SET 1

Question 1:

In the following experimental setup of electrolysis of water, if P and Q are the gases collected in the test tubes enclosing the electrodes R and S, then select the option/options in which the matching is correct:

(i) P - Oxygen gas, R - Anode

(ii) P - Hydrogen gas, S - Cathode

(iii) Q - Hydrogen gas, R - Cathode

(iv) Q - Oxygen gas, S - Anode

(A) (i) and (ii)

(B) (iii) and (iv)

(C) (i) and (iii)

(D) (ii) and (iv)

Correct Answer: (C) (i) and (iii)

Question 2:

You have three aqueous solutions A, B, and C as given below:

A - Potassium nitrate

B - Ammonium chloride

C - Sodium carbonate

The ascending order of the pH of these solutions is:

(A) A << B << C

(B) B << C << A

(C) C << A << B

(D) B << A << C

Correct Answer:(C) C << A << B

Question 3:

Select from the following a statement which is not true about the burning of magnesium ribbon in air:

(A) It burns with a dazzling white flame.

(B) A white powder is formed on burning.

(C) It is an endothermic reaction.

(D) It is an example of a combination reaction.

Correct Answer: (C) It is an endothermic reaction.

Question 4:

A hydrocarbon which does not belong to the same homologous series of carbon compounds is:

(A) C_4H_{10}

(B) C_6H_{14}

(C) C_7H_{14}

(D) $C_{10}H_{22}$

Correct Answer: (D) $C_{10}H_{22}$

Question 5:

The colour of the solution observed after about 1 hour of placing iron nails in copper sulphate solution is:

(A) Blue

(B) Pale green

(C) Yellow

(D) Reddish brown

Correct Answer: (B) Pale green

Question 6:

Juice of tamarind turns blue litmus to red. It is because of the presence of a chemical compound called:

(A) Acetic acid

(B) Methanoic acid

(C) Oxalic acid

(D) Tartaric acid

Correct Answer: (D) Tartaric acid

Question 7:

The water of crystallization is present in:

(A) Bleaching Powder

(B) Washing Soda

(C) Plaster of Paris

(D) Baking Soda

Correct Answer: (C) (i) and (iii)

Question 8:

A tall pea plant with round seeds (TTRR) is crossed with a short pea plant with wrinkled seeds (ttrr). The F1 generation will be:

(A) 25% tall with round seeds

(B) 50% tall with wrinkled seeds

(C) 75% tall with wrinkled seeds

(D) 100% tall with round seeds

Correct Answer: (D) 100% tall with round seeds.

Question 9:

A pair of endocrine glands located in the human brain is:

(A) Parathyroid and Pituitary

(B) Pineal and Thymus

(C) Hypothalamus and Thymus

(D) Hypothalamus and Pineal

Correct Answer: (D) Hypothalamus and Pineal

Question 10:

Select the option having correct matching of the organism given in Column I with the mode of reproduction in Column II:

Column I	Column II
P - Leishmania	1. Regeneration
Q - Spirogyra	2. Multiple Fission
R - Planaria	3. Binary Fission
S - Plasmodium	4. Fragmentation
-	5. Budding

(A) P-4, Q-2, R-1, S-3

(B) P-3, Q-4, R-5, S-2

(C) P-3, Q-4, R-1, S-2

(D) P-4, Q-3, R-2, S-1

Correct Answer: (C) P-3, Q-4, R-1, S-2.

Question 11:

The basic filtration unit of the excretory system in human beings is:

(A) Nephron

(B) Urethra

(C) Neuron

(D) Urinary bladder

Correct Answer: (A) Nephron

Question 12:

In the human alimentary canal, the digestive juice secreted by the gastric glands is:

(A) Bile, Trypsin, Pepsin

(B) Hydrochloric acid, Pepsin, Mucus

(C) Lipase, Bile, Mucus

(D) Salivary amylase, Pepsin, Bile

Correct Answer: (B) Hydrochloric acid, Pepsin, Mucus

Question 13:

Identify from the following the ray diagram which shows the correct path of the reflected ray for the ray incident on a concave mirror as shown:

(A)

(B)

(C)

(D)

Correct Answer:(C)

Question 14:

The part of the human eye which controls the amount of light entering it is:

(A) Iris

(B) Cornea

(C) Ciliary muscles

(D) Pupil

Correct Answer: (A) Iris

Question 15:

Consider the following food chain:

Grass → Grasshopper → Frog → Snake → Eagle

If the amount of energy available at the third trophic level is 50 kJ, the available energy at the producer level was:

(A) 0.5 kJ

(B) 5 kJ

(C) 500 kJ

(D) 5000 kJ

Correct Answer: (D) 5000 kJ

Question 16:

The incorrect statement about ozone is:

(A) It is a deadly poisonous gas.

(B) It shields the surface of the earth from UV radiation from the sun.

(C) It is used as a refrigerant and in fire extinguishers.

(D) It is formed by combining oxygen molecules with free oxygen atoms.

Correct Answer: (A) It is a deadly poisonous gas.

Question 17:

Assertion (A): Carbon and its compounds are our major sources of fuels.

Reason (R): Most of the carbon compounds on burning release a large amount of heat and light.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Correct Answer: (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).View Solution

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Question 18:

Assertion (A): Xylem tissue moves water and minerals obtained from the soil by the roots.

