Punjab Board Class 10 Science 2026 Question Paper with Solutions

Time Allowed :3 Hours	**Maximum Marks :**70	**Total questions :**30

General Instructions

Read the following instructions very carefully and strictly follow them:

1. Note :You must write the subject code/paper code 05/C in the bex provided on the title page of your anwwer book.
2. Make sure that answer book contains 24 pages (including title page) and are properly serialed as soon as you reccive it.
3. Question/s attempted after leaving blank pagels in the answer book would not be evaluated.
4. No extra sheet will be given. Write suitable answer and do not strike the written answer.
5. Annver should be hrief and to the point. Diaw labelled diagram where required.

1(i). What is focal length of a spherical mirror w.r.t. its radius of curvature ?

(A) Half

(B) Equal

(C) One Third

(D) One fourth

Correct Answer: (A) Half

Solution:

Step 1: Understanding the Concept:

For spherical mirrors (concave or convex) with a small aperture, the principal focus lies exactly halfway between the pole and the centre of curvature.

Step 2: Key Formula or Approach:

The relationship between the focal length (f) and the radius of curvature (R) is defined by the formula:

$$f = \frac{R}{2}$$

Step 3: Detailed Explanation:

The radius of curvature is the radius of the sphere from which the mirror was cut.

The focal length is the distance from the mirror's pole to its focal point.

Since the focal point is the midpoint of the radius, the focal length is half of the radius of curvature.

Step 4: Final Answer:

The focal length is half the radius of curvature.

Quick Tip

Always remember that $R = 2f$. In numerical problems, if the radius of curvature is given as 40 cm, the focal length will immediately be 20 cm.

1(ii). The human eye can focus on objects at different distances by adjusting the focal length of eye lens. This is due to :

(A) Presbyopia

(B) Accommodation

(C) Near-sightedness

(D) Far-sightendness

Correct Answer: (B) Accommodation

Solution:

Step 1: Understanding the Concept:

The human eye has the unique ability to change the curvature of its crystalline lens to focus on objects at varying distances.

Step 2: Detailed Explanation:

This adjustment is carried out by the ciliary muscles.

When viewing distant objects, the muscles relax, making the lens thin and increasing the focal length.

When viewing nearby objects, the muscles contract, making the lens thicker and decreasing the focal length.

This specific ability of the eye to adjust its focal length is termed the ”Power of Accommodation”.

Other options like Presbyopia or Myopia are defects of vision, not the mechanism of adjustment.

Step 3: Final Answer:

The ability to adjust the focal length of the eye lens is called accommodation.

Quick Tip

Accommodation power decreases with age, leading to a condition called Presbyopia where people struggle to see nearby objects clearly.

1(iii). The least distance of distinct vision for a young adult with normal vision about :

(A) 25 m

(B) 2.5 cm

(C) 25 cm

(D) 2.5 m

Correct Answer: (C) 25 cm

Solution:

Step 1: Understanding the Concept:

The ”near point” of the eye is the minimum distance at which an object can be seen clearly without any strain.

Step 2: Detailed Explanation:

For a healthy young adult with normal vision, the eye cannot focus on objects placed closer

than a certain limit because the ciliary muscles cannot strain the lens further.

Extensive biological studies and standard eye tests have established this average distance as 25 cm.

Holding a book closer than 25 cm causes the image to appear blurred and strains the eye muscles.

Step 3: Final Answer:

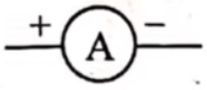
The least distance of distinct vision is 25 cm.

Quick Tip

Watch out for units in the options! 25 m and 2.5 cm are common distractors. Always ensure the value is 25 and the unit is centimeters (cm).

1(iv). Which of the following symbols show the correct component representing "Wires crossing without joining" ?

(A) 

(B) 

(C) 

(D) 

Correct Answer: (D) [

Solution:

Step 1: Understanding the Concept:

In electrical circuit diagrams, it is crucial to distinguish between wires that are physically connected and those that simply overlap in the drawing.

Step 2: Detailed Explanation:

Symbol (A) represents an inductor or a coil of wire.

Symbol (B) represents an ammeter used to measure electric current.

Symbol (C) shows a dot where lines meet, representing a wire joint or electrical connection.

Symbol (D) shows one line with a semicircular ”hump” over another straight line. This ”hump” indicates that the wires cross each other without making any electrical contact.

Step 3: Final Answer:

Option (D) is the standard symbol for wires crossing without joining.

