

CBSE
Class X Science
Sample Paper – 5 Solution

Section A

1. The brain box, called the cranium, protects the brain and has shock-absorbing fluid which prevents the brain from shocks and injuries.
2. A node located in the right auricle is called a pacemaker because it generates heart impulses.

Section B

3. Given, $P = 24 \text{ W}$, $V = 12 \text{ V}$

$$P = \frac{V^2}{R} \Rightarrow 24\text{W} = \frac{(12\text{V})^2}{R} \text{ or } R = \frac{(12)^2}{24}$$

Let the effective wattage (i.e. power) be P_1 when it operates on a 6 V supply, then

$$P_1 = \frac{(6\text{V})^2}{R} = \frac{(6\text{V})^2}{(12\text{V})^2} \times 24\text{W} = \frac{24\text{W}}{4} = 6\text{W}$$

The effective wattage when it operates on a 6 V battery is 6 W.

OR

$$P = 50 \text{ W}$$

$$t = 30 \text{ minutes} = 30 \times 60 \text{ s} = 1800 \text{ seconds}$$

We know

$$\text{Energy} = \text{Power} \times \text{Time}$$

$$E = P \times t$$

$$E = 50 \times 1800 \text{ s} = 90000 \text{ J} = 90 \text{ kJ}$$

4. Copper sulphate is the oxidising agent as it gives oxygen to zinc, and zinc is the reducing agent as it accepts oxygen.

5.

Biodegradable waste	Non-biodegradable waste
Waste substances are easily decomposed by microorganisms.	Waste substances are not decomposed by microorganisms.
These substances easily mix with the soil after a short interval of time. Example: Paper	These substances are not able to mix with the soil even after a long interval of time. Example: Plastic

Section C

6. A large number of alveoli in the lungs provides a large surface area for the exchange of gases. Walls of alveoli contain an extensive network of blood vessels. The walls are extremely thin and made of a single layer of cells.
7. In a food chain, the trophic levels are consecutive steps followed in the process of energy flow and each step or level is dependent on the other for food. Different trophic levels are
 - Producers: They form the first trophic level and are able to manufacture their own food (green plants).
 - Primary consumers: They form the second trophic level and are generally plant eaters (herbivores).
 - Secondary consumers: They form the third trophic level and are flesh eaters (carnivores).
 - Tertiary consumers: They form the fourth trophic level and feed on secondary consumers.

OR

The hindbrain controls involuntary actions. It consists of pons, medulla and cerebellum. Functions of the medulla and cerebellum:

- The medulla helps in controlling involuntary actions such as blood pressure, salivation and vomiting.
- The cerebellum is responsible for the precision of voluntary actions and maintaining the posture and balance of the body.

8.

(a) Total resistance in arm CE

$$CE = 5\Omega + 4\Omega = 9\Omega$$

(b) Current in arm AB

$$= \frac{4.5V}{9\Omega} = 0.5A$$

(c) Current in arm CE=

$$\frac{4.5A}{9\Omega}$$

$$= 0.5A$$

So, the potential difference across the 4Ω resistor

$$= 4\Omega \times 0.5A = 2V$$

9.

- (a) Sodium hydrogen carbonate and tartaric acid.
- (b) Baking powder is a mixture of baking soda and tartaric acid, whereas baking soda is only sodium hydrogen carbonate.
- (c) When baking powder mixes with water, sodium hydrogen carbonate reacts with tartaric acid to evolve carbon dioxide which gets trapped in the wet dough and bubbles out slowly making the cake soft and spongy.

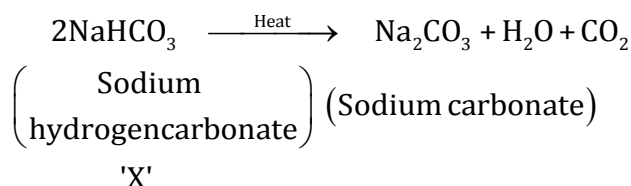
10.

