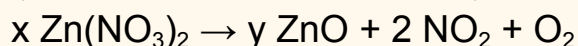


CBSE Class 10 Science Solutions

(Set 3 - 31/5/1)

SECTION A

Que 1. To balance the following chemical equation, the values of the coefficients x, y and z must be respectively:



- (A) 4, 2, 2
- (B) 4, 4, 2
- (C) 2,2,4
- (D) 2, 4, 2

Solution (A) 4, 2, 2

Que 2. Which of the following is a redox reaction, but not a combination reaction?

- (A) $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
- (B) $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- (C) $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
- (D) $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$

Solution The redox reaction that is not a combination reaction is:



Que 3. The salt present in tooth enamel is:

- (A) Calcium phosphate
- (B) Magnesium phosphate
- (C) Sodium phosphate
- (D) Aluminium phosphate

Solution The salt present in tooth enamel is:
(A) Calcium phosphate

Que 4. An aqueous solution of sodium chloride is prepared in distilled water. The pH of this solution is:
(A) 6
(C) 7
(B) 8
(D) 3

Solution The pH of an aqueous solution of sodium chloride is:
(C) 7

Que 5. A metal 'X' is used in the thermite process. When 'X' is heated with oxygen, it gives an oxide 'Y', which is amphoteric in nature. 'X' and 'Y' respectively are:
(A) Mn, MnO₂
(C) Fe, Fe₂O₃
(B) Al, Al₂O₃
(D) Mg, MgO

Solution The metal 'X' used in the thermite process, and its resulting oxide 'Y' are:
(B) Al, Al₂O₃

Que 6. The process in which transport of soluble products of photosynthesis takes place in plants is known as:
(A) Transpiration
(C) Conduction
(B) Evaporation
(D) Translocation

Solution The process involving the transport of soluble products of photosynthesis in plants is known as:

(D) Translocation

Que 7. The correct sequence of events when someone's hand touches a hot object unconsciously:

(A) Receptors in skin Motor neuron neuron Effector muscle in arm Relay neuron → Sensory

(B) Receptors in skin Relay neuron Sensory neuron neuron Effector muscle in arm Motor

(C) Receptors in skin Sensory neuron neuron Effector muscle in arm Relay neuron Motor

(D) Receptors in skin → Sensory neuron → Effector muscle in arm Motor neuron → Relay neuron

Solution The correct sequence of events when someone's hand touches a hot object unconsciously is:

(D) Receptors in skin → Sensory neuron → Effector muscle in arm → Motor neuron → Relay neuron

Que 8. Sense organ in which olfactory receptors are present is:

(A) Nose

(B) Skin

(C) Tongue

(D) Inner ear

Solution The sense organ in which olfactory receptors are present is:

(A) Nose

Que 9. The incorrect statement about placenta is:

(A) It is a disc embedded in the uterine wall.

(B) It contains villi on the embryo's side of the tissue.

(C) It has a very small surface area for glucose and oxygen to pass from mother to the embryo.

(D) The embryo gets nutrition from the mother's blood through it.

Solution The incorrect statement about placenta is:

(C) It has a very small surface area for glucose and oxygen to pass from mother to the embryo.

Que 10. Select from the following the conditions responsible for the rapid spread of bread mold on a slice of bread:

- (i) Formation of large number of spores
 - (ii) Presence of moisture and nutrients in bread
 - (iii) Low temperature
 - (iv) Presence of hyphae
- (A) (i) and (ii)
(B) (ii) and (iv)
(C) (ii) and (iii)
(D) (iii) and (iv)

Solution The conditions responsible for the rapid spread of bread mold on a slice of bread are:

(B) (ii) Presence of moisture and nutrients in bread and (iv) Presence of hyphae

Que 11. How will the image formed by a convex lens be affected, if the upper half of the lens is wrapped with a black paper?

- (A) The size of the image formed will be one-half of the size of the image due to the complete lens.
- (B) The image of the upper half of the object will not be formed.
- (C) The brightness of the image will reduce.
- (D) The lower half of the inverted image will not be formed.

Solution The image formed by a convex lens will be affected if the upper half of the lens is wrapped with black paper in the following way:

(B) The image of the upper half of the object will not be formed.

Explanation: When the upper half of the convex lens is covered with black paper, light rays from the upper half of the object will be blocked, preventing them from forming an image. As a result, only the lower half of the object will produce an image.

Que 17. Assertion (A): Some vegetable oils are healthy.

Reason (R): Vegetable oils generally have long unsaturated carbon chains.

Solution (A) Assertion (A) is true because some vegetable oils, such as olive oil and avocado oil, contain unsaturated fats that are considered healthy for the heart.

