

CBSE Class 10 Science Solution 2024

Set 3 - 31/2/3

Section - A

Ques 1. An iron nail is placed in a solution of copper sulphate. The nail is taken out after 15 minutes. The nail will be found to be covered with

- (A) blue deposit
- (B) brown deposit
- (C) grey deposit
- (D) green deposit

Ans. (B)

Explanation: An iron nail is placed in solution of copper sulphate the nail is taken out after 15 minutes the nail will be found to be covered with brown deposit. This brown deposit is of copper. This reaction is a displacement reaction as more reactive iron displaced less reactive copper from its aqueous solution.

Ques 2. Consider the following cases:

- (a) $\text{CaSO}_4 + \text{Al} \longrightarrow$
- (b) $\text{CuSO}_4 + \text{Ca} \longrightarrow$
- (c) $\text{FeSO}_4 + \text{Cu} \longrightarrow$
- (d) $\text{ZnSO}_4 + \text{Mg} \longrightarrow$

The cases in which new products will form are-

- (A) (a) and (b)
- (B) (b) and (c)

(C) (c) and (d)

(D) (b) and (d)

Ans. (A)

Explanation: CaSO_4 (Calcium sulfate) and Al (Aluminium) – This is a metal and a salt reaction. This could potentially lead to a new product.

- CuSO_4 (copper sulfate) and Ca (calcium) – Similar to above, a metal calcium is reacting with a salt copper sulfate. This could create a whole new product in its own right.
- FeSO_4 (Iron sulfate) and Cu (copper) – These are both metal sulfates; that is, they are salts of a metallic element. Although they may work together, they can hardly be integrated fully to create entirely new products.
- There are two such types of compounds, they are ZnSO_4 (zinc sulfate) and Mg (magnesium). There is interaction present but the formation of new products is unlikely to occur.

Ques 3. Which of the following reactions is an endothermic reaction?

(A) Burning of coal

(B) Decomposition of vegetable matter into compost

(C) Process of respiration

(D). Decomposition of calcium carbonate to form quick lime and carbon dioxide.

Ans. (D)

Explanation: (D) Decomposition of calcium carbonate to form quick lime and carbon dioxide.

- This is an endothermic reaction. the word “endo” means “in” and the word “thermic” means heat. So an endothermic reaction requires heat.
- Heat is required for the decomposition of calcium carbonate (CaCO_3) to form quick lime (CaO) and carbon dioxide (CO_2)

Ques 4. The oxide which can react with HCl as well as KOH to give corresponding salt and water is

- (A) CuO
- (B) Al₂O₃
- (C) Na₂O
- (D) K₂O

Ans. (B)

Explanation: Here's why:

- CuO (Copper Oxide): This would not have a reaction with the base, KOH. It can also combine with HCl (acid) to form CuCl₂ (copper chloride) and water.
- Al₂O₃ (Aluminum Oxide): This is an amphoteric oxide; this is an oxide which can either act as an acid or a base. This compound can interact with acids and bases equally because it contains both a strong acid portion and a strong base part.
- Na₂O (Sodium Oxide) and K₂O (Potassium Oxide): These are metal oxides that when coming into contact with water, they react with it to produce sodium hydroxide (NaOH) and potassium hydroxide (KOH), respectively. Thus they did not undergo further reaction with HCl or KOH.

Ques 5. Juice of tamarind turns blue litmus to red. It is because of the presence of an acid called:

- (A) methanoic acid
- (B) acetic acid
- (C) tartaric acid
- (D) oxalic acid

Ans. (C)

Explanation: Tamarind's tartaric acid concentration accounts for its natural acidity.

- The antioxidant tartaric acid is what gives tamarind its acidic flavor.
- Bananas and grapes also contain tartaric acid, while citrus fruits do not.
- It is not as harsh as lemons and limes.

6. Consider the following statements about homologous series of carbon compounds:

- (a) All succeeding members differ by- CH_2 unit.
- (b) Melting point and boiling point increases with increasing molecular mass.
- (c) The difference in molecular masses between two successive members is 16 u.
- (d) C_2H_2 and C_3H_4 are NOT the successive members of alkyne series. The correct statements are-

- (A) (a) and (b)
- (B) (b) and (c)
- (C) (a) and (c)
- (D) (c) and (d)

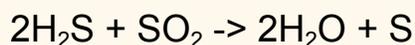
Ans. (A)

Explanation: Here's why:

- (a) Correct. This is true about homologous series. In each member, there is the same functional group, however, the length of the carbon chain is one carbon atom longer than that of the preceding member. The symbol “- CH_2 ” refers to the insertion of what is called methylene.
- (b) Correct. In a homologous series, it is observed that as the molecular weight increases, the forces of intermolecular interactions, like the London dispersion forces, are enhanced. process results in a greater energy being needed to overcome these forces and change the phase to a liquid or a gas. As a result, it has been observed that the melting point and boiling point generally rises as the molecular mass of the substance increases.