Quick Tip

In professional schematics, a simple cross without a dot often means no connection, but for exams, the ”jump” or ”hump” symbol is the most correct choice.

1(v). Choose the correct non-biodegradable material among the following :

(A) Cake

(B) Flower

(C) Wood

(D) Plastic

Correct Answer: (D) Plastic

Solution:

Step 1: Understanding the Concept:

Biodegradable materials can be broken down by microorganisms into harmless substances. Non-biodegradable materials cannot be decomposed by natural biological processes.

Step 2: Detailed Explanation:

Cake is made of organic food substances and is easily decomposable.

Flowers are plant matter and are naturally biodegradable.

Wood consists of cellulose and is also biodegradable over a period of time.

Plastic is a synthetic polymer made from petroleum products. It is highly resistant to bacterial action and can persist in the environment for hundreds of years without decomposing.

Step 3: Final Answer:

Plastic is the non-biodegradable material.

Quick Tip

DDT, glass, and metals are other common examples of non-biodegradable pollutants frequently asked in exams.

1(vi). Which of the following is decomposer ?

(A) Vulture

(B) Fungus

(C) Amoeba

(D) Algae

Correct Answer: (B) Fungus

Solution:

Step 1: Understanding the Concept:

Decomposers are organisms that break down dead and decaying organic matter into simpler nutrients that return to the soil.

Step 2: Detailed Explanation:

Vultures are scavengers; they eat dead animals but do not decompose matter at the cellular level into soil nutrients.

Fungi (like mushrooms and molds) and bacteria are primary decomposers. They secrete enzymes to dissolve organic remains.

Amoebas are single-celled protozoans that act as consumers in aquatic food chains.

Algae are autotrophs (producers) that create their own food through photosynthesis.

Step 3: Final Answer:

Fungus is a classic example of a decomposer in an ecosystem.

Quick Tip

Decomposers are often called ”nature’s recyclers” because they prevent the accumulation of waste and replenish soil fertility.

1(vii). You will observe brown fumes when lead nitrate is heated in boiling tube ?

Brown fumes are due to :

(A) PbO

(B) NO_2

(C) $Pb(NO_3)_2$

(D) HNO_3

Correct Answer: (B) NO_2

Solution:

Step 1: Understanding the Concept:

When lead nitrate is heated, it undergoes thermal decomposition, breaking into simpler compounds including a brown gas.

Step 2: Key Formula or Approach:

The balanced chemical reaction is:

$$2Pb(NO_3)_2(s) \xrightarrow{\Delta} 2PbO(s) + 4NO_2(g) + O_2(g)$$

Step 3: Detailed Explanation:

$Pb(NO_3)_2$ is white lead nitrate powder.

Heating it produces lead monoxide (PbO), which is a yellow solid residue.

It also releases oxygen gas (O_2), which is colorless.

Most importantly, it produces nitrogen dioxide (NO_2), which is a gas characterized by its distinct reddish-brown color. These are the ”brown fumes” observed during the experiment.

Step 4: Final Answer:

The brown fumes are due to the evolution of Nitrogen dioxide (NO_2).

Quick Tip

Whenever you read ”brown fumes” in inorganic chemistry reactions, Nitrogen dioxide (NO_2) or Bromine gas are the prime candidates. In nitrate decomposition, it's always NO_2.

1(viii). Which one of the following types of medicine is used for treating in digestion ?

(A) Antibiotic

(B) Analgesic

(C) Antacid

(D) Antiseptic

Correct Answer: (C) Antacid

Solution:

Step 1: Understanding the Concept:

Indigestion or ”acidity” is caused by an excess of hydrochloric acid in the stomach.

Treatment requires a substance that can neutralize this acid.

Step 2: Detailed Explanation:

Antibiotics are used to fight bacterial infections.

Analgesics are used to reduce pain (painkillers).

Antacids are mild bases (like magnesium hydroxide or sodium bicarbonate) that react with stomach acid to form salt and water (neutralization reaction), providing relief from the burning sensation and pain of indigestion.

Antiseptics are used on skin wounds to prevent infection.

Step 3: Final Answer:

Antacids are used to treat indigestion.

Quick Tip

"Milk of Magnesia" ($Mg(OH)_2$) is a very popular antacid. Remember: Acid + Base $\rightarrow$ Salt + Water.

