

CBSE
Class X Science
Sample Paper – 9 Solution

Section A

1. The cerebellum is responsible for the precision of voluntary actions.
2. Cooking gas possesses chemical energy. A dry cell possesses electrical energy.
3. Aluminium is a more active metal than iron but suffers less corrosion because of the formation of thin, transparent, protective, non-porous adhering film of aluminium oxide on the surface of aluminium which makes it resistant to corrosion.

OR

X is a metal since metal oxides are basic in nature.

Section B

4. If due to some accident, changes occur in the gene frequency of members of the sub-population of a species, the genetic makeup of the organism changes slightly. This phenomenon is known as genetic drift. As these changes occur without any kind of adaptation, they have no survival advantage.
5. Refractive index of a medium is

$\mu = \frac{c}{v}$; where c is speed of light in air and v is speed of light in medium

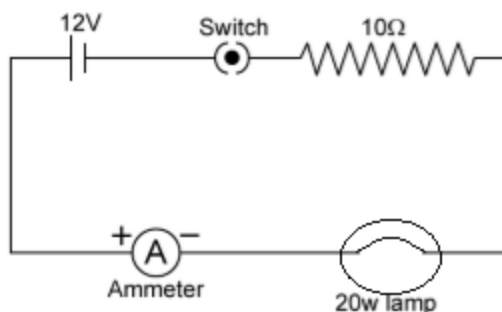
Let v_f is velocity in flint glass and v_c is velocity in crown glass

$$\frac{v_c}{v_f} = \frac{1.66}{1.52}$$

Section C

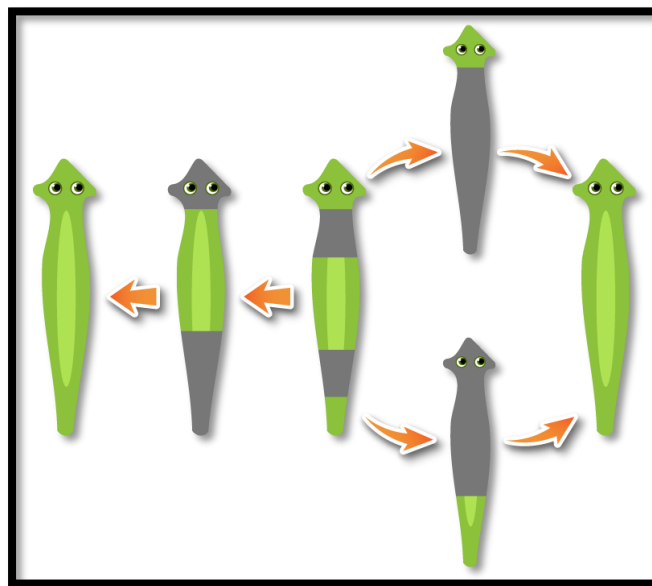
6.

(a) Circuit diagram:



(b) Current drawn by the lamp at 12 V as per the given rating = $(20/12) = (5/3)$ A.
Hence, resistance of the lamp $12/(5/3) = (36/5) \Omega$.
Total resistance = $10 + (36/5) = (86/5) \Omega$
So, current drawn from the battery as shown by the ammeter, $12/(86/5) = (30/43)$ A = 0.7A

7. Butter consists of fat, which is digested by bile released from the liver.
 - Fats are present in the intestines in the form of large globules, making it difficult for enzymes to act on them.
 - Bile salts present in the bile break fats into smaller globules to increase the action of enzymes. This process is known as emulsification.
 - Later, lipase acts on the emulsified fats and breaks them down into fatty acids and glycerol.
8. Regeneration is the ability of an organism to grow into a complete individual when its body is divided into pieces. It can be seen in *Hydra* and *Planaria*.



Regeneration in *Planaria*

Regeneration is carried out with the help of specialised cells called regenerative cells. These cells proliferate and produce a large number of cells. From this mass of cells, different cells undergo changes to become various cell types and tissues. These changes take place in an organised sequence referred to as development.

