

CBSE Class 10 Science Solution

Set 3 - 31/5/3

SECTION A

Ques 2. 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 of 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 option (C). It should be: It has a very large surface area for glucose and oxygen to pass from mother to the embryo.

Ques 3. An aqueous solution 'A' turns phenolphthalein solution pink. When another aqueous solution 'B' is added to the pink solution, the pink colour disappears. Now when a few drops of solution 'A' are added to this reaction, the mixture appears pink again. The respective changes in the nature of the solution are from:

- (A) acidic basic basic**
- (B) basic acidic acidic
- (C) acidic basic acidic
- (D) basic acidic basic

Solution The respective changes in the nature of the solution are from option (A) acidic, basic, basic.

Ques 4. The correct sequence of events when someone's hand touches a hot object unconsciously:

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

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

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

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

Solution The correct sequence of events is option (C) Receptors in skin, Sensory neuron, Relay neuron, Motor neuron, Effector muscle in arm.

Ques 5. To balance the following chemical equation, the values of the coefficients x, y and z must be respectively: $Zn(NO_2)_x + y ZnO + z NO$

(A) 4,22

(11) 4.4.2

(C) 2,2,4

(D) 2.4.2

Solution The correct values of the coefficients are (C) 2, 2, 4.

Ques 6. Which of the following is a redox reaction, but not a combination reaction?

(A) $C + CO \rightarrow CO_2$

(B) $2H_2 + O_2 \rightarrow 2H_2O$

(C) $2Mg + O_2 \rightarrow 2MgO$

(D) $FeO + 3CO \rightarrow Fe + 3CO_2$

The redox reaction that is not a combination reaction is option (D) $FeO + 3CO \rightarrow Fe + 3CO_2$.

Ques 7. An aqueous solution of sodium chloride is prepared in distilled water. The pH of this solution is:

(A) 6

(B) 8

(C) 7

(D) 8

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

Ques 8. 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, MnO
- (C) Fe, FeO
- (B) Al, Al₂O
- (D) Mg, MgO

Solution

The metal 'X' and its oxide 'Y' respectively are option (B) Al, Al₂O₃.

Ques 9. The process in which transport of soluble products of photosynthesis takes place in plants is known as:

- (A) Transpiration
- (B) Evaporation
- (C) Conduction
- (D) Translocation

Solution The process in which transport of soluble products of photosynthesis takes place in plants is option (D) Translocation.

Ques 10. 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 option (A) Nose.

Ques 15 The color of light for which the refractive index of glass is minimum, is

- (A) Red
- (B) Yellow
- (C) Green
- (D) Violet

Solution The color of light for which the refractive index of glass is minimum is option (D) Violet

Ques 16. The current carrying device which produces a magnetic field similar to that of a bar magnet is:

- (A) A straight conductor
- (13) A circular loop
- (C) A solenoid
- (D) A circular coil

Solution. The current-carrying device which produces a magnetic field similar to that of a bar magnet is option (C) A solenoid.

For Questions number 17 to 20, two statements are given, one labeled as Assertion (A) and the other labeled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
- (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A)
- (C) Assertion (A) is true, but Reason (R) is false.
- (D) Assertion (A) is false, but Reason (R) is true.

Ques 17. 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 Assertion (A) is false.

Reason (R) is true.

Explanation: Electrons move from higher potential to lower potential in a conductor. The dry cell indeed maintains an electric potential difference across the ends of a conductor, but this doesn't imply that electrons move from lower to higher potential. Instead, they move from higher to lower potential.

Ques 18. Assertion (A): Some vegetable oils are healthy.

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

Solution

Both assertion (A) and reason (R) are true.

Explanation: Some vegetable oils, like olive oil and avocado oil, contain healthy unsaturated fats that can be beneficial for health. Vegetable oils typically consist of long unsaturated carbon chains, which contribute to their health benefits when consumed in moderation.

Ques 19. Assertion (A): Sex of the children will be determined by what they inherit from their mother.

Reason (R): Women have XX sex chromosomes.

Solution Assertion (A) is false.

Reason (R) is true.

Explanation: The sex of a child is determined by both parents. Women typically have XX sex chromosomes, but the sex of the child is determined by the combination of chromosomes from both parents. The father contributes either an X or a Y chromosome, determining the sex of the child.

Ques 20. Assertion (A): Green plants trap only 1% of the energy of sunlight that falls on their leaves.

Reason (R): All grown plants are the producers in a food chain.

Solution Assertion (A) is true.

Reason (R) is false.

Explanation: Green plants do indeed trap only a small fraction of the energy of sunlight that falls on their leaves, with estimates often around 1%. However, not all green plants are primary producers in a food chain. While many are, some green plants may be consumers or decomposers in various ecosystems.

SECTION B

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

Ques 21.