1(ix). Choose the correct chemical formula of Gypsum :

(A) $CaSO_4 \cdot 2H_2O$

(B) $CaSO_4 \cdot \frac{1}{2}H_2O$

(C) $CaSO_4$

(D) CaO

Correct Answer: (A) $CaSO_4 \cdot 2H_2O$

Solution:

Step 1: Understanding the Concept:

Gypsum is a mineral found in nature as calcium sulfate dihydrate, meaning it has two molecules of water of crystallization.

Step 2: Detailed Explanation:

The formula $CaSO_4 \cdot 2H_2O$ corresponds to Gypsum.

The formula $CaSO_4 \cdot \frac{1}{2}H_2O$ corresponds to Plaster of Paris (PoP).

$CaSO_4$ (without water) is anhydrous calcium sulfate or "dead burnt plaster".

CaO is calcium oxide (quicklime).

Step 3: Final Answer:

The correct chemical formula for Gypsum is $CaSO_4 \cdot 2H_2O$.

Quick Tip

Remember the temperature: Gypsum is heated to 373 K to lose 1.5 water molecules and turn into Plaster of Paris.

1(x). Which among the following is least reactive metal ?

(A) Al

(B) Fe

(C) Zn

(D) Mg

Correct Answer: (B) Fe

Solution:

Step 1: Understanding the Concept:

Metals can be arranged in a ”reactivity series” based on their ability to displace other elements or react with oxygen and water.

Step 2: Key Formula or Approach:

The reactivity order for these four common metals is:

$$Mg > Al > Zn > Fe$$

Step 3: Detailed Explanation:

Magnesium (Mg) is highly reactive and burns easily in air.

Aluminium (Al) and Zinc (Zn) are intermediate in reactivity.

Iron (Fe) is positioned below all of these in the reactivity series. It reacts slowly with air and water (rusting) compared to the vigorous reactions of the others.

Step 4: Final Answer:

Iron (Fe) is the least reactive among the given choices.

Quick Tip

Use the mnemonic: ”Please Stop Calling Me A Zebra, Instead Try Learning How Copper Saves Gold” to remember the series. Fe comes after Zn.

1(xi). While cooking, if the bottom of the vessel is getting blackened on the outside, what could be the reason for that ?

(A) The food is not cooked properly.

(B) The fuel is not burning completely.

(C) The fuel is wet.

(D) The fuel is burning completely.

Correct Answer: (B) The fuel is not burning completely.

Solution:

Step 1: Understanding the Concept:

Clean burning of fuels like LPG requires sufficient oxygen. If oxygen is limited, combustion is incomplete.

Step 2: Detailed Explanation:

Complete combustion of hydrocarbons produces a blue flame and no soot.

Incomplete combustion occurs when air inlets are blocked or oxygen supply is poor. This results in a yellow, ”sooty” flame.

The soot consists of fine, unburnt carbon particles. These particles settle on the cool outer surface of the cooking vessel, forming a black layer.

Step 3: Final Answer:

The blackening is due to the incomplete combustion of the fuel.

Quick Tip

A blue flame indicates complete combustion and higher efficiency, while a yellow flame indicates waste of fuel and carbon deposition.

1(xii). Choose the correct blood cells which helps to clot the blood at the time of injury :

(A) RBC

(B) WBC

(C) Lymph

(D) Platelets

Correct Answer: (D) Platelets

Solution:

Step 1: Understanding the Concept:

Blood is composed of specialized cells that perform distinct functions. One critical function is preventing excessive bleeding when a vessel is damaged.

Step 2: Detailed Explanation:

Red Blood Cells (RBCs) carry oxygen using hemoglobin.

White Blood Cells (WBCs) protect the body against pathogens (immunity).

Lymph is a tissue fluid, not a type of blood cell.

Platelets (thrombocytes) are cell fragments that circulate in the blood. When an injury occurs, they rush to the site, stick together to form a plug, and trigger a chemical cascade that leads to the formation of a permanent fibrin clot.

Step 3: Final Answer:

Platelets are the components responsible for blood clotting.

Quick Tip

A low platelet count can lead to excessive bleeding even from minor cuts, a condition sometimes seen in diseases like dengue.

1(xiii). The kidneys in human beings are a part of the system for :

(A) Nutrition

(B) Respiration

(C) Excretion

(D) Transportation

Correct Answer: (C) Excretion

Solution:

Step 1: Understanding the Concept:

The human body has specialized systems to process nutrients, move gases, and remove toxic wastes produced during metabolism.

Step 2: Detailed Explanation:

The nutrition system involves ingestion and digestion of food.