9.
 - (a) The metallic character decreases from left to right along a period of the periodic table because on moving from left to right, the size of the atoms decreases and the nuclear charge increases. Hence, the tendency to release electrons decreases. Thus, the electropositive character decreases.

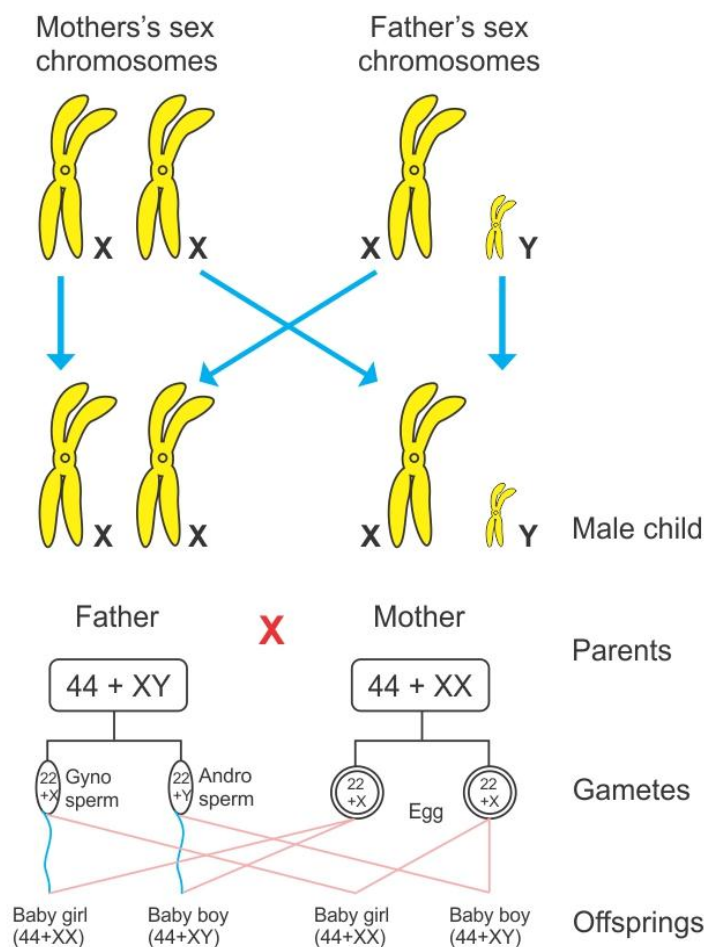
(b) Ca: Electronic configuration: 2, 8, 8, 2

The physical and chemical properties of elements with atomic number 12 and 38 will resemble those of calcium.

This is because they all belong to the second group and all of them have two electrons in the valence shell.

10. Sex determination in human beings:

- Human males possess one X chromosome and one Y chromosome (XY) in their cells. Therefore, half of the male gametes or sperms will have X chromosomes and the other half will have Y chromosomes.
- Human females have two X chromosomes (XX) in their cells. Therefore, all the female gametes or ova always have X chromosomes.



- If a sperm carrying an X chromosome fertilises an ovum which always carries the X chromosome, then the combination of sex chromosomes will be XX, and hence, the child born will be a female (girl).
- If a sperm carrying the Y chromosome fertilises an ovum, then the combination of sex chromosomes will be XY, and hence, the child born will be a male (boy).
- Thus, the male (father) is responsible for the sex of the baby.

11. Effective resistance for the parallel combination of $5\ \Omega$ and $20\ \Omega$ is given by

$$\frac{1}{R} = \frac{20+5}{20 \times 5}, R=4$$

Hence, total resistance in the circuit $12 + 4 = 16\ \Omega$.

Current drawn from the battery $= 16/12 = 4/3 = 1.33\ \text{A}$

- (a) Potential difference across the parallel combination of resistors is $(4/3) \times 4 = (16/3)\ \text{V}$.

Hence, current through $5\ \Omega$ resistor is $(16/15)\ \text{A}$ and current through $20\ \Omega$ resistor is $(16/60) = (4/15)\ \text{A}$.