Reason (R): Xylem tissue is found only in the roots of a plant.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Correct Answer: (C) Assertion (A) is true, but Reason (R) is false.

Question 19:

Assertion (A): In the common domestic circuit, the earth wire is connected to a metallic plate buried deep inside the earth.

Reason (R): Earth wire ensures that any leakage of current to the metallic body of the appliance keeps its potential to that of the earth, so the user may not get a severe electric shock.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Correct Answer: (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Question 20:

Assertion (A): Food web is a network of several food chains operating in an ecosystem.

Reason (R): Food web decreases the stability of an ecosystem.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Correct Answer: (C) Assertion (A) is true, but Reason (R) is false.

Question 21:

A light green coloured solution of sulphate salt of metal 'P' is taken in a beaker, a rod of another metal 'Q' is put in this solution as shown in the following figures:

Correct Answer: Metal 'P' is Copper (Cu), and metal 'Q' is Zinc (Zn). The reaction is: $Zn(s)+CuSO_4(aq)\rightarrow Cu(s)+ZnSO_4(aq)$ $Zn(s)+CuSO_4(aq)\rightarrow Cu(s)+ZnSO_4(aq)$ This reaction occurs because Zinc displaces Copper from its sulphate solution. Zinc is more reactive than Copper, which is consistent with the reactivity series.

Question 22:

(a) How is the brain protected in our body?

Correct Answer: The brain is protected by the skull, which forms a hard, bony protective layer around it. Additionally, the brain is cushioned by the cerebrospinal fluid (CSF), which helps to absorb shocks and impacts. The meninges, which are three protective membranes, further shield the brain from injury.

Question 22:

(b) A doctor finds in one of his patients that he is not maintaining a proper posture and balance of his body. State the region of the brain and also the part of the brain which is responsible for it.

Correct Answer:

The part of the brain responsible for maintaining posture and balance is the cerebellum. The cerebellum controls voluntary movements and helps in maintaining body posture and balance by coordinating muscular activity.

Question 23:

(a) "Proteins control the expression of various characters." Explain this statement by taking an example of "tallness" as a characteristic in plants.

Correct Answer:

Proteins are responsible for the expression of genetic traits through their role in gene expression and regulation. For example, in plants, the height or "tallness" characteristic can be controlled by the production of specific proteins. A gene encoding a growth hormone or related protein will direct the plant to grow taller. This process involves transcription and translation of genetic material to produce the necessary proteins that control cell division and elongation, contributing to the overall height.

Question 23:

(b) Explain the mechanism of inheritance used by sexually reproducing organisms to ensure the stability of DNA of the species.

Correct Answer: In sexually reproducing organisms, inheritance occurs through the passing of genetic material (DNA) from both parents. DNA from both the father and the mother combines during fertilization, resulting in offspring with a genetic makeup that is a combination of both parents. The process ensures the stability of DNA by maintaining the integrity of genes through generations, with mechanisms such as genetic recombination and mutation correction playing key roles in stabilizing the DNA.

Question 24:

(a) Study the figure in which the path of a ray of light going from Medium 1 to Medium 2 is shown.

Out of the two Media – Medium 1 and Medium 2, in which is the speed of light more?

Correct Answer: The speed of light is more in Medium 1 as the refracted ray bends away from the normal when it enters Medium 2, which suggests that the speed of light in Medium 1 is higher.

Question 24:

(b) State the reason for bending of the refracted ray away from the normal.

Correct Answer:

The bending of the refracted ray away from the normal is due to the difference in the speed of light in the two media. Light travels faster in Medium 1, and when it enters Medium 2, where the speed of light is slower, the ray bends away from the normal as per Snell's Law.

Question 24:

(c) Express refractive index of Medium 2 concerning Medium 1 in terms of speed of light in two media.

Correct Answer: The refractive index of Medium 2 concerning Medium 1 is given by the formula:$n_{2/1} = \frac{c_1}{c_2}$
Where:
 c_1 is the speed of light in Medium 1,
 c_2 is the speed of light in Medium 2.

Question 25:

Give reasons:
(a) The sky appears dark to passengers flying at very high altitudes.

(b) What is a rainbow? Why do we see a rainbow in the sky only after the rainfall?

Correct Answer:

At very high altitudes, passengers are above the atmosphere where there is less scattering of sunlight. As a result, they do not see the scattered blue light and the sky appears dark, similar to the condition experienced by astronauts in space.

(ii) 'Danger' signal lights are red.
Red light has the longest wavelength and the least scattering in the atmosphere. This makes red light more visible over longer distances, which is why it is used for 'Danger' signals.

(b) A rainbow is a meteorological phenomenon caused by reflection, refraction, and dispersion of light, which results in a spectrum of light appearing in the sky. It occurs when sunlight passes through raindrops, breaking the light into its constituent colors. We see a rainbow only after rainfall because the raindrops act as prisms, refracting and dispersing the light, and the sky is clear enough for sunlight to shine through.
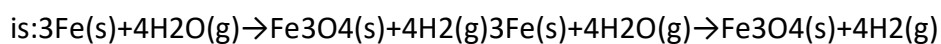
Question 26:

We do not clean natural ponds or lakes, whereas an aquarium or a swimming pool needs to be cleaned regularly. Why?

Correct Answer: Natural ponds and lakes have a self-cleaning system where natural processes such as filtration, sedimentation, and biological processes help maintain water quality. However, aquariums and swimming pools are enclosed and do not have these natural processes, which is why they require regular cleaning and maintenance to prevent the accumulation of waste and maintain clean water.