- (a)
 - (i) The quality of the environment was maintained due to conservation of forests.
 - (ii) The local people could use the forest resources in suitable ways.
- (b) Conservation of wildlife helps in maintaining the ecological balance of the biosphere and provides a gene bank for improvement of domesticated plants and animals.
- (c) IUCN stands for 'International Union for Conservation of Nature and Natural Resources'.

11.

- (a) Two characters.
They are shape of seed and colour of seed.
- (b) A dominant trait is a genetic trait which is considered dominant if it is expressed in a person who has only one copy of that gene.
A recessive trait is a genetic trait which is expressed only when two copies of the same gene are present.

12.



- (a) When CO₂ gas escapes as bubbles it leaves behind pores which make the cake or bread soft and spongy.
- (b) It is a salt of a strong base, so the pH of the solution will be more than 7.

OR

- (a) $2\text{CH}_3\text{COOH} + \text{Zn} \rightarrow (\text{CH}_3\text{COO})_2\text{Zn} + \text{H}_2$
- (b) $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O}$
- (c) $2\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \rightarrow 2\text{CH}_3\text{COONa} + \text{H}_2\text{O} + \text{CO}_2$

13.

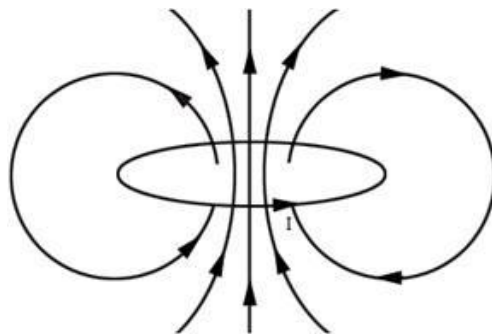
- (a) The strength of the magnetic field (B) is inversely proportional to the radius of the circular loop (r).

$$B \propto \frac{1}{r}$$

- (b) The strength of the magnetic field (B) is directly proportional to the number of turns in the coil (N).

$$B \propto N$$

- (c) The magnetic field lines will be as shown below.

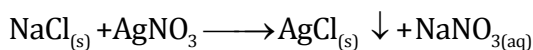


OR

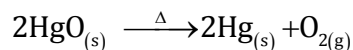
- (a) Factors on which the direction of force experienced by a current-carrying conductor placed in a magnetic field depend are
(i) Direction of current and (ii) direction of magnetic field
- (b) The force acting on a current-carrying conductor placed in a magnetic field is maximum when the direction of the current is at right angles to the direction of the magnetic field.
- (c) Because the proton beam is moving parallel to the direction of the magnetic field, no force acts on it.

14.

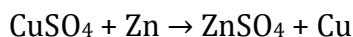
- (a) Double decomposition reaction: This is a type of chemical reaction in which two compounds in a solution react to form two new compounds by mutual exchange of radicals.



- (b) Thermal decomposition reaction: A decomposition reaction brought about by heat is known as thermal decomposition.



- (c) Displacement reaction: It is a chemical reaction in which a more active element displaces a less active element from its salt solution.



15.

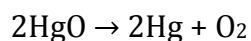
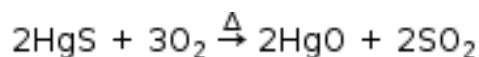
- (a) When the object lies between the optical centre and the focus of the lens, a convex lens forms an erect and virtual image.
- (b) When a parallel beam of light falls on a smooth and highly polished surface, the reflected beam is also parallel and directed in a fixed direction. Such reflection of 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.

Section D

16.

- (a) Hg - Mercury
- (b) HgS - Cinnabar
- (c) When heated in air, cinnabar is first converted to mercuric oxide (HgO) which is reduced to mercury on further heating.