The respiratory system handles the exchange of O_2 and CO_2.

The transportation (circulatory) system moves blood through the body.

The excretory system is responsible for removing nitrogenous wastes like urea from the blood. The kidneys are the primary organs that filter blood to produce urine, which contains these wastes.

Step 3: Final Answer:

Kidneys are an integral part of the excretory system.

Quick Tip

The functional unit of the kidney is the nephron. Kidneys also play a key role in maintaining water and salt balance (osmoregulation).

1(xiv). Which is the main thinking part of the brain ?

(A) Fore-brain

(B) Hind brain

(C) Mid-brain

(D) Medulla

Correct Answer: (A) Fore-brain

Solution:

Step 1: Understanding the Concept:

The brain is divided into functional regions that control everything from basic survival reflexes to complex abstract thought.

Step 2: Detailed Explanation:

The fore-brain (specifically the cerebrum) is the largest and most complex part. It is responsible for intelligence, memory, abstract reasoning, and voluntary muscle movements. This is where ”thinking” happens.

The mid-brain and hind-brain primarily handle involuntary functions and coordination.

The medulla (part of hind-brain) specifically controls vital reflexes like heartbeat and breathing.

Step 3: Final Answer:

The fore-brain is the primary thinking part of the human brain.

Quick Tip

The fore-brain is also responsible for interpreting sensory information like sight, sound, and touch.

1(xv). Name the mode of reproduction which allow new generations to be created from a single individual :

(A) Sexual Reproduction

(B) Unisexual

(C) Bisexual

(D) Asexual reproduction

Correct Answer: (D) Asexual reproduction

Solution:

Step 1: Understanding the Concept:

Reproductive strategies differ based on whether one or two parents are involved in creating offspring.

Step 2: Detailed Explanation:

Sexual reproduction involves the fusion of male and female gametes, typically from two distinct parents.

”Unisexual” and ”Bisexual” are terms used to describe organisms with one or both types of

reproductive organs, respectively.

Asexual reproduction is a process where an individual can reproduce on its own without the formation or fusion of gametes. The offspring are genetically identical clones of the single parent. Examples include binary fission in bacteria or budding in Hydra.

Step 3: Final Answer:

Reproduction from a single individual is called asexual reproduction.

Quick Tip

Asexual reproduction is faster but results in less genetic variation compared to sexual reproduction.

1(xvi). The image formed by the concave mirror is observed to be virtual, erect and larger than the object. Where should be the position of an object ?

(A) Between the principal focus and the centre of curvature

(B) At the centre of curvature

(C) Beyond the centre of curvature

(D) Between the pole of the mirror and its principal focus

Correct Answer: (D) Between the pole of the mirror and its principal focus

Solution:

Step 1: Understanding the Concept:

A concave mirror forms real and inverted images for most positions. There is only one special case where it forms a virtual, erect, and magnified image.

Step 2: Detailed Explanation:

If an object is placed between the focus (F) and the center of curvature (C), the image is real, inverted, and magnified.

If an object is at C, the image is real, inverted, and the same size.

If an object is beyond C, the image is real, inverted, and smaller.

When an object is placed extremely close to the mirror—specifically between the pole (P)

and the principal focus (F)—the reflected rays diverge and never meet on the real side. They appear to come from behind the mirror, creating a virtual, upright (erect), and enlarged image.

Step 3: Final Answer:

The object position must be between the pole and the focus.

Quick Tip

This specific property is why concave mirrors are used as shaving or vanity mirrors, as they provide a clear, magnified, and upright view of the face.

---

2. Explain the formation of scum when hard water is treated with soap.

Correct Answer: Formation of insoluble calcium and magnesium salts of fatty acids.

Solution:

Step 1: Understanding the Concept:

Hard water contains dissolved salts of calcium and magnesium (usually chlorides, sulfates, or bicarbonates).

Soap is the sodium or potassium salt of long-chain fatty acids (like stearic acid).

Step 2: Detailed Explanation:

When soap is added to hard water, the sodium ions in the soap are displaced by the calcium (Ca^{2+}) or magnesium (Mg^{2+}) ions present in the water.

This displacement reaction results in the formation of insoluble precipitates, commonly known as "scum".