Question 27:

(a) Steam is passed over red hot iron.

Correct Answer: When steam is passed over red-hot iron, iron reacts with water vapor to form iron oxide and hydrogen gas. The balanced chemical equation for this reaction
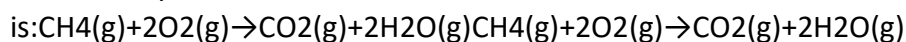
is:$3Fe(s)+4H_2O(g) \rightarrow Fe_3O_4(s)+4H_2(g)$ $3Fe(s)+4H_2O(g) \rightarrow Fe_3O_4(s)+4H_2(g)$
In this reaction, iron (Fe) reacts with steam (water vapor, H_2O) to form iron oxide (Fe_3O_4) and hydrogen gas (H_2).

Question 27:

(b) Natural gas is burnt in air.

Correct Answer: Natural gas primarily consists of methane (CH_4). When methane is burned in air (which provides oxygen), it reacts to form carbon dioxide and water. The balanced chemical equation for this combustion reaction
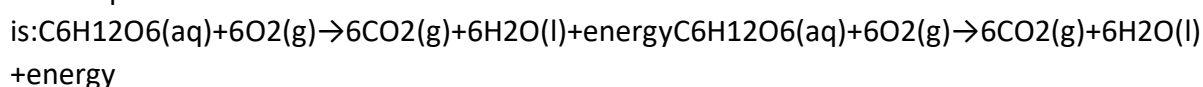is:$CH_4(g)+2O_2(g) \rightarrow CO_2(g)+2H_2O(g)$ $CH_4(g)+2O_2(g) \rightarrow CO_2(g)+2H_2O(g)$
In this reaction, methane (CH_4) reacts with oxygen (O_2) to form carbon dioxide (CO_2) and water vapor (H_2O).

Question 27:

(c) Glucose reacts with oxygen in the cells of our body and provides energy.

Correct Answer: In our body, glucose ($C_6H_{12}O_6$) reacts with oxygen (O_2) to produce carbon dioxide (CO_2), water (H_2O), and energy. This reaction is part of cellular respiration, which is an exothermic process that provides energy for our cells. The balanced chemical equation for this process
is:$C_6H_{12}O_6(aq)+6O_2(g) \rightarrow 6CO_2(g)+6H_2O(l)+energy$ $C_6H_{12}O_6(aq)+6O_2(g) \rightarrow 6CO_2(g)+6H_2O(l)+energy$
This process provides the energy necessary for the various biological functions of our body.
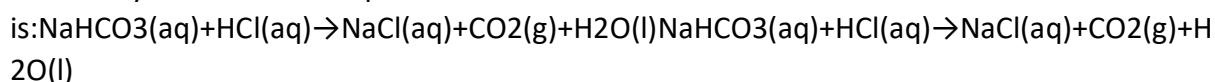Quick Tip: Balancing chemical equations requires ensuring that the number of atoms on both sides of the equation is the same. In combustion and respiration reactions, oxygen is crucial, and the products are often carbon dioxide and water.

Question 28:

(a) State the chemical property in each case on which the following uses of baking soda are based upon:

(i) As an anti-acid.

Correct Answer: Baking soda ($NaHCO_3$) acts as an anti-acid due to its ability to neutralize excess stomach acid. When baking soda reacts with hydrochloric acid (HCl) in the stomach, it produces sodium chloride (NaCl), carbon dioxide (CO_2), and water (H_2O), which relieves the acidity. The chemical equation
is:$NaHCO_3(aq)+HCl(aq) \rightarrow NaCl(aq)+CO_2(g)+H_2O(l)$ $NaHCO_3(aq)+HCl(aq) \rightarrow NaCl(aq)+CO_2(g)+H_2O(l)$
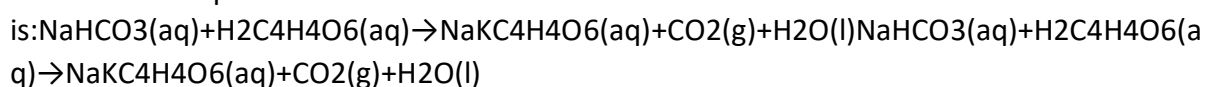Thus, the chemical property utilized here is its ability to neutralize acids.

Question 28:

(ii) As a constituent in making baking powder.

Correct Answer: Baking powder contains baking soda as one of its ingredients. When baking soda reacts with an acid like cream of tartar or vinegar, carbon dioxide gas is produced, causing the dough to rise. This reaction is the basis for baking soda's role in baking powder. The chemical equation is:$NaHCO_3(aq)+H_2C_4H_4O_6(aq)\rightarrow NaKC_4H_4O_6(aq)+CO_2(g)+H_2O(l)NaHCO_3(aq)+H_2C_4H_4O_6(aq)\rightarrow NaKC_4H_4O_6(aq)+CO_2(g)+H_2O(l)$
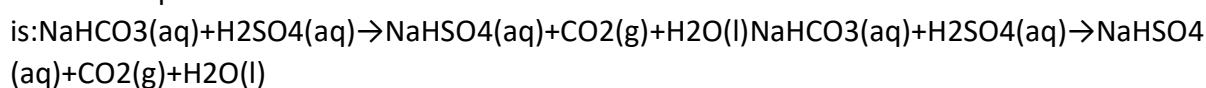
Here, the acid-base reaction produces carbon dioxide that helps in leavening the dough.