(R) Reason (R) is also true because unsaturated fats typically have long carbon chains with double bonds, which contribute to their health benefits.

Que 18. Assertion (A): Sex of the children will be determined by what they inherit from their mother.

Reason (R): Women have XX sex chromosomes.

Solution (B) Assertion (A) is false because the sex of the children is determined by what they inherit from both parents, not just the mother.

(R) Reason (R) is true because women typically have two X chromosomes, which is one of the combinations that can determine the sex of the child.

Que 19. Assertion (A): Electrons move from lower potential to higher potential in a conductor.

Reason (R): A dry cell maintains electric potential difference across the ends of a conductor.

Solution (C) Assertion (A) is false because electrons move from higher potential to lower potential in a conductor, following the direction of the electric field.

(R) Reason (R) is true because a dry cell, like a battery, maintains a potential difference between its terminals, creating an electric field that can drive the movement of electrons through a conductor.

Que 20. Assertion (A): Ozone layer protects the surface of the Earth from harmful UV radiations.

Reason (R): Chlorofluorocarbons (CFCs) are responsible for depletion of the ozone layer.

Solution (A) Assertion (A) is true because the ozone layer in the Earth's stratosphere absorbs most of the Sun's ultraviolet (UV) radiation, protecting life on Earth from its harmful effects.

(D) Reason (R) is also true because chlorofluorocarbons (CFCs), which were used in products like aerosol sprays and refrigerants, were found to be major contributors to the depletion of the ozone

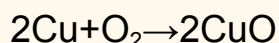
SECTION B

Questions no. 21 to 26 are very short answer type questions.

Que 21 .

(a) Copper powder is taken in a china dish and heated over a burner. Name the product formed and state its color. Write the chemical equation for the reaction involved.

Solution (a) When copper powder is heated over a burner, it undergoes oxidation to form copper oxide (CuO), which is black in color. The chemical equation for the reaction involved is:



OR

(b) Write a chemical equation for the chemical reaction which occurs when the aqueous solutions of barium chloride and sodium sulfate react together. Write the symbols of the ions present in the compound precipitated in the reaction.

Solution When aqueous solutions of barium chloride (BaCl_2) and sodium sulfate (Na_2SO_4) react together, a white precipitate of barium sulfate

($BaSO_4$) is formed. The chemical equation for the reaction is:
 $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$

Que 22. The melting and boiling points of carbon compounds are generally low and they are largely non-conductors of electricity. State two conclusions based on these two properties.

Solution The low melting and boiling points of carbon compounds and their non-conductivity of electricity indicate that they are generally molecular substances with weak intermolecular forces. Two conclusions based on these properties are:

Carbon compounds are likely to exist as discrete molecules held together by weak intermolecular forces.

These weak intermolecular forces make carbon compounds volatile and non-conductive.

Que 23. (a) Sometimes while running, the athletes suffer from muscle cramps. Why? How is the respiration in this case different from aerobic respiration?

Solution (a) Athletes may suffer from muscle cramps during running due to a buildup of lactic acid in muscles, leading to oxygen debt. In this case, the respiration is different from aerobic respiration as it proceeds without oxygen, known as anaerobic respiration.

OR

(b) Write the other name given to lymph. State its two functions.

Solution Lymph is also known as tissue fluid. Its two functions are:

Lymph helps in the transportation of fats and fat-soluble vitamins absorbed from the digestive system.

Lymph plays a role in the immune response by carrying lymphocytes and antibodies to fight against infections.

Que 24. Some unicellular organisms such as Plasmodium and Leishmania differ in the manner in which they reproduce. Name and explain the reproductive process taking place in them.

Solution Plasmodium reproduces by sporogony, a process involving the formation of sporozoites within sporozoan cells. Leishmania reproduces through binary fission, where the parent cell divides into two identical daughter cells.

Que 25. The heat produced at a point due to concentration of sunlight by a convex lens burns a paper.

(a) Explain why it happens.

Solution The heat produced at a point due to concentration of sunlight by a convex lens burns a paper because the concentrated sunlight raises the temperature of the paper to its ignition point, causing it to combust.

(b) Name the term (in the context of the lens used) given to the point at which the paper starts burning. What does the bright spot formed on the paper represent?

Solution The term given to the point at which the paper starts burning is the focal point of the lens. The bright spot formed on the paper represents the convergence of light rays at the focal point, resulting in intense heat.

Que 28. Name the ore of mercury and state the form in which it is found in nature. Write the chemical equations along with the condition required for the reactions involved in the extraction of mercury from its ore.