(d)



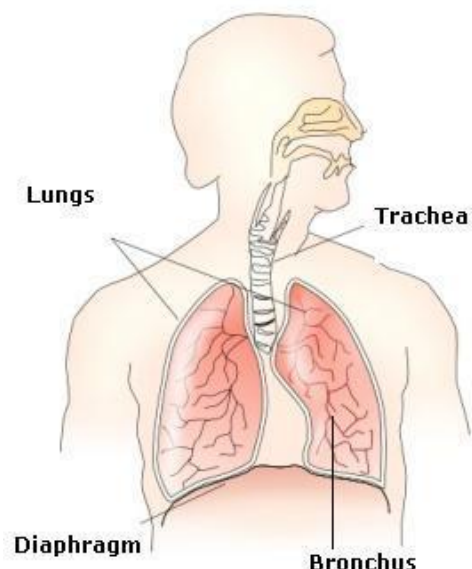
OR

- (a) If we bring a lighted matchstick near the gas, it will burn very brightly, accompanied by explosion along with a 'pop sound'. This shows that the gas evolved is hydrogen.
- (b) The reaction takes place as follows:

$$\text{Mg} + 2\text{H}_2\text{O} \longrightarrow \text{Mg}(\text{OH})_2 + \text{H}_2 \uparrow$$
- (c) Magnesium will lose all its shine and a deposit of magnesium hydroxide will be formed on the surface of the metal after a week's time.
- (d) As the solution contains $\text{Mg}(\text{OH})_2$ which is slightly basic, the indicator will acquire blue colour indicating that the pH of the solution is more than 7.

17.

(a) Respiratory system:



(b) Haemoglobin.

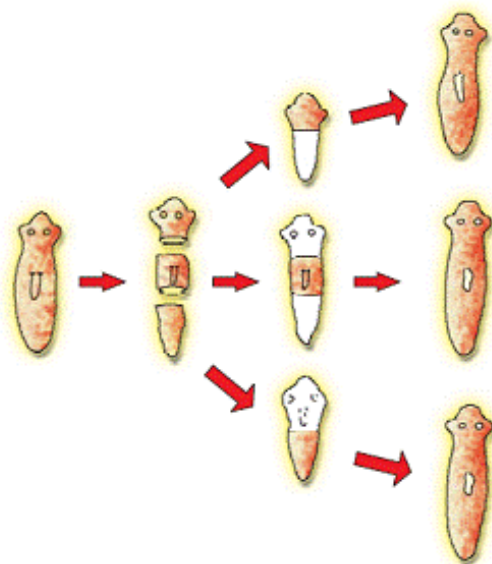
Role of haemoglobin: It is an iron-protein compound in red blood cells which gives blood its red colour and transports oxygen and carbon dioxide.

(c) The rate of breathing in aquatic organisms is much faster than that in terrestrial organisms because the amount of dissolved oxygen in water is fairly low compared to the amount of oxygen in the air.

OR

(a) Planaria can be cut into any number of pieces and each piece grows into a complete organism. This process is called regeneration. It is carried out by specialised cells in the organism.

Regeneration in Planaria



- (b) The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta. It provides a large space area for glucose and oxygen to pass from the mother to the embryo. The developing embryo also produces waste substances which can be moved by transferring them into the mother's blood through the placenta.
- (c) The ovule develops a tough coat and is gradually converted to a seed. The ovary grows rapidly and ripens to form a fruit.

18.

- (a) Humans have cultivated wild cabbage and produced different vegetables.
Example:

- (i) Some farmers wanted a short distance between the leaves of wild cabbage and so produced the common variety of cabbage.
- (ii) When farmers opted for the arrested flower development of wild cabbage, it led to the production of broccoli.
- (iii) Some farmers went in for sterile flowers of wild cabbage and developed another variety of cabbage called cauliflower.
- (iv) When farmers opted for the swollen part of wild cabbage, it led to the production of kohlrabi.
- (v) Finally, farmers wanted to grow large leaves of wild cabbage and ended up producing the leafy vegetable kale.