Question 28:

(iii) In soda-acid fire extinguishers.

Correct Answer: In soda-acid fire extinguishers, baking soda reacts with an acid (like sulfuric acid) to release carbon dioxide gas, which helps extinguish the fire by displacing oxygen. The chemical equation for this reaction is:$NaHCO_3(aq)+H_2SO_4(aq)\rightarrow NaHSO_4(aq)+CO_2(g)+H_2O(l)NaHCO_3(aq)+H_2SO_4(aq)\rightarrow NaHSO_4(aq)+CO_2(g)+H_2O(l)$

Thus, the chemical property used here is the production of CO2 when it reacts with acids.

Question 29

(a) Write chemical equations to show what happens when an acid reacts with:

(i) Metal.

Correct Answer: When an acid reacts with a metal, a salt and hydrogen gas are produced. For example, when zinc (Zn) reacts with hydrochloric acid (HCl), zinc chloride (ZnCl2) and hydrogen gas (H2) are formed. The chemical equation is: $Zn(s) + +2HCl(aq)\rightarrow ZnCl_2(aq)+H_2(g)Zn(s) + +2HCl(aq)\rightarrow ZnCl_2(aq)+H_2(g)$Quick Tip: Acid-base reactions always produce salt and water. Acids reacting with metals or carbonates can also produce hydrogen gas or carbon dioxide.

Question 29:

(ii) Base.

Correct Answer:

When an acid reacts with a base, a salt and water are produced in a neutralization reaction. For example, when hydrochloric acid (HCl) reacts with sodium hydroxide (NaOH), sodium chloride (NaCl) and water (H2O) are formed. The chemical equation is: $HCl(aq)+NaOH(aq)\rightarrow NaCl(aq)+H_2O(l)HCl(aq) NaOH (aq)\rightarrow NaCl(aq)+H_2O(l)$Quick Tip: Acid-base reactions always produce salt and water. Acids reacting with metals or carbonates can also produce hydrogen gas or carbon dioxide.
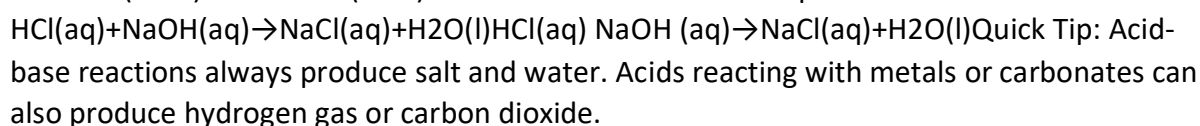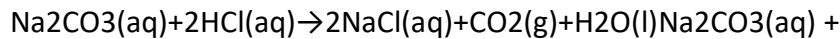
Question 29:

(iii) Carbonate.

Correct Answer: When an acid reacts with a carbonate, a salt, carbon dioxide (CO2), and water are produced. For example, when hydrochloric acid (HCl) reacts with sodium

carbonate (Na2CO3), sodium chloride (NaCl), carbon dioxide (CO2), and water (H2O) are formed. The chemical equation is:

$$Na_2CO_3(aq)+2HCl(aq)\rightarrow 2NaCl(aq)+CO_2(g)+H_2O(l)$$

Na2CO3(aq) + +2HCl(aq)→2NaCl(aq)+CO2(g)+H2O(l)Quick Tip: Acid-base reactions always produce salt and water. Acids reacting with metals or carbonates can also produce hydrogen gas or carbon dioxide.

Question 29:

(b) Name the blood vessel that brings (i) oxygenated blood (ii) deoxygenated blood, to the human heart. Also name that chamber of the heart which receives deoxygenated blood and state how deoxygenated blood from this chamber is sent to the lungs for oxygenation.

Correct Answer: (i) Oxygenated blood:
The blood vessel that brings oxygenated blood to the human heart is the pulmonary vein. This vein carries oxygen-rich blood from the lungs to the left atrium of the heart.

(ii) Deoxygenated blood:
The blood vessel that brings deoxygenated blood to the human heart is the superior and inferior vena cava. These veins carry deoxygenated blood from the body back to the right atrium of the heart.

Chamber receiving deoxygenated blood:
The chamber of the heart that receives deoxygenated blood is the right atrium. Blood flows into this chamber from the superior and inferior vena cava.

How deoxygenated blood is sent to the lungs for oxygenation:
Once deoxygenated blood enters the right atrium, it is pumped into the right ventricle, which then contracts to send the blood through the pulmonary artery to the lungs for oxygenation. The pulmonary artery carries the deoxygenated blood to the lungs, where it exchanges carbon dioxide for oxygen.

Question 30:

(a)List two observations made by Mendel in F1 generation plants.

Correct Answer:

Mendel made the following observations in the F1 generation:

1. All plants in F1 generation had purple flowers, indicating that the purple flower trait was dominant over the white flower trait.

2. The F1 plants were all hybrids, having a combination of WW and ww genes, but the dominant trait (purple) expressed itself in the phenotype.

Question 30:

(b) Give the

(i) percentage of white flowered plants and

(ii) ratio of the gene combinations WW, Ww, and ww in F2 generation.