Solution Two animal hormones are insulin and thyroxine. Insulin is secreted by the pancreas, and it helps in growth and development by facilitating the uptake of glucose by cells for energy and promoting the synthesis of proteins and fats. Thyroxine is secreted by the thyroid gland,

and it regulates metabolism by controlling the rate of energy production and consumption in cells.

Que 29. Taking the example of any two animal hormones along with their gland of secretion, explain how these hormones help (i) in growth and development and (ii) regulate metabolism in the body.

Solution (i) Hormones aiding in growth and development:

Example 1: Growth Hormone (GH)

Secreted by: Pituitary Gland

GH stimulates growth in bones and tissues by promoting cell division and protein synthesis.

Example 2: Thyroid Hormones (T3 and T4)

Secreted by: Thyroid Gland

Thyroid hormones regulate metabolism and play a crucial role in the growth and development of tissues and organs.

(ii) Hormones regulating metabolism:

Example 1: Insulin

Secreted by: Pancreas

Insulin regulates glucose metabolism by promoting the uptake of glucose into cells, thus lowering blood glucose levels.

Example 2: Adrenaline (Epinephrine)

Secreted by: Adrenal Glands

Adrenaline regulates metabolism by increasing heart rate, dilating air passages, and mobilizing energy sources during fight or flight response.

Que 30 .Mendel crossed pure tall pea plants (TT) with pure short pea plants (tt)

and obtained F_1 progeny. When the plants of F_1 progeny were self-pollinated, plants of F_2 progeny were obtained.

(a) What did the plants of F_1 progeny look like? Give their gene combination.

Solution The plants of F_1 progeny were all tall and had the gene combination Tt.

(b) Why could the gene for shortness not be expressed in plants of F_1 progeny?

Solution In F_1 progeny, the gene for shortness (t) was masked by the dominant tallness gene (T).

(c) Write the ratio of the plants obtained in F_2 progeny and state the conclusion that can be drawn from this experiment.

Solution In F_2 progeny, the ratio of tall plants to short plants was approximately 3:1, indicating the presence of one dominant allele (T) and one recessive allele (t). This experiment demonstrates Mendel's Law of Segregation.

Que 32. (a) What happens when a bundle of wires of soft iron is placed inside the coil of a solenoid carrying a steady current? Name the device obtained. Why is it called so?

Solution When a bundle of wires of soft iron is placed inside the coil of a solenoid carrying a steady current, it becomes an electromagnet. This device is called an electromagnet because it produces a magnetic field when an electric current passes through it

(b) Draw the magnetic field lines inside a current carrying solenoid. What does this pattern of magnetic field lines indicate?

Solution The magnetic field lines inside a current-carrying solenoid are concentric circles around the coil. This pattern indicates a strong magnetic field within the solenoid, similar to that of a bar magnet.

Que 33. Differentiate between food chain and food web. In a food chain consisting of deer, grass and tiger, if the population of deer decreases,

what will happen to the population of organisms belonging to the first and third trophic levels?

Solution Food chain: Represents a linear sequence of organisms in an ecosystem, showing who eats whom.

Food web: Represents a network of interconnected food chains, showing multiple feeding relationships.

If the population of deer decreases in the food chain consisting of deer, grass, and tiger, it will affect the populations of organisms belonging to the first and third trophic levels. A decrease in deer population may lead to a decrease in the tiger population due to a reduced food source, while an increase in grass population may occur due to reduced grazing pressure.

SECTION D

Questions no. 34 to 36 are long answer type questions.

Que 34. (a) A few crystals of ferrous sulfate were taken in a dry boiling tube and heated. Tiny water droplets were observed in the tube after some time.

(i) From where did these water droplets appear? Explain.

(ii) What color change will be observed during heating?

(iii) How many molecules of water are attached per molecule of FeSO_4 crystal? Write the molecular formula of crystalline forms of (I) Copper sulfate, and (II) Sodium carbonate.

(iv) State how Plaster of Paris is obtained from gypsum. Write two uses of Plaster of Paris.

Solution (i) The water droplets observed in the boiling tube are formed due to the condensation of water vapor present in the air on the cooler surface of the tube.

(ii) The color change observed during heating is from light green (anhydrous) to white (hydrated).

(iii) The number of water molecules attached per molecule of FeSO_4 crystal is 7. The molecular formula of crystalline forms are:

(I) Copper Sulphate (Crystalline Form): $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

(II) Sodium Carbonate (Crystalline Form): $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

(iv) Plaster of Paris is obtained from gypsum by heating gypsum at 373 K.

Two uses of Plaster of Paris are:

It is used in making casts for setting fractured bones.

It is used in making decorative items and statues.