(a) Sometimes while running, the athlete suffers from muscle cramps. Why? How is the respiration in this case different from aerobic respiration?

OR

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

Write the formula and the molecular mass of the third homologue of alcohols, State how the boiling point of an alcohol changes as one moves from lower to higher homologues

Solution

(a) Athletes sometimes suffer from muscle cramps due to inadequate oxygen supply to muscles during anaerobic respiration.

(b) Lymph is also known as tissue fluid. Its functions include transporting fats and removing bacteria from tissues.

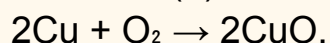
Formula and molecular mass of the third homologue of alcohols: C_3H_8O , molecular mass = 60 g/mol. Boiling point of alcohol increases with increasing molecular mass.

Ques 23. (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.

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 (a) Product formed: Copper oxide (black). Equation:



(b) Reaction: $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4$ (precipitate) + $2NaCl$. Ions:

Ba^{2+} , SO_4^{2-} .

Ques 24. Identify the organ in the human female reproductive system where the sperm encounters the egg cell. What will happen if it is blocked? Name the technique by which it can be blocked.

Solution The sperm encounters the egg in the fallopian tube. If blocked, fertilization may not occur. It can be blocked through tubal ligation.

Ques 25. "The linear magnification produced by a spherical mirror is +3." Based on this statement answer the following questions:

- (a) What is the type of mirror?
- (b) Where is the object located?
- (c) List two properties of the image formed (other than the size/magnification).

Solution (a) The mirror is concave.

(b) The object is located beyond the focal point.

(c) Properties of the image: Real and inverted.

Ques 26. The filament of an electric lamp draws a current of 0.5 A. which lights for 2 hours. Calculate the charge that flows through the circuit.

Solution Charge flowing through the circuit = Current \times Time = 0.5 A \times 2 hours = 1 Coulomb.

SECTION C

Questions no. 27 to 33 are short answer type questions.

Ques 27. Answer the following questions in the context of electrolysis of water:

- (a) Why is this reaction/process called a decomposition reaction?
- (b) Giving reason states whether this reaction is exothermic or endothermic.
- (c) Name the gasses collected at the anode and cathode.
- (d) What is the mass ratio of the gasses collected at the anode and cathode?

Solution

(a) This reaction/process is called a decomposition reaction because water molecules (H_2O) are broken down into their constituent elements, hydrogen (H_2) and oxygen (O_2).

(b) Electrolysis of water is an endothermic process because it requires input energy to break the bonds within water molecules.

(c) Hydrogen gas (H_2) is collected at the cathode, and oxygen gas (O_2) is collected at the anode.

(d) The mass ratio of the gasses collected at the anode and cathode is 1:2, which means for every one part of hydrogen produced, two parts of oxygen are produced.

Ques 28. 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: A linear sequence of organisms where each organism serves as a source of food for the next one.

Food Web: A complex network of interconnected food chains that illustrate the feeding relationships within an ecosystem.

If the population of deer decreases:

Organisms at the first trophic level (grass) may experience an increase in population due to reduced consumption by deer.

Organisms at the third trophic level (tiger) may experience a decrease in population due to scarcity of prey (deer) for hunting.

Ques 29. Name a plant growth hormone synthesized at the shoot tip. Explain its effect on the growth of a plant in response to light.

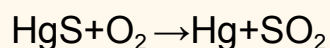
Solution Auxin is a plant growth hormone synthesized at the shoot tip. In response to light, auxin redistributes within the plant, causing phototropism. This hormone promotes cell elongation on the shaded side of the shoot, leading to bending towards the light source.

Ques 30. Name the ores 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

Ores of mercury: Cinnabar (HgS).

Form in nature: Found as cinnabar ore.



Condition: Roasting of cinnabar in the presence of air.

Ques 31. Mendel crossed pure tall pea plants (TT) with pure short pea plants (tt) and obtained F₁ progeny. When the plants of F₁ progeny were self-pollinated, plants of F₂ progeny were obtained.

(a) What did the plants of F₁ progeny look like? Give their genic combination.

(b) Why could the gene for shortness not be expressed in plants of F₁ progeny?

(c) Write the ratio of the plants obtained in F₂ progeny and state the conclusion that can be drawn from this experiment.

Solution(a) The plants of F₁ progeny were all tall and had the genotype Tt.

(b) The gene for shortness (t) could not be expressed in the F₁ progeny because the dominant allele (T) masked the expression of the recessive allele (t).

(c) The ratio of plants obtained in F₂ progeny is 3 tall (TT or Tt) to 1 short (tt). Conclusion: The trait for height segregates in a 3:1 ratio in the F₂ generation, indicating Mendel's law of segregation.