Correct Answer:

When the F1 generation plants (all Ww) are crossed with each other, the generation shows the following results:

(i) Percentage of white flowered plants:

- White flowers occur in the generation when the genotype is ww. According to Mendel's ratio, 25 of the plants in the generation will have the white flower trait (ww).

(ii) Ratio of gene combinations WW, Ww, and ww in the generation:

- The ratio of gene combinations in a generation is 1:2:1. This means:

- 1 WW (homozygous dominant)

- 2 Ww (heterozygous)

- 1 ww (homozygous recessive)

Question 30:

(c) Write one difference between dominant and recessive trait.

Correct Answer: A dominant trait expresses itself in the phenotype even when only one copy of the allele is present, whereas a recessive trait only expresses itself when both alleles are recessive (i.e., in the homozygous recessive state).

Question 31:

(a) What is the focal length of the convex lens used? Give a reason to justify your answer.

Correct Answer: To determine the focal length of the lens, we need to use the lens formula:$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$
Where f is the focal length, v is the image distance, and u is the object distance.

- From the table, we can observe that as the object distance (u) decreases, the image distance (v) increases.

- This behavior is characteristic of a converging (convex) lens and suggests that the object is placed outside the focal length, but the exact focal length can be deduced if specific values

for uu and vv are considered. Given the data, the image moves further as the object distance decreases, which is consistent with a convex lens having a positive focal length.

Question 31:

(b) Which one of the sets of observations is not correct and why?

Correct Answer:- Observation (2) shows an image distance of +20 cm for an object distance of -60 cm. This is not correct because the image formed by a convex lens should be at a larger distance when the object is placed farther away.

The correct relationship should show the image moving towards the focal point as the object distance decreases. Thus, observation (2) seems to be incorrect.

Question 31:

(c) Draw a ray diagram to show image formation for any correct set of observations.

Correct Answer: Let's consider observation (4), where the object distance is -30 cm and the image distance is +30 cm. The ray diagram for this situation is as follows:

This diagram shows that the image is formed at the same distance as the object from the lens but on the opposite side of the focal point, as expected for a convex lens.

Question 32:

(a) Name the defect of vision the person is suffering from.

Correct Answer: The person is suffering from hypermetropia (farsightedness), which is a defect of vision where distant objects are seen more clearly than near objects. This defect occurs when the eye is too short or the cornea has too little curvature, causing light to focus behind the retina. Convex lenses are used to correct this defect by converging light before it enters the eye.

Question 32:

(b) List two causes of this defect.

Correct Answer: Two common causes of hypermetropia are:

1. Shortened eyeball: The eye's length from the cornea to the retina is too short, which prevents the image from being focused on the retina.

2. Weak curvature of the cornea or lens: If the cornea or lens is too flat, it cannot bend light rays sufficiently to bring them to focus on the retina.

Question 32:

(c) Determine the focal length of the lenses used in the spectacles.

Correct Answer: The power of a lens P is related to its focal length f by the formula:
$$P = \frac{1}{f}$$
Where P is the power in diopters (D) and f is the focal length in meters.

Given that the power $P = +2.0D$, we can calculate the focal length:
$$f = \frac{1}{P} = \frac{1}{2.0} = 0.5m$$

Thus, the focal length of the lenses used in the spectacles is 0.5 meters.

Question 33:

(a) Explain the statement "Potential difference between two points is 1 volt".

Correct Answer: The potential difference between two points is defined as the amount of work required to move a unit positive charge from one point to the other against the electric field. If the potential difference between two points is 1 volt, it means that 1 joule of work is done to move a charge of 1 coulomb from one point to another.

Mathematically, the potential difference V is given by: $V = \frac{W}{Q}$

Where W is the work done in joules and Q is the charge in coulombs.
Thus, a potential difference of 1 volt means 1 joule of energy is required to move 1 coulomb of charge between the two points.

Question 33:

(b) What do the symbols given below represent in an electric circuit? Write one function of each.
Correct Answer: (i) Symbol of a Battery (or Cell):
The symbol $+-+-$ represents a simple electric cell or battery in a circuit.

- Function: The function of a battery is to supply electrical energy to the circuit. It provides the voltage or potential difference that drives the current through the circuit.

(ii) Symbol of a Resistor:
The symbol $\triangle\triangle$ represents a resistor in an electric circuit.

- Function: The function of a resistor is to limit or control the flow of electric current in the circuit. It converts electrical energy into heat energy and helps in regulating the current in various parts of the circuit.

Question 34:

(a) Name an alcohol and a carboxylic acid having two carbon atoms in their structures. Draw their structures and state how this alcohol and carboxylic acid can be converted into a carboxylic acid. What happens when these two compounds react in the presence of an acid? Write chemical equations for the reactions involved in the two cases mentioned above.

Correct Answer: - The alcohol with two carbon atoms is ethanol (C2H5OH), and the carboxylic acid with two carbon atoms is acetic acid (CH3COOH).
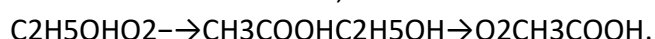
Ethanol Structure: C2H5OHC2H5OH
In the presence of oxygen or acid, ethanol can be oxidized to acetic acid (CH3COOH).