- (c) Incorrect. Although the number of atomic mass units added in going from one member of the series to the next is an -CH₂ unit, 16 u, the mass is not. A carbon atom has a mass of 12 u, and the two hydrogens have a mass of 2 u (1 u each). Therefore, the "-CH₂" unit contributes a 14 u (12 + 2), and not 16 u.
- (d) Correct. For the members to be in order of an alkyne series, the alkynes should have '-CH₂' difference between them. C₂H₂ (ethyne) contains two carbon atoms; On the Other Hand, C₃H₄ (propyne) has three carbon atoms. The difference is only one carbon atom and not some sort of "-CH₂"-part.

7. Identify the correct statement about the following reaction:



- (A) H₂S is oxidising agent and SO₂ is reducing agent.
- (B) H₂S is reduced to sulphur.
- (C) SO₂ is oxidising agent and H₂S is reducing agent.
- (D) SO₂ is oxidised to sulphur

Ans. (C)

Explanation:

- Oxidizing agent: Here, Sulphur dioxide (SO₂) acts as Oxidizing agent because it loses Oxygen atom and get reduced to S(Sulphur) therefore, it acts as Oxidizing agent.
- Reducing agent: In this reaction, H₂S(Hydrogen sulphide) by gaining Oxygen atom, it is oxidized to H₂O(Water) therefore, it acts as Reducing agent.

8. Select out of the following a gland which does NOT occur as a pair in the human body:

- (A) Pituitary
- (B) Ovary
- (C) Testis
- (D) Adrenal

Ans. (A)

Explanation: The pituitary gland does not occur in pairs, while the adrenal gland, testis (in male) and ovary (in female) do.

9. In human respiratory system, when a person breathes in, the position of ribs and diaphragm will be:

- (A) lifted ribs and curve/dome shaped diaphragm.
- (B) lifted ribs and flattened diaphragm.
- (C) relaxed ribs and flattened diaphragm.
- (D) relaxed ribs and curve/dome shaped diaphragm.

Ans. (B)

Explanation: During inhalation, the diaphragm flattens and the ribs move upwards and outwards due to contraction of the intercostal muscles. This increases the volume of the thoracic cavity and the pressure decreases. As the outside pressure is higher, air gushes into the lungs.

10. Which of the following statement(s) is (are) true about human heart?

- (a) Right atrium receives oxygenated blood from lungs through pulmonary artery.
- (b) Left atrium transfers oxygenated blood to left ventricle which sends it to various parts of the body.
- (c) Right atrium receives deoxygenated blood through vena cava from upper and lower body.
- (d) Left atrium transfers oxygenated blood to aorta which sends it to different parts of the body.

- (A) (a)
- (B) (a) and (d)
- (C) (b) and (c)
- (D) (b) and (d)

Ans. (C)

Explanation: The heart's four chambers are:

- Right atrium: This chamber receives oxygen-depleted blood returning from the body and pumps it into the right ventricle.
- Right ventricle: The right ventricle pumps blood from the right atrium to the pulmonary artery that sends the deoxygenated blood to the lungs, where it picks up oxygen.
- Left atrium: This chamber receives oxygenated blood from the lungs and pumps it to the left ventricle.
- Left ventricle: The thickest of all the chambers, the left ventricle is the difficult working part of the heart as it pumps blood throughout the whole body.

11. A cross made between two pea plants produces 50% tall and 50% short pea plants. The gene combination of the parental pea plants must be

- (A) Tt and Tt
- (B) TT and Tt
- (C) Tt and tt
- (D) TT and tt

Ans. (C)

Explanation: If the cross is carried out between a homozygous recessive organism and another organism showing the dominant phenotype and the

organism showing the dominant phenotype has a heterozygous genotype for the trait then the resulting F1 generation will have half of the organisms of the dominant phenotype (i.e 50%) and the other half of the recessive phenotype. So, both the parental characters will be seen. It can be shown by means of a Punnett square as shown in the image. (ii) The cross carried out is a test cross.