OR

(b) An acid 'X' present in tamarind when mixed with 'Y', produces a mixture 'Z'. 'Z' in addition to a dough when heated makes cakes soft and spongy. 'Y' is prepared from common salt and helps in faster cooking.

(i) Write the common names of X', 'Y' and 'Z', and the chemical formula of Y.

(ii) How is 'Y' prepared and how does it help in making cakes soft and spongy? Illustrate the reaction with a suitable chemical equation.

(iii) Write the name and chemical formula of a mild base other than 'Y' used as an antacid.

Solution i) Common names:

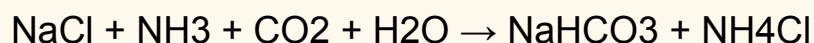
Acid 'X': Tartaric Acid

'Y': Sodium Bicarbonate (Baking Soda)

'Z': Carbon Dioxide

Chemical formula of 'Y': NaHCO_3

(ii) 'Y' is prepared by reacting sodium chloride (common salt) with ammonia and carbon dioxide. It helps in making cakes soft and spongy by releasing carbon dioxide gas when heated, which gets trapped in the dough, causing it to rise. The reaction is:



(iii) A mild base used as an antacid is Magnesium Hydroxide ($\text{Mg}(\text{OH})_2$).

Que 36.

(a)

(i) The potential difference across the two ends of a circuit component is decreased to one-third of its initial value, while its resistance remains constant. What change will be observed in the current flowing through it? Name and state the law which helps us to answer this question.

(ii) Draw a schematic diagram of a circuit consisting of a battery of four 1.5 V cells, a 5 Ω resistor, a 10 Ω resistor and a 15 Ω resistor and a plug key, all connected in series. Now find

(I) the electric current passing through the circuit, and

(II) potential difference across the 10 Ω resistor when the plug key is closed.

Solution (i) According to Ohm's Law, the current flowing through the circuit component will increase threefold.

(ii)

(I) Electric current passing through the circuit:

$$\text{Total EMF of batteries} = 4 \times 1.5 \text{ V} = 6 \text{ V}$$

$$\text{Total resistance of the circuit (R}_{\text{total}}) = 5 \Omega + 10 \Omega + 15 \Omega = 30 \Omega$$

$$\text{Electric current (I)} = \text{Total EMF} / \text{Total Resistance} = 6 \text{ V} / 30 \Omega = 0.2 \text{ A}$$

(II) Potential difference across the 10 Ω resistor:

$$\text{Potential difference (V)} = \text{Current} \times \text{Resistance} = 0.2 \text{ A} \times 10 \Omega = 2 \text{ V}$$

OR

(b)

(i) When is the potential difference between two points said to be 1 volt?

(ii) A copper wire has a diameter of 0.2 mm and resistivity of 1.6×10^{-8} Ωm . What will be the length of this wire to make its resistance 14 Ω ? How much does the resistance change, if the diameter of the wire is doubled?

Solution (i) The potential difference between two points is said to be 1 volt when 1 joule of work is done to move a charge of 1 coulomb between these two points.

(ii) Given:

Diameter of wire (d) = 0.2 mm = 0.2×10^{-3} m

Resistivity (ρ) = 1.6×10^{-8} Ω m

Resistance (R) = 14 Ω

We use the formula: $R = (\rho * L) / A$

Solving for length (L): $L = (R * A) / \rho = (14 * \pi * (0.1 \times 10^{-3})^2) / (1.6 \times 10^{-8}) \approx 0.27$ km

Doubling the diameter of the wire results in a resistance change of 4 times.

SECTION E

Questions no. 37 to 39 are case-based/data-based questions with 3 short sub-parts. Internal choice is provided in one of these sub-parts.

Que 37. Carbon is a versatile element that forms the basis of all living organisms and many of the things we use. A large variety of compounds is formed because of its tetravalency. Compounds of carbon are formed with oxygen, hydrogen, nitrogen, sulfur, chlorine and many other elements.

Answer the following questions:

(a) What are hydrocarbons?

Solution Hydrocarbons are organic compounds composed of carbon and hydrogen atoms bonded together in various ways. They are the simplest organic compounds and form the basis of many organic substances found in nature, including fossil fuels like petroleum and natural gas

(b) List two properties by virtue of which carbon can form a large number of compounds.

Solution Two properties by virtue of which carbon can form a large number of compounds are:

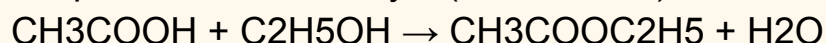
1. Tetravalency: Carbon has four valence electrons, allowing it to form stable covalent bonds with up to four other atoms, including other carbon atoms. This enables carbon to form long chains, branched structures, and ring structures, leading to the formation of diverse organic compounds.
2. Catenation: Carbon has the unique ability to form strong covalent bonds with other carbon atoms, resulting in the formation of long chains and complex molecular structures. This property of catenation allows carbon to form a wide variety of compounds, including straight-chain, branched-chain, and cyclic compounds.