Acetic acid Structure: CH3COOHCH3COOH
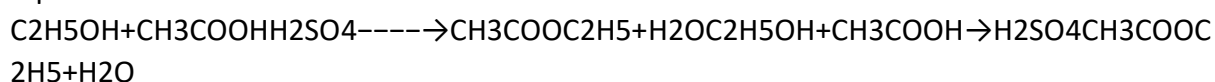
Conversion of Ethanol to Acetic Acid:
When ethanol is oxidized, it forms acetic acid. The reaction can be written as:
C2H5OHO2−→CH3COOHC2H5OH→O2CH3COOH.
This is an oxidation reaction where ethanol (an alcohol) is converted to acetic acid (a carboxylic acid) by the addition of oxygen.

Reaction of Ethanol and Acetic Acid in the Presence of Acid:
When ethanol and acetic acid react in the presence of an acid (e.g., concentrated HSO4, they undergo esterification to form ethyl acetate (an ester) and water. The chemical equation for this reaction is:
C2H5OH+CH3COOHH2SO4−−−−→CH3COOC2H5+H2OC2H5OH+CH3COOH→H2SO4CH3COOC2H5+H2O
In this reaction, ethyl acetate is formed along with water.

Question 34:

(b) What are soaps? Write the structure of a soap molecule. Explain the cleansing action of a soap. Why are soaps not considered suitable for washing clothes in a region where water is hard? How is this problem overcome?

Correct Answer:- Soaps are sodium or potassium salts of fatty acids, which are long-chain carboxylic acids. They are used as cleaning agents because they can remove dirt and oils from surfaces.

Structure of Soap Molecule:
A soap molecule consists of a long hydrocarbon chain (non-polar) attached to a carboxylate group (polar). The general formula for soap is: RCOONaRCOONa.
Where R is a long hydrocarbon chain.

Cleansing Action of Soap:
Soap molecules have two parts:

- The hydrophobic tail (non-polar) which is attracted to oils and grease.

- The hydrophilic head (polar) which is attracted to water.

When soap is added to water, the hydrophobic tail attaches to the grease or dirt, while the

hydrophilic head faces outward, forming micelles. The soap molecules surround the dirt or oil, allowing it to be removed by water.

Soaps in Hard Water:
In hard water, soap reacts with calcium (Ca) or magnesium (Mg) ions present in the water to form insoluble scum, which makes the soap less effective. This is why soap is not considered suitable for washing clothes in regions with hard water.

Overcoming Hard Water Problem:
To overcome this problem, water softeners (like washing soda, Na_2CO_3 can be used to remove calcium and magnesium ions from water. Washing soda reacts with Ca and Mg ions to form insoluble carbonates, thereby softening the water and allowing soap to work effectively.

Question 35:

(a) Define Puberty. List any two changes seen in boys at the time of puberty.

Correct Answer:

Puberty is the period of life when an individual becomes capable of sexual reproduction. It involves a series of physical, hormonal, and emotional changes that prepare the body for reproductive capability.

Two changes seen in boys at the time of puberty include:

1. Development of secondary sexual characteristics: This includes the growth of facial and body hair and deepening of the voice.

2. Increase in height and muscle mass: Boys experience a growth spurt, and there is an increase in muscle development.

Question 35:

(b) Why are testes in human males located outside the abdominal cavity in the scrotum?

Correct Answer: The testes are located outside the abdominal cavity in the scrotum to maintain a temperature lower than the body's core temperature, which is essential for the production of healthy sperm. Sperm production requires a temperature of around 2–3°C lower than the normal body temperature, and the scrotum helps regulate this temperature by contracting or relaxing in response to environmental conditions.

Question 35:

(c) List any three techniques of contraception used by humans. Which one of these is not meant for males?

Correct Answer: Three techniques of contraception used by humans include:

1. Condoms (for both males and females).

2. Oral contraceptives (birth control pills) – typically used by females.

3. Intrauterine device (IUD) – a device used by females to prevent pregnancy.

The technique that is not meant for males is the intrauterine device (IUD), as it is used in females to prevent pregnancy by being placed inside the uterus.

OR

Question 35:

(A) Name the part performing the following functions in the human female reproductive system:

(i) Production of eggs

(ii) Site of fertilization

(iii) Site of implantation

(iv) Entry of the sperms

Correct Answer:- Production of eggs: The ovaries are the organs responsible for the production of eggs (ova).

- Site of fertilization: Fertilization occurs in the fallopian tubes (also called oviducts)
.
- Site of implantation: The fertilized egg implants in the uterus.

- Entry of sperms: The sperms enter the female reproductive system through the vagina.

Question 35:

(B) What changes are observed in the uterus:

(i) After the implantation of the zygote and

(ii) If an egg does not get fertilized?

Correct Answer: After the implantation of the zygote: After the zygote implants in the uterine lining, the uterus thickens and remains prepared to support the pregnancy. Hormones such as progesterone maintain the uterine lining.

- If an egg does not get fertilized: If fertilization does not occur, the uterus sheds its lining

during menstruation, and the menstrual cycle continues. The egg is expelled from the body along with the uterine lining.

Question 36:

(a) What are magnetic field lines? How is the direction of the magnetic field at a point determined? Draw the pattern of magnetic field lines of the magnetic field produced by a current-carrying circular loop. Mark on it the direction of (i) current and (ii) magnetic field lines. Name the two factors on which the magnitude of the magnetic field due to a current-carrying coil depends.

Correct Answer: Magnetic Field Lines: Magnetic field lines represent the direction and strength of a magnetic field. These lines emerge from the north pole and enter the south pole. The denser the field lines, the stronger the magnetic field at that point.