12. The maximum resistance of a network of five identical resistors of $1/5 \Omega$ each can be -

- (A) 1Ω
- (B) 0.5Ω
- (C) 0.25Ω
- (D) 0.1Ω

Ans. (A)

Explanation: Maximum resistance is obtained when all the resistors are connected in series.

$$\text{Effective resistance } R_{\max} = R + R + R + R + R = 5R$$

$$\text{Therefore, } R_{\max} = 5 * 1/5 = 1 \Omega$$

13. The speed of light in vacuum is $3 * 10^8$ m/s. If the speed of light in a medium is $2.25 * 10^8$ m/s, the absolute refractive index of the medium is

- (A) $7/6$
- (B) $5/4$
- (C) $4/3$
- (D) $5/2$

Ans. (C)

Explanation: We know that the refractive index of a medium = c/v_m

Where, v_m = speed of light in the medium = $2.25 * 10^8$ m/s

and, c = speed of light = $3 * 10^8$ m/s

Therefore, Refractive index of medium = $3 * 10^8$ m/s / $2.25 * 10^8$ m/s = 1.33

14. Study the following statements:

- (a) A fuse in a circuit prevents damage to the circuit due to overloading.
- (b) Total resistance in a circuit increases due to overloading.
- (c) During short circuiting the current in the circuit abruptly increases.
- (d) In order that each appliance has same current, they are connected in parallel to each other.

The correct statements are

- (A) (a) and (b)
- (B) (b) and (d)
- (C) (a) and (c)
- (D) (a), (c) and (d)

Ans. (C)

Explanation: Here's why:

- (a) Correct. A fuse is usually a safety device that, due to an overload, melts and splits the circuit as a result of an overload. This minimises on overheating of the circuit and also on the appliances that are connected to the circuit.
- (b) Incorrect. Overloading occurs when many appliances are connected to a single circuit and they draw a current rating that is more than the circuit can handle. This may lead to overheating and even damaging the component but it does not directly imply that total resistance in the circuit is enhanced. The value of resistance remains the same for each of the appliances.
- (c) Correct. In a short circuit, there is establishment of an abnormal path of extremely low resistance linking the live wire to the neutral. This significantly decreases the total opposition offered by the circuit, which enables a short burst of current.

- (d) Incorrect. This means that when the appliances are connected in parallel, each appliance will have its own separate path over which electrical current can flow. This does not necessarily mean that each of the appliances will be given the same current. Amperage in each appliance varies depending on a specific resistance of each appliance.

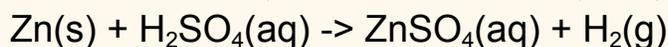
Section - B

15. a) Give one example of each of the following:

- (i) Chemical reaction showing evolution of gas.
- (ii) Change in the colour of the substance during a chemical reaction.

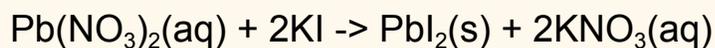
Ans. (i) Evolution of gas:

The chemical reaction between zinc and dilute sulphuric acid is characterized by the evolution of hydrogen gas.



(ii) Change in colour:

The reaction between lead nitrate solution and potassium iodide solution.



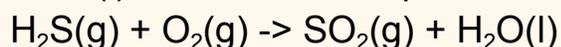
In this reaction colour changes from colourless to yellow.

OR

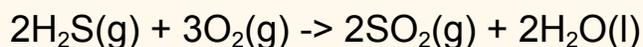
b) Translate the following statements into chemical equations and then balance them:

- (i) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
- (ii) Silver bromide on exposure to sunlight decomposes into silver and bromine.

Ans. (i) The chemical equation for the above statement is -

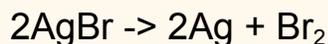


The balanced chemical equation for the above chemical equation will be



(ii) In this reactions, pale yellow colour of silver bromide changes to greyish white due to formation of silver metal.

The balanced chemical equation is as follows:



16. Name the blood vessel which brings blood to the kidneys. Why is nephron called a basic filtration unit of kidney? Write the role of tubular part of nephron in urine formation.

Ans. Blood flows into your kidney through the renal artery. The basic filtration unit of the kidney is called nephron as it is used to separate water, ions and small molecules from the blood, filter out wastes and toxins, and return the required molecules into the blood. The major function of tubules is reabsorption and the process can either be through active transport or passive transport. In addition, secretions by tubules help in the urine formation without affecting the electrolyte balance of the body.

17. Mendel crossed a round and yellow seeded pea plant with a wrinkled and green seeded pea plant. What did the plants of F_1 generation look like in terms of shape and colour of seed? On self-pollinating F_1 generation plants, plants with four types of combinations of characters were seen in F_2 generation. Write the combinations along with their ratios.