- (b) Total current drawn from the battery $(4/3) = 1.33\ \text{A}$

- (c) Total resistance in the circuit $12 + 4 = 16\ \Omega$

OR

Let running time per day be n hours.

Running cost for 30 days $= n \times 0.5 \times 4.60 \times 30 = 200$

Hence, $n = 200 / (0.5 \times 4.60 \times 30) = 2$ hours 54 minutes.

12.

- (a) An ecosystem is a self-sustaining system where the biotic and abiotic components of various communities live together and interact with each other.

The two main components of an ecosystem are biotic components and abiotic components. The biotic system consists of all the living organisms of a particular area including humans, animals etc. The abiotic system consists of the non-living components including air, minerals, soil, water and sunlight.

- (b) A pond is an example of a natural ecosystem, whereas an aquarium is an example of an artificial ecosystem. Ponds do not need to be cleaned on a regular basis because they have natural flora and fauna present in them which helps in cleaning the pond ecosystem. However, an aquarium does not contain soil and decomposing bacteria which help in degrading complex organic substances into simpler inorganic substances. Therefore, an aquarium needs to be cleaned regularly.

OR

- (a) Bacteria and fungi are examples of decomposers present in an ecosystem.

- (b) Decomposers breakdown or decompose the dead remains of plants and animals and their waste organic products into simpler, inorganic substances. The latter are released into the environment for their reuse as raw materials by producers. Thus, decomposers provide space for new life to settle in the biosphere. Hence, their presence is crucial to the functioning of the ecosystem.

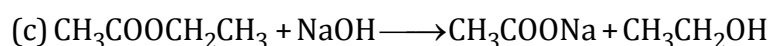
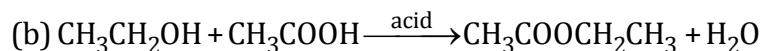
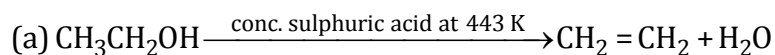
13. Equipment containing mercury should be handled carefully. If broken or discarded, their disposal should be done carefully.

Associated value: Students will learn to handle equipment containing mercury and will be cautious about the disposal of poisonous items.

14.

- (a) The human eye is like a camera. Its lens system forms an image on a light-sensitive screen called the retina. The crystalline lens merely provides the finer adjustment of focal length required to focus objects at different distances on the retina. The iris, a dark muscular diaphragm, controls the size of the pupil. The pupil regulates and controls the amount of light entering the eye. All these features are similar to the working of a camera.
- (b) For a person with myopia, the image is formed before the retina. Some divergence of light rays is required to get a focused image on the retina. Hence, a diverging lens or concave lens should be used to correct the myopic eye.
- (c) The far point of the eye for this person with myopia is at 80 cm which is ∞ for the normal eye. Hence, a concave lens of focal length 80 cm should be used so that parallel light rays get focused at 80 cm and this person with myopia is able to see properly.

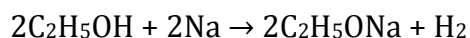
15.



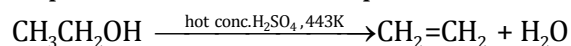
OR

- (a) The gas evolved burns with a pop sound, so it is hydrogen gas.

Therefore, A is ethanol.



- (b) When compound 'A' which is ethanol is heated with excess of concentrated sulphuric acid at 443 K, it produces ethene.



Section D

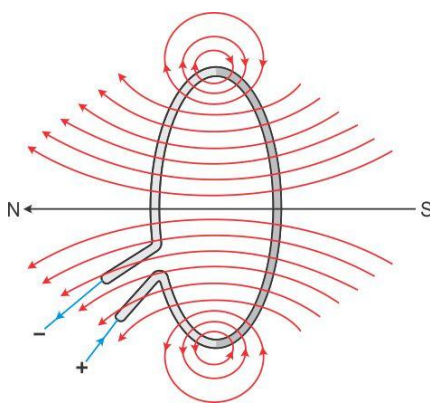
16.

(a) The process by which a changing magnetic field in a conductor induces a current in another conductor is called electromagnetic induction.