Direction of Magnetic Field: The direction of the magnetic field at any point is determined by the right-hand rule. If you curl the fingers of your right hand in the direction of the current in a wire, the direction of your thumb gives the direction of the magnetic field lines.

Magnetic Field Due to a Current-Carrying Circular Loop:
For a circular loop carrying a current, the magnetic field lines form concentric circles around the wire and they pass through the center of the loop. The magnetic field is strongest at the center of the loop and decreases as you move away from the center.
Current:→ClockwiseorCounter−clockwisedependingontheview.Current:→ClockwiseorCounter−clockwisedependingontheview.MagneticFieldLines:→Formcircularloopsaroundthecurrent.MagneticFieldLines:→Formcircularloopsaroundthecurrent.

Factors Affecting the Magnitude of the Magnetic Field:
The magnitude of the magnetic field produced by a current-carrying coil depends on:
1. Current (I): The greater the current, the stronger the magnetic field.
2. Number of turns (N): More turns in the coil result in a stronger magnetic field.

Question 36:

(B) Why can't two magnetic field lines cross each other? Draw magnetic field lines showing the direction of the magnetic field due to a current-carrying long straight solenoid. State the conclusion which can be drawn from the pattern of magnetic field lines inside the solenoid.

Correct Answer: Why can't Two Magnetic Field Lines Cross Each Other?
If two magnetic field lines were to cross each other, it would imply that the magnetic field has two different directions at the same point, which is not possible. Therefore, magnetic field lines never intersect.

Magnetic Field Due to a Current-Carrying Long Straight Solenoid:
A solenoid is a coil of wire carrying a current. The magnetic field produced by a solenoid is uniform and parallel inside the solenoid, with the field lines forming straight lines from one end to the other. Outside the solenoid, the field lines are similar to the field of a bar

magnet, with distinct north and south poles.
Inside the solenoid: Uniform magnetic field, parallel lines.

Outside the solenoid: Like a bar magnet's field, with loops.

Conclusion from Magnetic Field Lines of a Solenoid:
The magnetic field inside the solenoid is uniform and parallel, and its strength depends on the current in the solenoid and the number of turns per unit length.

Question 37:

(I) How does electrical conductivity and melting point of a metal change when it is converted to its alloy by mixing a small amount of an element in it?

Correct Answer: When a metal is converted to an alloy by mixing a small amount of a different element, several physical properties of the metal change. For example:

- Electrical Conductivity: The electrical conductivity of a metal typically decreases when it is turned into an alloy. This happens because the atoms of the added element create irregularities in the atomic structure, which disrupt the free flow of electrons necessary for conduction.

- Melting Point: The melting point of an alloy often differs from the melting points of the constituent metals. Typically, alloys have a lower melting point than their pure components, especially if the alloy formation creates a new crystalline structure that requires less energy to break.

Question 37:

(II) What are alloys? How is 'Brass' (an alloy) prepared?

Correct Answer: Alloys are mixtures of two or more metals or a metal and a non-metal. The properties of alloys differ from those of pure metals, making them useful for various applications. Alloys are typically created by melting the metals together.

Brass is an alloy primarily composed of:

- Copper (Cu): 70-90

- Zinc (Zn): 10-30

Brass is prepared by melting copper and zinc together. It is widely used for making instruments, coins, and decorative items due to its corrosion resistance and aesthetic qualities.

Question 37:

(III) What is stainless steel? How is it prepared? Write one important property which makes it more useful in making cooking utensils as compared to its primary metal.

Correct Answer: Stainless Steel is a corrosion-resistant alloy made primarily of:

- Iron (Fe): 70-90

- Chromium (Cr): 10-20

- Nickel (Ni): 5-10

Stainless steel is prepared by adding chromium and nickel to steel, which enhances its corrosion resistance, especially to rust and staining. It is widely used in cooking utensils and other kitchenware due to its non-reactive nature with food and its high durability.

Important Property:
The presence of chromium in stainless steel forms a thin, self-healing layer of chromium oxide on the surface, making it resistant to corrosion and stains. This property makes it much more suitable than pure iron for cooking utensils.

Question 38:

(I)Name the movement which causes 'X' and 'Y' to grow downwards and upwards respectively. (Refer above figure)

Correct Answer:

- The movement which causes 'X' (roots) to grow downwards is called gravitropism (also known as geotropism), where the plant grows in response to gravity.

- The movement which causes 'Y' (stem) to grow upwards is called negative gravitropism (also known as geotropism), where the plant grows against gravity.

Question 38:

(II) Write the name of a hormone that plays a major role in (i) falling of leaves (ii) rapid cell division.

Correct Answer:- (i) The hormone that plays a major role in falling of leaves is Abscisic acid (ABA). ABA promotes leaf abscission, particularly under stress conditions such as drought.

- (ii) The hormone that plays a major role in rapid cell division is Cytokinins. Cytokinins promote cell division and are often found in areas of active growth.

Question 38:

(III) (a) Leaves of the sensitive plant move very quickly in response to 'touch'. How is this stimulus of touch communicated and explain how the movement takes place?

Correct Answer: The sensitive plant (Mimosa pudica) exhibits thigmotropism, which is the movement in response to touch.
- When the leaves of the sensitive plant are touched, it causes a rapid change in turgor pressure in the cells.
- The signal is first detected by mechanoreceptors in the plant's cells, which then trigger an electrical impulse that moves across the plant tissue.
- This causes a change in the flow of water in the plant cells, resulting in the leaves folding and drooping. This is a defense mechanism to avoid herbivory.

