu = 1.5$

for r = 18°

$$\frac{\sin 40}{\sin 18} = 2.08 \neq 1.5$$

Thus, this observation is wrong

for r = 22°

$$\frac{\sin 40}{\sin 22} = 1.71 \neq 1.5$$

Thus, this observation is wrong

for r = 30°

$$\frac{\sin 40}{\sin 30} = 1.28 \neq 1.5$$

Thus this observation is wrong

for r = 25°

$$\frac{\sin 40}{\sin 25} = 1.5$$

Thus, the observation which measures the refracting angle as 25° is correct.