Fleming's right-hand rule is applied to determine the direction of induced current.

Stretch the thumb, forefinger and middle finger of the right hand so that they are perpendicular to each other. If the forefinger indicates the direction of the magnetic field and the thumb shows the direction of motion of the conductor, then the middle finger will show the direction of induced current.

(b)



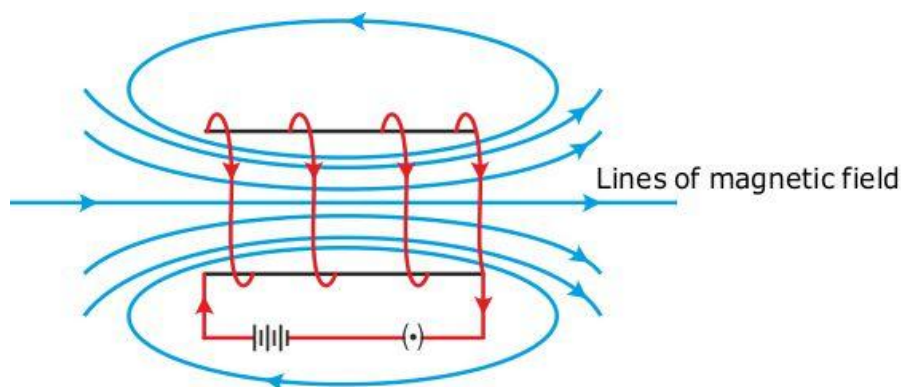
(c)

(i) Electric generator

(ii) Electric motor

OR

(a)



(b)

The **magnitude of a magnetic field** at the centre of the coil is

- i. Directly proportional to the current flowing through it
- ii. Inversely proportional to the radius of the coil
- iii. Directly proportional to the number of turns of the coil

- (c) **Clock face rule is used to determine the direction of magnetic field in a circular coil.**

Looking at a face of the coil, if the current around it is in the clockwise direction, then the face is the South Pole. If the current around it is in the anticlockwise direction, then the face is the North Pole. This is called the **clock rule**.

17.

- (a) A salt is a compound formed from an acid by the replacement of the hydrogen in the acid by a metal.

Example: Sodium chloride (NaCl) is obtained from hydrochloric acid and sodium metal.

Ammonium chloride (NH₄Cl) is obtained from ammonia and hydrochloric acid.

- (b) Salts having the same positive ions are said to belong to a family of salts.

Example: Sodium chloride and sodium sulphate belong to the same family of salts called sodium salts.

- (c) Salts which contain water of crystallisation are called hydrated salts.

Example: Copper sulphate crystals contain 5 molecules of water of crystallisation.

Salts which have lost their water of crystallisation are called anhydrous salts.

Example: On strong heating, copper sulphate crystals lose all the water of crystallisation and form anhydrous copper sulphate.

- (d) Copper sulphate pentahydrate salt: Its chemical formula is CuSO₄.5H₂O. It is blue in colour.

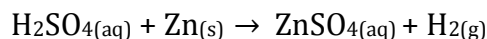
Iron sulphate heptahydrate salt: Its chemical formula is FeSO₄.7H₂O. It is green in colour.

- (e) The aqueous solution of ammonium chloride salt turns blue litmus red.

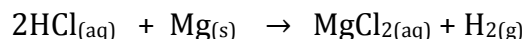
OR

- (a)

- (i) Sulphuric acid + Zinc → Zinc sulphate + Hydrogen



- (ii) Hydrochloric acid + Magnesium → Magnesium chloride + Hydrogen



- (b) A reaction in which an acid and a base react with each other to give a salt and water is termed a neutralisation reaction. In this reaction, energy is evolved in the form of heat.

- (c) Uses of washing soda:

- (i) Sodium carbonate (washing soda) is used in glass, soap and paper industries.
(ii) It is used in the manufacture of sodium compounds such as borax.

18.

- (a) Fossils are impressions on rocks of dead organisms which got buried inside the Earth millions of years ago. They provide information about the types of organisms which existed that time and provide evolutionary relationship with present-day animals.