Ans. F_1 Generation:

In this cross round seed and yellow seed are dominant while wrinkled and green seeds are recessive. The genotypes of the two parental plants were purebred round-yellow plant (RRYY) and purebred wrinkled-green plant (rrgg), and all the plants in the F_1 generation were round yellow seeded (RrYy).

Here's why:

The alleles R and Y are dominant to recessive alleles r and g, thus only the dominant phenotypes namely round and yellow are displayed in the F₁ generation.

F₂ Generation:

When Mendel self pollinated the finish plants RrYy, seed shape and colour to be heterozygous in F₁ generation, the F₂ generation was expected to exhibit four phenotypes of seed shape and colour in a definite ratio.

Combinations and Ratios:

Round Yellow (RY): -9/16 as the most dominant odds for both traits

Round Green (RG): 3/16 (dominant for the shape, recessive for the color).

Wrinkled Yellow (Yr): 3/16: shape is recessive allele while the color is dominant.

Wrinkled Green (rg): It is a homozygous recessive genotype, 1/16 for both height and hair colour.

This 9:3:3:1 ratio is a basic concept of the Mendelian ratios where two independent genes regulating two different characteristics are involved.

Explanation:

In self-pollination of F₁ generation, the genotypes of the different alleles (R, r, Y, y etc) are recombined in the F₂ generation. This random segregation enables the exhibition of at least one dominant allele and one recessive allele in the F₂ generation. The specific ratio shows the chances of receiving various genotypes of the alleles involved.

18.a) A person suffering from an eye defect uses lenses of power -1 D . Name the defect of vision and list its two causes. State the nature (converging/diverging) of the corrective lens.

Ans. If person is suffering from an eye defect and uses a lens of power -1D , then he is suffering from the defect of vision called myopia.

Two causes for the development of myopia defect is -

Elongation or increase in the size of the eye lens - This leads to an increase in the distance of the retina from the eye lens. In such a case, the image of a distant object is formed in front of the retina.

Excessive curvature of the eye - This leads to the thickening of the eye lens which decreases the focal length of the eye lens. In such a case, the image of the object is formed in front of the retina.

The nature of lens used to correct this defect is concave lens.

OR

(b) What is presbyopia? Name the type of lenses used for the correction of this defect. State the nature (converging/diverging) of the upper part of such lenses.

Ans. Presbyopia is caused as part of the natural aging process of the eye. Presbyopia can be corrected by using bifocal lenses. Therefore option 2 is correct. The upper half of each lens is diverging and corrects myopia when the wearer is looking ahead at distant objects.

19. Name the term used for the materials which cannot be broken down by biological processes. Give two ways by which they harm various components of an ecosystem.

Ans. Substances that are not broken down by biological processes are said to be non-biodegradable. These substances may be inert and simply persist in the environment for a long period of time or may harm the various members of the ecosystem, e.g. plastic.

Section - C

20. (a) Sodium metal is stored under kerosene oil. Why?
(b) Some metal oxides are soluble in water. What are the aqueous solutions of these oxides called? Write one example of such a solution.
(c) At ordinary temperature the surface of metals such as magnesium, aluminium, zinc etc. is covered with a thin layer. What is the composition of this layer? State its importance.

Ans. a) Sodium is stored in kerosene because sodium reacts vigorously with oxygen and moisture due to its high reactivity so keeping it in kerosene will prevent sodium from coming in contact with oxygen and moisture.

b) Sodium oxide and Potassium oxide dissolve in water . These solutions in water are called Alkalis.

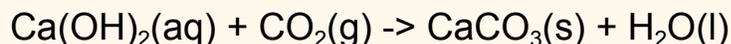
c) At ordinary temperature, the surfaces of metals such as magnesium, aluminium, zinc, lead, etc., are covered with a thin layer of oxide. The protective oxide layer prevents the metal from further oxidation. Iron does not burn on heating but iron filings burn vigorously when sprinkled in the flame of the burner.

21. It is observed that Calcium on reaction with water floats on its surface. Explain why it happens. Also write a balanced chemical equation for the reaction that occurs. What happens when the aqueous solution of the product of this reaction reacts with Carbon dioxide gas? Write a balanced chemical equation for the reaction.

Ans. The reaction of calcium with water is less violent. So, the heat released is not sufficient for the hydrogen to catch fire. Calcium starts floating because the bubbles of hydrogen gas which are formed during the reaction stick to the surface of the calcium metal and hence calcium floats on water.



When the aqueous solution of the product of this reaction reacts with Carbon dioxide gas it produces a solid calcium carbonate precipitate and water.



22. (a) List any two contraceptive methods practised only by women. Mention how these methods work.