- (b) Tools used to trace evolutionary relationships among species:

- (i) Excavating
- (ii) Time-dating
- (iii) DNA sequencing
- (iv) Fossil study

19.

- (a)
 - (i) Right-hand thumb rule: If one holds a wire carrying current in the right hand in such a way that the thumb indicates the direction of current, then the folded fingers indicate the direction of the magnetic field surrounding the wire.
 - (ii) Fleming's left-hand rule: If we stretch the first three fingers of the left hand mutually perpendicular to each other such that the forefinger points along the direction of the magnetic field and the middle finger points along the direction of the current, then the thumb indicates the direction of the force experienced by the conductor.
 - (iii) Fleming's right-hand rule: If the forefinger, second (central) finger and thumb of the right hand are stretched at right angles to each other, with the forefinger in the direction of the field and the thumb in the direction of the

motion of the wire, then the induced current in the wire is in the direction of the second or central finger.

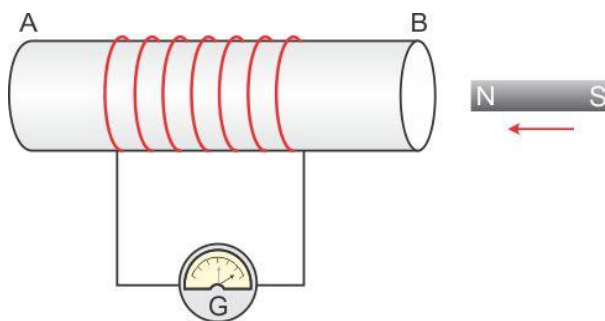
- (b) The direction of AC changes after equal intervals of time. The direction of DC does not change. Advantage of AC over DC is that AC can be transmitted over long distances without much loss of energy.

20.

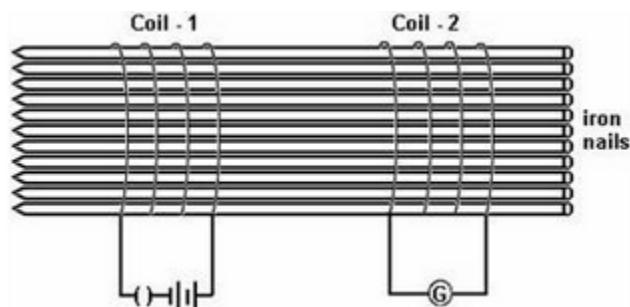
- Elements with comparatively filled shells are noble gas elements and they belong to Group 18. Since the element has two shells, it must be present in neon (Ne) with electronic configuration 2, 8.
- The electronic configuration suggests that this element belongs to the third period and second group, i.e. magnesium (Mg).
- The element with three shells is present in the third period and has four valence electrons. It must belong to Group 14. So, it is silicon with electronic configuration 2, 8, 4.
- The element with two shells is expected to be present in the second period and it has three electrons in its valence shell. This means it is in Group 13 and is boron (B) with electronic configuration 2, 3.
- This element has two shells, and the first shell has only two electrons. Therefore as the given second shell has twice the electrons present in first shell, i.e. four, the electronic configuration is 2, 4, and the element is carbon (C).

21.

- The process by which a changing magnetic field in a conductor induces a current in another conductor is called electromagnetic induction.
- By moving a magnet towards or away from a coil.
We take a coil with several turns and it is connected to a sensitive galvanometer. When a bar magnet is moved towards the coil, we see a deflection in the galvanometer. This deflection dies down after some time. The deflection is because of the induced current.



- By varying current in one coil, an induced emf is produced in the other coil.



Two coils of insulated copper wire are wrapped on few long iron rods. Coil-1 is connected to a battery through a switch and Coil-2 is connected to a galvanometer. Now, the current is switched on in Coil-1. A momentary deflection is seen in the galvanometer attached to Coil-2. The deflection is due to current induced in Coil-2 momentarily as the magnetic field builds up along the axis of Coil-1 when the current is switched on.