(b) **Evidences in favour of evolution in organisms:**

- (i) Homologous organs: Organs which have similar origin and structural plan but perform different functions are called homologous organs.

Example: Inheritance pattern of limbs in amphibians (frog), reptiles (lizard), birds (sparrow) and mammals (human) is the same. The limbs in these organisms perform different functions.

- (ii) Analogous organs: Organs which have dissimilar origin and structural plan but perform similar function are called analogous organs.

Example: Wings of birds (sparrow), mammals (bat) and insects (cockroach) have the same function of flying but are structurally different. Wings of birds have feathers, wings of bats are skin folds between the fingers and wings of insects are membranous without bones.

- (iii) Fossils: Study of fossils helps to understand the evolutionary history of organisms.

Example: The study of evolution of feathers shows that dinosaurs also had feathers but they never used them. The use of feathers for flying was by birds. It shows that birds are related to dinosaurs as these are reptiles.

OR

- (a) Placenta is a disc-like tissue which develops between the uterus wall and the embryo.

Role of placenta:

- Exchange of water between the mother and the foetus
- Exchange of nutrients
- Exchange of respiratory gases
- Removal of nitrogenous wastes from the foetus. Nitrogenous wastes cross the placenta and are removed through the mother's kidneys.
- Antibodies cross the placenta and provide immunity to the baby

(b) Ways of preventing pregnancy:

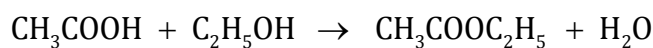
- Natural method: The sexual act is avoided from day 10 to day 17 of the menstrual cycle, i.e. during the period ovulation is expected. So, the chances of fertilisation are very high.
- Barrier methods: The fertilisation of ovum and sperm is prevented with the help of physical devices (condom and diaphragm).

- Oral contraceptives: Tablets or drugs are taken orally. These contain small doses of hormones which prevent the release of eggs and prevent fertilisation.
- Intrauterine contraceptive devices: Contraceptive devices such as Copper-T rods are placed in the uterus to prevent pregnancy.

19.

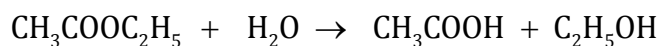
(a) Compound A with molecular formula $C_2H_4O_2$ is ethanoic acid, also called acetic acid. Its structural formula is CH_3COOH . A dilute solution of acetic acid called vinegar is used as a preservative of pickles.

(b) Compound A reacts with ethanol to form compound B which is an ester and has a pleasant smell. The reaction is called an esterification reaction.



Ethanoic acid Ethyl ethanoate

(c) Compound A can be obtained from ethyl ethanoate by reacting with water in the presence of dilute hydrochloric acid acting as a catalyst.



Ethyl ethanoate Ethanoic acid

(d) The process is ester hydrolysis.

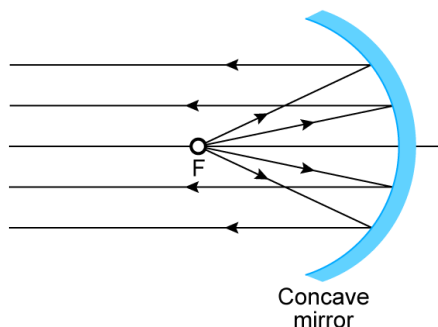
(e) Carbon dioxide is evolved with effervescence when compound A reacts with washing soda.

20.

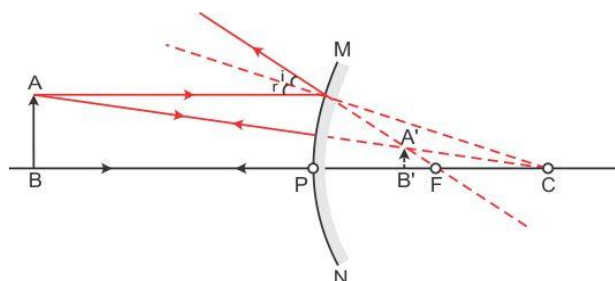
(a) Carbon monoxide binds to the iron of haemoglobin and prevents the transport of oxygen. The decreased oxygen supply stimulates the release of erythropoietin which increases red blood cell production in the red bone marrow, causing the number of red blood cells in the blood to increase.