(c) (i) Write the formula of the functional group present in (1) aldehydes, and (2) ketones. Write a chemical equation for the reaction that occurs between ethanoic acid and ethanol in the presence of a catalyst.

Solution

1. The functional group present in aldehydes is the carbonyl group (-CHO).
2. The functional group present in ketones is also the carbonyl group (-CO-).

Chemical equation for the reaction between ethanoic acid and ethanol in the presence of a catalyst (sulfuric acid):



OR

(c) (ii) What are structural isomers? Write the structures of two isomers of butane (C₄H₁₀).

Solution (ii)

Structural isomers are organic compounds that have the same molecular formula but different structural arrangements of atoms. This means they have different structural formulas and, therefore, different chemical properties.

The structures of two isomers of butane (C₄H₁₀) are:

n-Butane (normal butane): $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_3$

2-Methylpropane (or isobutane): $\text{CH}_3\text{-CH}(\text{CH}_3)\text{-CH}_3$

Que 38. Pollination is an important process in sexual reproduction of plants. It is an essential process that facilitates fertilization in plants. Pollinating agents can be wind, water, insects and birds. Several changes take place in the flower after the fertilization has taken place.

(a) Write the main difference between self-pollination and cross-pollination.

Solution The main difference between self-pollination and cross-pollination is the source of pollen. In self-pollination, the pollen from the same flower (or another flower of the same plant) fertilizes the ovule within the same flower. In cross-pollination, the pollen from one flower is transferred to the stigma of a different flower, either on the same plant or another plant of the same species.

(b) Name the part of the flower which attracts insects for pollination. What happens to this part after fertilization?

Solution part of the flower which attracts insects for pollination is usually the brightly colored petals and the sweet-smelling nectar produced by the flower. After fertilization, this part may wither and fall off, or it may remain as the fruit of the plant.

(c)

(i) Define fertilization. What is the fate of ovules and the ovary in a flower after fertilization?

Solution Fertilization is the process by which the male gametes (pollen) fuse with the female gametes (ovules) to form a zygote. After fertilization, the ovules develop into seeds, and the ovary of the flower develops into a fruit, which protects and nourishes the seeds.

OR

(c) (ii) In a germinating seed, which parts are known as future shoot and future root? Mention the function of cotyledon.

Solution In a germinating seed, the future shoot is known as the plumule, and the future root is known as the radicle. The cotyledon(s) store food reserves and provide nourishment to the developing seedling until it can produce its own food through photosynthesis.

Que 39. A highly polished surface such as a mirror reflects most of the light falling on it. In our daily life we use two types of mirrors: plane and spherical. The reflecting surface of a spherical mirror may be curved inwards or outwards. In concave mirrors, reflection takes place from the inner surface, while in convex mirrors reflection takes place from the outer surface.

(a) Define the principal axis of a concave mirror.

The principal axis of a concave mirror is an imaginary straight line passing through the center of curvature (C) and the pole (P) of the mirror. It is perpendicular to the surface of the mirror at its center.

(b) A ray of light is incident on a concave mirror, parallel to its principal axis. If this ray after reflection from the mirror passes through the principal axis from a point at a distance of 10 cm from the pole of the mirror, find the radius of curvature of the mirror.

Solution $R = -10 \text{ CM}$

(c) (i) An object is placed at a distance of 10 cm from the pole of a convex mirror of focal length 15 cm. Find the position of the image.

Solution $V = -30 \text{ CM}$

OR

(c) (ii) A mirror forms a virtual, erect and diminished image of an object. Identify the type of this mirror. Draw a ray diagram to show the image formation in this case.

Solution

Since the image formed is virtual, erect, and diminished, it indicates that the mirror is a convex mirror. In a convex mirror, the reflected rays diverge, so when extended backward, they appear to originate from a point behind the mirror. Here's a ray diagram showing the image formation:

Draw the principal axis (dotted line) passing through the pole (P) of the convex mirror.

Draw an arrow representing the object placed beyond the focal point.

Draw a ray parallel to the principal axis. After reflection, it appears to diverge from the focal point (F) behind the mirror.

Draw a ray passing through the focal point. After reflection, it becomes parallel to the principal axis.

The point where these reflected rays appear to meet is the virtual image (I), which is virtual, erect, and diminished compared to the object.