Ques 32. A 2000 W heater has a resistance of about 25 Ω, whereas a 100 W bulb has a resistance of 500 Ω. When 220 V is applied on them, then which of the two

(a) can carry large currents?

(b) may be used with an electrical circuit having 10 A rating?

(c) will be fitted with a 15 A electric board and not with a 5 A electric board ?

Justify your answer in each case.

Solution (a) The 100 W bulb has higher resistance (500Ω) compared to the 25Ω resistance of the 2000 W heater. According to Ohm's Law, $V = IR$. Since the heater has lower resistance, it can carry larger currents.

(b) Both the heater and the bulb can be used with an electrical circuit having a 10 A rating, as long as the voltage remains within the safety limits.

(c) The 2000 W heater should be fitted with a 15 A electric board, considering the power rating and potential current draw. The 100 W bulb can be fitted with a 5 A electric board

Ques 35

. (a) A few crystals of ferrous sulfate were taken in a dry boiling tube and heated. Tiny water droplets were served 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 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) These water droplets appeared due to the heating of ferrous sulfate crystals, which contain water molecules of crystallization. Upon heating, these water molecules are released as vapor, forming the tiny water droplets.

(ii) The color change observed during heating is from pale green (ferrous sulfate crystals) to white or colorless (anhydrous ferrous sulfate).

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

(I) Copper sulfate: CuSO_4

(II) Sodium carbonate: Na_2CO_3

(iv) Plaster of Paris is obtained from gypsum by heating gypsum at 373 K, which drives off the water of crystallization, resulting in the formation of Plaster of Paris. Two uses of Plaster of Paris are:

Used in orthopedic casts for setting broken bones.

Used in the construction industry for making molds and sculptures.

(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 An acid X present in tamarind when mixed with Y, produces a mixture Z. Y, prepared from common salt, helps in faster cooking and makes cakes soft and spongy.

(i) Common names:

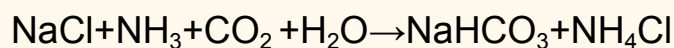
X: Tartaric acid

Y: Baking soda (sodium bicarbonate)

Z: Carbon dioxide gas

Chemical formula of Y: NaHCO_3

(ii) Baking soda (Y) is prepared by reacting sodium chloride (common salt) with ammonia and carbon dioxide:



Baking soda helps in making cakes soft and spongy by releasing carbon dioxide gas upon heating, which gets trapped in the batter, causing it to rise.

(iii) Name and chemical formula of a mild base:

Name: Magnesium hydroxide (milk of magnesia)

Chemical formula: $\text{Mg}(\text{OH})_2$

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

Ques 37. 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.

(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.

(c) 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 . (a) 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.

(b) $R = 40 \text{ CM}$

(c) $V = +30 \text{ CM}$ from the pole (P) of the convex mirror.

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 (c) (ii) A mirror that forms a virtual, erect, and diminished image of an object is a concave mirror. Here's a ray diagram to illustrate the image formation:

Concave mirrors are curved inward.

They reflect light rays divergently.

When an object is placed beyond the focal point, a virtual, erect, and diminished image is formed behind the mirror.

Ques 38, 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?

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

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

Solution

(a) Hydrocarbons are organic compounds consisting of hydrogen and carbon atoms. They are classified into two main types: aliphatic and aromatic.

(b) Last two properties:

Catenation: Carbon has the unique ability to form long chains or rings due to its tetravalency.

Isomerism: Carbon compounds can exist in different structural forms known as isomers, which have the same molecular formula but different structural arrangements.

(c) (1) Functional group in aldehydes: -CHO (carbonyl group)

(2) Functional group in ketones: -C(=O)- (carbonyl group)

Reaction between ethanol and ethanal in the presence of a catalyst (acid):
Ethanol+Ethanal→Ethyl ethanoate+Water

OR

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

Solution(c) Structural isomers are compounds with the same molecular formula but different structural arrangements. Two isomers of butane (C₄H₁₀) are:

n-butane (normal butane): CH₃-CH₂-CH₂-CH₃

Isobutane (2-methylpropane): CH(CH₃)₃

Ques 39. 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.

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

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

Solution

(a) Main difference between self-pollination and cross-pollination:

Self-pollination occurs within the same flower or between flowers of the same plant, while cross-pollination involves the transfer of pollen from the flower of one plant to the stigma of another plant.

(b) Part of the flower that attracts insects for pollination: The colorful petals and fragrant nectar attract insects. After fertilization, this part often withers or falls off.

(c) Fertilization is the fusion of male and female gametes, resulting in the formation of a zygote. After fertilization, ovules develop into seeds, and the ovary develops into a fruit.

OR

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

Solution

(i) Future shoot: Plumule

Future root: Radicle

Function of cotyledon: Provides nutrition to the developing seedling and may act as a seed leaf for photosynthesis until true leaves develop.