(b) The anterior interventricular artery supplies blood to the anterior wall of the heart and the majority of the left ventricle. A blocked anterior interventricular artery reduces the oxygen supply to the portion of the heart which is supplied by that artery and the cardiac muscle in that area is not able to contract efficiently. Thus, the left ventricle on the anterior surface of the heart does not contract normally.

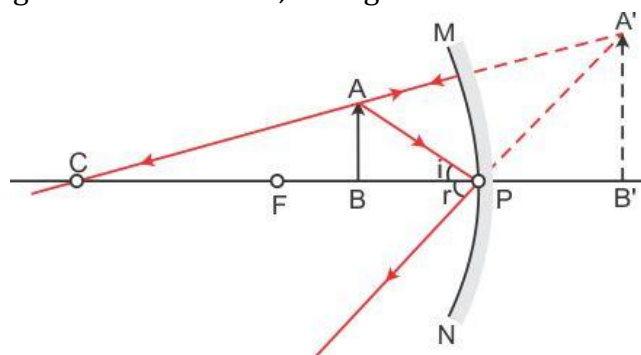
- 21.** The mirror used in a search light is a concave mirror. A light source is placed at the focal point of the mirror. Light rays from the source are reflected by the mirror and all the reflected rays are parallel so that they travel a long distance to help in search operations.



The mirror used as a rear-view mirror is a convex mirror.
Image formed by a convex mirror:



A concave mirror can form a magnified and virtual image. A convex mirror cannot form an enlarged image. When the object is placed between the pole and the focus of the mirror, the image formed is virtual, enlarged and erect.



Section E

22. Carboxylic acid can be distinguished from an alcohol by performing the following tests:

Test with NaHCO_3 solution in water

On adding carboxylic acid to baking soda, carbon dioxide is liberated with brisk effervescence.

On adding a solution of baking soda to alcohol, no brisk effervescence occurs.

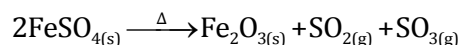
Test with blue litmus solution

Carboxylic acid turns blue litmus red.

There is no change in colour when a blue litmus solution is added to alcohol.

OR

Green vitriol ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) loses its water of crystallisation on heating and gives the smell of burning sulphur.



23. Precautions to be taken while identifying different parts of an embryo of a dicot seed:

- The slide should be properly focused upon in alignment with the eyepiece.
- The slide should be observed under a compound microscope by magnifying it first under low power and then under high power.

OR

Two precautions to be taken:

- Germinating seeds (living) should be used.
- The experiment set up must be air-tight.

24.(a) Hydrogen

(b) Hydrogen

25. The first graph shows that the resistance of a conductor is inversely proportional to the cross section. If the cross section A increases, then the resistance R of the conductor decreases, i.e. $R \propto (1/A)$.

The second graph shows that the resistance of the conductor is directly proportional to the length of the conductor. If the length l increases, then the resistance R also increases, i.e. $R \propto l$.

OR

We know that

$$P = V^2 / R$$

$$\therefore V = \sqrt{P \times R}$$

$$\frac{P}{4} = \frac{V^2}{R}$$

$$V^2 = \frac{P}{4} \times R$$

$$V = \frac{\sqrt{P \times R}}{2}$$

Thus, the potential difference must be half the initial value to reduce the power by $1/4^{\text{th}}$.

26.

- (a) The given figure shows the process of binary fission. (iii), (iv), (i), (ii) is the correct sequence of the steps in binary fission.
(b) *Amoeba* and *Paramecium* reproduce by the process of binary fission.

27. A convex lens forms an image at the focal point when the object is placed at an infinite distance. The student should try to measure the focal length by focusing a distant object on a screen/wall. In this way, he can select convex lenses of focal lengths 20 cm and 30 cm for the required experiment.