The general chemical reaction can be represented as:

$$2C_{17}H_{35}COONa(aq) + Ca^{2+}(aq) \rightarrow (C_{17}H_{35}COO)_2Ca(s) + 2Na^{+}(aq)$$

(Soap + Calcium ions $\rightarrow$ Calcium stearate/Scum + Sodium ions)

Because of this reaction, soap does not lather easily in hard water until all the calcium and magnesium ions are precipitated.

Step 3: Final Answer:

Scum is formed due to the reaction of soap with calcium and magnesium ions in hard water, producing insoluble precipitates.

Quick Tip

Detergents do not form scum with hard water because their calcium and magnesium salts are soluble in water. This is why detergents are preferred for washing in hard water areas.

---

3. Aluminium is a highly reactive metal, yet it is used to make utensils for cooking ? Give reason.

Correct Answer: Formation of a protective, non-reactive aluminium oxide layer.

Solution:

Step 1: Understanding the Concept:

While aluminium is high in the reactivity series, its surface behavior is unique when exposed to air.

Step 2: Detailed Explanation:

When aluminium is exposed to air, it reacts instantly with oxygen to form a very thin, tough, and stable layer of aluminium oxide (Al_2O_3) on its surface.

This oxide layer is non-porous and adheres strongly to the metal.

It acts as a protective shield that prevents the underlying metal from further oxidation or reacting with food and water during cooking.

Additionally, aluminium is a very good conductor of heat and is relatively cheap, making it ideal for cookware.

Step 3: Final Answer:

Aluminium is used for utensils because it forms a self-protecting oxide layer that prevents further corrosion and reaction with food.

Quick Tip

"Anodizing" is a process used commercially to thicken this natural oxide layer on aluminium utensils to make them even more resistant to corrosion.

---

4. Why Plaster of Paris should be stored in a moisture-proof container ?

Correct Answer: To prevent it from reacting with moisture and turning into hard Gypsum.

Solution:

Step 1: Understanding the Concept:

Plaster of Paris (PoP) is chemically calcium sulfate hemihydrate ($CaSO_4 \cdot \frac{1}{2}H_2O$). It has a strong affinity for water.

Step 2: Key Formula or Approach:

The reaction with water is:

$$CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O \rightarrow CaSO_4 \cdot 2H_2O$$

Step 3: Detailed Explanation:

When Plaster of Paris comes into contact with moisture (water vapor) from the air, it undergoes a chemical reaction to form Gypsum ($CaSO_4 \cdot 2H_2O$).

Gypsum is a very hard solid mass.

Once PoP turns into Gypsum, it loses its property of being molded into different shapes, making it useless for construction or medical casts.

To maintain its powdered form and usability, it must be kept away from humidity.

Step 4: Final Answer:

PoP is stored in moisture-proof containers to prevent its conversion into hard Gypsum.

Quick Tip

The "setting" of Plaster of Paris is an exothermic process, meaning it releases a small amount of heat when it reacts with water.

5. Do basic solutions also have $H^+(aq)$ ions ? If yes, then why are these basic ?

Correct Answer: Yes, but the concentration of OH^- ions is much higher than H^+ ions.

Solution:

Step 1: Understanding the Concept:

In any aqueous solution, there is an equilibrium between hydrogen ions (H^+) and hydroxide ions (OH^-). This is due to the self-ionization of water.

Step 2: Detailed Explanation:

Pure water contains equal amounts of both ions.

In a basic solution, bases release extra OH^- ions.

Even in the presence of many OH^- ions, a very small concentration of H^+ ions always exists.

The solution is classified as "basic" because the concentration of hydroxide ions $[OH^-]$ is significantly greater than the concentration of hydrogen ions $[H^+]$.

Conversely, in acidic solutions, $[H^+] > [OH^-]$.

Step 3: Final Answer:

Yes, basic solutions have H^+ ions, but they are basic because the concentration of OH^- ions far exceeds that of H^+ ions.

Quick Tip

Remember: $[H^+] \times [OH^-] = 10^{-14}$ at room temperature. If one increases, the other must decrease, but neither ever becomes zero.

---

6. What do you mean by Exothermic and Endothermic reaction ? Explain example.

Correct Answer: Exothermic releases heat; Endothermic absorbs heat.

Solution:

Step 1: Understanding the Concept:

Chemical reactions involve energy changes, usually in the form of heat being absorbed from or released to the surroundings.

Step 2: Detailed Explanation:

Exothermic Reaction: A reaction in which heat is evolved or released along with the formation of products.

Example: Burning of natural gas (methane).

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g) + \text{Heat}$$

Another example is Respiration.