(b) Write the two roles performed by testes in human males

Ans. (a) Two contraceptive methods practised only by women are

(i) Oral pills: Change hormonal balance so eggs are not released.

(ii) Loop / Copper-T : Placed in the uterus. Prevent pregnancy by checking the entry of sperms through the vagina.

(b) First, it produces spermatozoa, the male gametes. Second, it synthesizes testosterone, the principal male sex hormone.

23. (a) Give reasons for the following:

(i) Alveoli in lungs are richly supplied with blood capillaries.

(ii) Respiratory pigment in the blood takes up oxygen and not carbon dioxide.

(iii) During anaerobic respiration, a 3-carbon molecule is formed as an end product instead of CO_2 in human beings.

Ans. (i) Alveoli are richly supplied with blood so that exchange of gases can take place btw the membrane of alveoli and blood capillaries.

(ii) Hemoglobin is the respiratory pigment that carries oxygen to different body parts from the lungs. Carbon dioxide produced in the tissue regions is carried by the hemoglobin and brought back to the lungs for elimination out of the body.

(iii) During anaerobic respiration in humans, lactate, a 3-carbon molecule, is formed as an end product instead of carbon dioxide due to oxygen deficiency, allowing glycolysis to continue and ATP production to sustain in the absence of oxygen.

OR

(b) (i) Name the movements that occur all along the gut in human digestive system. How do they help in digestion?

(ii) Where is bile juice stored in human body? List two roles of bile juice

Ans. (i) The peristaltic movement also called as the Peristalsis refers to the contraction and relaxation of the food in the oesophagus and the food pipe and the food is forced down the track to the stomach. This movement is involuntary and is necessary for the movement of food down the stomach and bowels down the anus.

(ii) Bile is a fluid that is made and released by the liver and stored in the gallbladder. Bile juice helps in the absorption of fat-soluble vitamins. Bile also serves as the route of excretion for bilirubin, a by-product formed during the destruction of red blood cells.

24. Define the term power of accommodation of human eye. Write the name of the part of eye which plays a major role in the process of accommodation and explain what happens when human eye focuses (1) nearby objects and (ii) distant objects

Ans. Power of accommodation is the ability of the eye lens to focus near and far objects clearly on the retina by adjusting its focal length. The ciliary muscles are capable of modifying the curvature of the lens and thereby affecting the focal length of the lens. This adjustment in focal length is called the power of accommodation of the eye. Hence, the part of the eye which helps in its accommodation is ciliary muscles. When the ciliary muscles contract, the lens becomes thicker, decreasing its focal length to focus on near objects. Conversely, when the muscles relax, the lens

becomes thinner, increasing its focal length to focus on distant objects. This process enables clear vision across a range of distances.

25. Define the term solenoid. Draw the pattern of magnetic field lines around a current carrying solenoid. State how this magnetic field can be used to magnetise a piece of magnetic material, like soft iron.

Ans. A solenoid is a coil with many circular turns where the wire is tightly wrapped in the shape of a cylinder. It is used as an electromagnet.

26. Use of pesticides to protect our crops affect organisms at various trophic levels especially human beings. Name the phenomenon involved and explain how does it happen.

Ans. The phenomenon is known as biological magnification or biomagnification. Biomagnification happens when toxic chemicals, like DDT, whose remains in the environment are consumed indirectly by organisms through food. When an organism in the higher food chain consumes the lower organism containing such chemicals, the chemicals can get accumulated in the higher organism.

Section - D

27. (i) Distinguish between hormonal co-ordination in plants and animals.

(ii) Which part of the brain is responsible for-

(1) intelligence

(2) riding a bicycle

(3) vomiting

(4) controlling hunger

(iii) How is brain and spinal-cord protected against mechanical injuries?

Ans. (i) Hormonal co-ordination in plants involves plant hormones (phytohormones) regulating growth and development. In animals, hormonal co-ordination involves endocrine glands secreting hormones to control various physiological processes.

(ii)(1) Part of the brain that controls intelligence and memory is cerebrum.

(2) The cerebellum coordinates smooth body movements such as walking, dancing, riding a bicycle and picking up a pencil, etc.

(3) The reflex action during vomiting is controlled by the vomit centre in the Medulla oblongata. The medulla oblongata is connected by the pons to the midbrain and is continuous posteriorly with the spinal cord.

(4) Hunger is partly controlled by a part of your brain called the hypothalamus, your blood sugar (glucose) level, how empty your stomach and intestines are, and certain hormone levels in your body.

(iii) A bony box called the cranium protects the brain, while the spinal cord is covered by the vertebral column. These bony structures prevent the brain and the spinal cord from injuries.