Question 38:

(B) Name the plant hormone which is synthesized at the shoot tip. How does this hormone help the plant to bend towards light?

Correct Answer:The plant hormone synthesized at the shoot tip is Auxin.

- Auxins promote cell elongation on the side of the plant that is away from the light, causing the plant to bend toward the light source.

- This phenomenon is known as phototropism, where the plant grows towards light to maximize photosynthesis.

Question 39:

(i) Draw a circuit diagram showing the above two resistors X and Y joined in parallel with same battery and same ammeter and voltmeter.

Correct Answer: In this case, we would rearrange the resistors into a parallel combination and ensure the same battery is connected along with the ammeter and voltmeter. The

circuit diagram for the parallel combination is shown below:
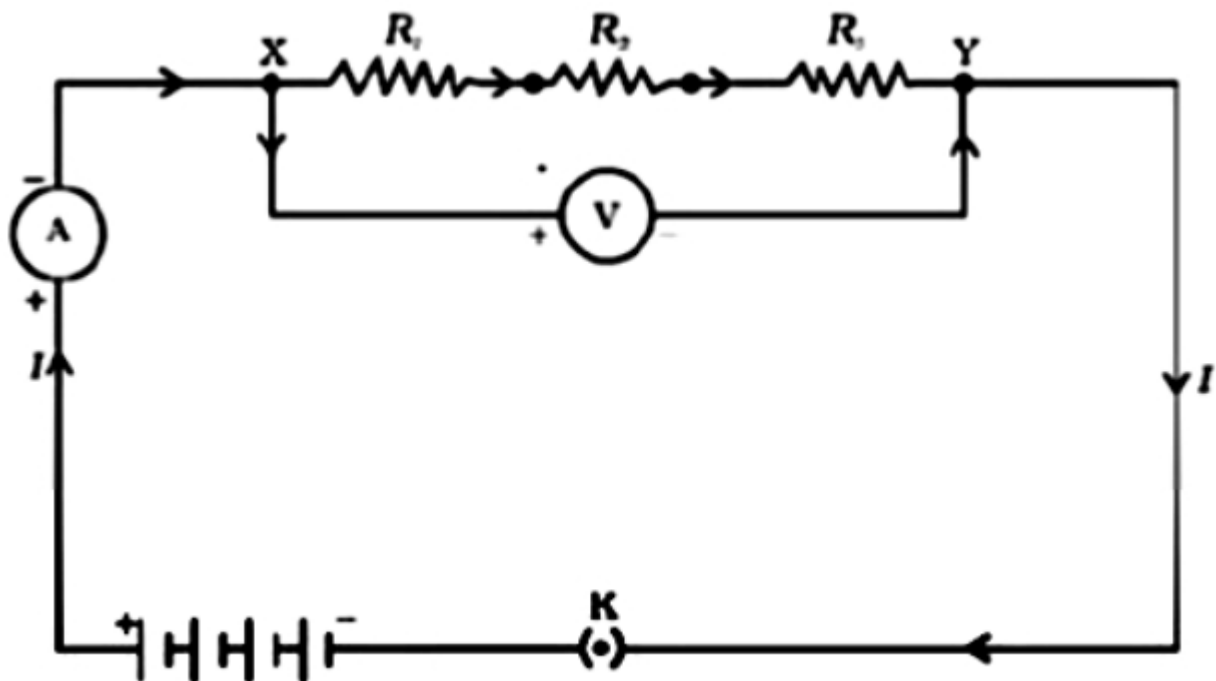
Question 39:

(ii) In which combination of resistors will the (i) potential difference across X and Y and (ii) current through X and Y, be the same?

Correct Answer: In a F2parallel combinationF2, the F2potential differenceF2 across each resistor is the same. Therefore, the potential difference across X and Y will be the same in parallel.

However, in F2series combinationF2, the current through both resistors will be the same as the same current flows through all components in a series circuit. Thus, the correct combination is the F2parallel combinationF2 for the potential difference and the F2series combinationF2 for the current.

Question 39:

(iii) Find the current drawn from the battery by the series combination of the two resistors (X and Y).

Correct Answer: In a series combination, the total resistance RtotalRtotal is the sum of the individual resistances:Rtotal=RX+RY=3Ω+6Ω=9ΩRtotal=RX+RY=3Ω+6Ω=9Ω

Using Ohm's law I=VRI=VR, where V=2VV=2V and Rtotal=9ΩRtotal=9Ω, we find the current II as:I=2V9Ω=0.222AI=2V9Ω=0.222A

Thus, the current drawn from the battery is 0.222A0.222A.

Question 39:

(b) Determine the equivalent resistance of the parallel combination of the two resistors (X and Y).

Correct Answer: In a parallel combination, the reciprocal of the total resistance RtotalRtotal is the sum of the reciprocals of the individual resistances:1Rtotal=1RX+1RY=13Ω+16Ω1Rtotal=1RX+1RY=13Ω+16Ω1Rtotal=26+16=361Rtotal=26+16=36Rtotal=63=2ΩRtotal=63=2Ω

Thus, the equivalent resistance of the parallel combination of the two resistors

is 2Ω2Ω.