Endothermic Reaction: A reaction in which heat or energy is absorbed from the surroundings to proceed.

Example: Decomposition of calcium carbonate.

$$CaCO_3(s) + \text{Heat} \rightarrow CaO(s) + CO_2(g)$$

Another example is Photosynthesis (absorbs light energy).

Step 3: Final Answer:

Exothermic reactions release energy (e.g., combustion), while endothermic reactions absorb energy (e.g., thermal decomposition).

Quick Tip

Most decomposition reactions are endothermic because they require energy to break chemical bonds, while most combination and combustion reactions are exothermic.

---

7. What happens when Magnesium ribbon is burnt ? Write its chemical equation also.

Correct Answer: It burns with a dazzling white flame to form Magnesium Oxide.

Solution:

Step 1: Understanding the Concept:

Magnesium is a reactive metal that reacts with oxygen when ignited.

Step 2: Key Formula or Approach:

The balanced chemical equation is:

$$2Mg(s) + O_2(g) \rightarrow 2MgO(s)$$

Step 3: Detailed Explanation:

When a magnesium ribbon is cleaned (to remove the protective oxide layer) and heated in air, it catches fire.

It burns with a characteristic and brilliant ”dazzling white flame”.

The reaction with atmospheric oxygen produces a white, powdery substance called Magnesium Oxide (MgO).

This is a combination reaction as two reactants form a single product.

Step 4: Final Answer:

Magnesium burns with a dazzling white flame to produce white Magnesium Oxide powder.

Quick Tip

Always wear safety goggles when performing this experiment, as the brilliant white light can be harmful to the eyes.

---

8. Define ecosystem. What is the role of decomposers in the ecosystem ?

Correct Answer: Ecosystem is the interaction of biotic and abiotic factors. Decomposers recycle nutrients.

Solution:

Step 1: Understanding the Concept:

An ecosystem is a functional unit of nature where living organisms interact among themselves and with the surrounding physical environment.

Step 2: Detailed Explanation:

Definition: An ecosystem consists of all the living organisms (biotic components like plants, animals) in an area interacting with the non-living (abiotic components like air, water, soil)

of that environment.

Role of Decomposers:

1. They break down complex organic substances (dead plants and animals) into simple inorganic substances.

2. These simple substances go back into the soil and are reused by producers (plants).

3. They act as ”natural cleaners” by disposing of dead remains.

4. They help in nutrient cycling, maintaining the balance of the ecosystem.

Step 3: Final Answer:

An ecosystem is an interactive system of biotic and abiotic components. Decomposers are essential for recycling nutrients back into the environment.

Quick Tip

Without decomposers, the earth would be covered with dead matter, and the soil would run out of nutrients for new plants to grow.

---

9. When does an electric short circuit occur ?

Correct Answer: When live and neutral wires come into direct contact.

Solution:

Step 1: Understanding the Concept:

An electric short circuit is a condition where the electrical resistance of a circuit becomes almost zero, causing an excessive current to flow.

Step 2: Detailed Explanation:

A short circuit occurs when the ”live wire” (positive) and the ”neutral wire” (negative) come into direct contact with each other.

This can happen due to:

1. Damage to the insulation of the wires.

2. A fault in an electrical appliance.

According to Ohm’s law ($I = V/R$), when resistance (R) becomes very small, the current (I)

increases abruptly.

This heavy current produces a large amount of heat, which can lead to sparks, melting of wires, and electrical fires.

Step 3: Final Answer:

A short circuit occurs when live and neutral wires touch directly, leading to an abrupt increase in current.

Quick Tip

An electrical fuse or a Miniature Circuit Breaker (MCB) is used in houses to protect against short circuits by breaking the connection when current exceeds a safe limit.

---

10. Why are copper and aluminium wires usually employed for electricity transmission ?

Correct Answer: High electrical conductivity and low resistance.

Solution:

Step 1: Understanding the Concept:

Efficiency in electricity transmission depends on minimizing energy loss due to heat. Materials with low resistivity are preferred.

Step 2: Detailed Explanation:

Copper and aluminium are among the best conductors of electricity.

They have very low electrical resistivity, which means they offer minimal opposition to the flow of current.

Lower resistance ($R = \rho L/A$) leads to less heat generation ($H = I^2Rt$) during transmission, reducing energy wastage.

Furthermore, copper is highly ductile and durable, while aluminium is much lighter and cheaper than copper, making it ideal for long-distance overhead power lines.