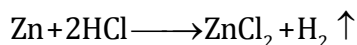
- (c) When a bar magnet is held stationary inside the coil, there will be no deflection in the galvanometer indicating that no current is produced in the coil.

OR

- (a) Total resistance $R = R_1 + R_2 = 18 \Omega + 6 \Omega = 24 \Omega$
 (b) Current flowing through the circuit, $I = V/R = 6/24 = 0.25 \text{ A}$
 (c) Potential difference across the lamp, $V_1 = IR_1 = 0.25 \times 18 = 4$
 Potential difference across the resistor R_2 , $V_2 = IR_2 = 0.25 \times 6 = 1.5 \text{ V}$

SECTION E

22. The colourless and odourless gas that produces a pop sound on burning is hydrogen. It is produced when zinc reacts with dilute hydrochloric acid.



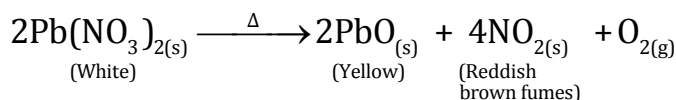
OR

pH of the solution decreases with increase in concentration of H^+ ions and increases with decrease in concentration of H^+ ions.

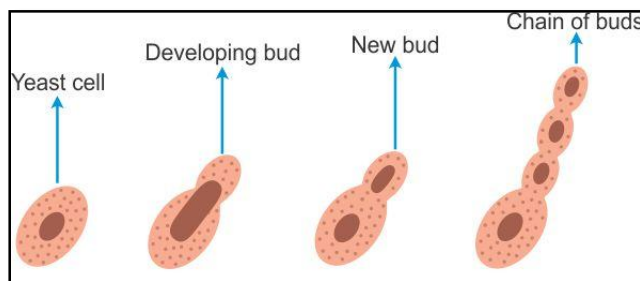
A fruit juice has pH between 3.4 and 2.6, indicating that it is acidic in nature.

23. The white-coloured compound is lead nitrate with chemical formula $\text{Pb}(\text{NO}_3)_2$.

The reaction occurs as

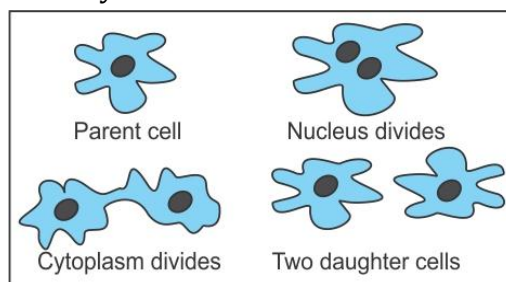


24. The process of reproduction in yeast is budding.



25. Binary fission is a type of asexual reproduction in which two individuals are formed from a single parent and the parental identity is lost.

Initial and final stages of binary fission



OR

Events which occur during binary fission in Amoeba:

- Elongation of the cell
- Division of the cytoplasm
- Division of the nucleus
- Formation of two daughter cells

26. Device X is a convex lens of focal length 40 cm.

The parallel rays from the distant object fall on the convex lens and converge at its second principal focus (i.e. where the screen is placed). The distance between the screen and the convex lens gives the approximate focal length of the lens, i.e. 40 cm.

27. The positive terminal of the ammeter should be connected to the positive terminal of the cell, and the negative terminal should be connected to the negative terminal of the cell.

OR

- Bulbs glow the dimmest in **circuit A**. As three bulbs are connected in series, the potential difference across each bulb is less.
- Circuit B emits light with maximum intensity. The bulbs are connected in parallel in circuit B and thus the potential difference across is the same as that of the power supply. Thus, each glows with equal brightness, and as the number of bulbs is more, the amount of light emitted is more.
- All bulbs in circuit B glow with equal brightness as that of the bulb connected in circuit C.