Step 3: Final Answer:

They are used because of their high conductivity, low resistivity, and cost-effectiveness.

Quick Tip

Silver is the absolute best conductor, but it is not used for transmission because it is extremely expensive.

---

11. How much current will an electric bulb draw from a 220 V source, if the resistance of the bulb filament is 1200 Ω ?

Correct Answer: 0.18 A (approx)

Solution:

Step 1: Understanding the Concept:

Current, voltage, and resistance are related by Ohm's Law.

Step 2: Key Formula or Approach:

Ohm's Law:

$$V = IR \text{ or } I = \frac{V}{R}$$

Where:

$V =$ Potential difference (Voltage)

$I =$ Electric current

$R =$ Resistance

Step 3: Detailed Explanation:

Given values:

$V = 220$ V

$R = 1200\ \Omega$

Plugging the values into the formula:

$$I = \frac{220}{1200}$$

$$I = \frac{22}{120} = \frac{11}{60}$$

$$I \approx 0.183 \text{ A}$$

Step 4: Final Answer:

The current drawn by the bulb is approximately 0.18 A.

Quick Tip

Always double-check the units. Current is in Amperes (A), Voltage in Volts (V), and Resistance in Ohms (Ω).

---

12. Why does the sky appear dark instead of blue to an astronaut ?

Correct Answer: Lack of atmosphere to scatter sunlight.

Solution:

Step 1: Understanding the Concept:

The blue color of our sky is due to the scattering of sunlight by the particles and gas molecules in the Earth's atmosphere (Rayleigh scattering).

Step 2: Detailed Explanation:

On Earth, the atmosphere scatters the shorter wavelengths of sunlight (blue/violet) in all directions, making the sky look blue.

Outer space is a vacuum and has no atmosphere or particles.

When astronauts are in space, there is nothing to scatter the sunlight toward their eyes.

As a result, no light reaches their eyes from the background space, and the sky appears completely black or dark.

Step 3: Final Answer:

The sky appears dark in space because there is no atmosphere to scatter sunlight.

Quick Tip

This is also why shadows on the moon are pitch black—there's no atmospheric scattering to provide "fill-in" light.

---

13. Draw diagram of human eye. Label lens, Ciliary muscles, Retina and Optic nerve.

Correct Answer: [A correctly labeled diagram showing key parts of the eye.]

Solution:

Step 1: Understanding the Concept:

The human eye is a complex sensory organ that acts like a camera to capture images.

Step 2: Key Formula or Approach:

To draw the diagram correctly:

1. Draw the outer spherical shape (Sclera).
2. Draw the transparent front bulge (Cornea).
3. Place the crystalline **Lens** behind the iris.
4. Show the **Ciliary muscles** attached to the lens to control its shape.
5. Label the inner back layer as the **Retina** (the light-sensitive screen).
6. Show the bundle of nerve fibers exiting the back as the **Optic nerve**.

Step 3: Final Answer:

sert high-quality labeled biological diagram of the eye here.

Quick Tip

Always use a sharp pencil for diagrams and ensure the labels are neat. The retina is where the image is actually formed.

---

14. Explain Magnification of lens.

Correct Answer: Ratio of height of image to height of object.

Solution:

Step 1: Understanding the Concept:

Magnification (m) produced by a lens is a measure of how much larger or smaller the image is compared to the original object.

Step 2: Key Formula or Approach:

The formula for magnification is:

$$m = \frac{\text{Height of image } (h')}{\text{Height of object } (h)}$$

In terms of distances:

$$m = \frac{v}{u}$$

where v = image distance and u = object distance.

Step 3: Detailed Explanation:

1. If $|m| > 1$, the image is enlarged.
2. If $|m| < 1$, the image is diminished.
3. If $|m| = 1$, the image is the same size as the object.
4. A positive sign $(+)$ for m means the image is virtual and erect.
5. A negative sign $(-)$ for m means the image is real and inverted.

Step 4: Final Answer:

Magnification is the ratio of image height to object height and indicates the nature and relative size of the image.

Quick Tip

Remember: For mirrors, $m = -v/u$, but for lenses, $m = +v/u$. Don't swap these!

---

15. How does an embryo, get nourishment inside the mother's body ?

Correct Answer: Through a specialized tissue called the placenta.

Solution:

Step 1: Understanding the Concept:

The developing embryo is connected to the mother's bloodstream to obtain necessary nutrients and oxygen.

Step 2: Detailed Explanation:

Nourishment is provided by a disc-like specialized tissue called the **Placenta**, which is embedded in the uterine wall.

The placenta contains villi on the embryo's side and blood spaces on the mother's side.
This structure provides a large surface area for the diffusion of glucose and oxygen from the mother's blood to the embryo.
Similarly, it also helps in removing waste products like carbon dioxide and urea from the embryo's blood into the mother's blood.

Step 3: Final Answer:

The embryo gets nourishment via the placenta, which facilitates the exchange of nutrients and waste between the mother and the fetus.

Quick Tip

The umbilical cord connects the fetus specifically to the placenta, acting as the primary lifeline during pregnancy.

---

16. What is the need for a system of control and coordination in an organism ?

Correct Answer: To ensure harmonious functioning of all organs and response to stimuli.

Solution:

Step 1: Understanding the Concept:

Multicellular organisms have various organs performing different functions simultaneously. These must be synchronized to maintain life.

Step 2: Detailed Explanation:

1. **Harmony:** It ensures that all organs work together at the right time. For example, during exercise, the heart rate and breathing rate increase together.
2. **Response to Stimuli:** It allows the organism to detect changes in the environment (stimuli) and react appropriately for survival (e.g., pulling back a hand from a hot object).
3. **Homeostasis:** It helps in maintaining a constant internal environment (like body temperature and blood sugar level).
4. **Growth and Development:** In plants and animals, hormones control growth patterns.

Step 3: Final Answer:

Control and coordination are essential for survival, organized growth, and responding efficiently to environmental changes.

Quick Tip

In animals, this is achieved through the Nervous and Endocrine systems. In plants, it is achieved solely through hormones.

---

17. What are plant hormones ? Give two examples.

Correct Answer: Chemical substances that regulate growth. Examples: Auxins, Gibberellins.

Solution:

Step 1: Understanding the Concept:

Plants do not have a nervous system. They coordinate their activities using chemical messengers called phytohormones.

Step 2: Detailed Explanation:

Definition: Plant hormones are naturally occurring organic chemical substances that are synthesized in one part of the plant (usually in very small amounts) and translocated to other parts to regulate physiological processes.

Examples:

1. **Auxins:** Promote cell elongation and are responsible for phototropism (bending towards light).
2. **Gibberellins:** Help in the growth of the stem and seed germination.

(Others include Cytokinins for cell division and Abscisic Acid for inhibiting growth).

Step 3: Final Answer:

Plant hormones are regulatory chemicals. Examples include Auxins and Gibberellins.

Quick Tip

Abscisic acid (ABA) is often called the ”stress hormone” of plants because it causes stomata to close during water shortages and promotes leaf fall.

---

18. What are the differences between the transport of materials in Xylem and Phloem ?

Correct Answer: Xylem transports water (upward); Phloem transports food (bidirectional).

Solution:

Step 1: Understanding the Concept:

Vascular plants have two distinct systems for moving essential substances.

Step 2: Detailed Explanation:

Xylem:

1. Primarily transports water and dissolved minerals from roots to leaves.
2. The flow is strictly **unidirectional** (upward only).
3. Transport occurs through physical forces like transpiration pull and root pressure.

Phloem:

1. Transports organic food (sucrose) from leaves to all other parts of the plant (translocation).
2. The flow is **bidirectional** (both upward and downward).
3. Transport is an active process requiring energy from ATP.

Step 3: Final Answer:

Xylem moves water upward using physical forces, whereas Phloem moves food in multiple directions using metabolic energy.

Quick Tip

Remember: ”X” for Xylem and ”W” for Water. ”P” for Phloem and ”F” for Food.

---

19. Find the power of a concave lens of focal length 4 m.

Correct Answer: -0.25 D

Solution:

Step 1: Understanding the Concept:

The power of a lens is the reciprocal of its focal length in meters.

Step 2: Key Formula or Approach:

Power (P) in dioptres (D) is given by:

$$P = \frac{1}{f(\text{in meters})}$$

Crucially, for a **concave lens**, the focal length is always taken as **negative**.

Step 3: Detailed Explanation:

Given:

Type of lens = Concave

Focal length, $f = -4$ m

Calculation:

$$P = \frac{1}{-4}$$

$$P = -0.25 \text{ D}$$

Step 4: Final Answer:

The power of the lens is -0.25 Dioptres.

Quick Tip

Always include the sign (+ or -) in the final answer for power. A negative sign confirms it is a diverging (concave) lens.

---

20. When a 12 V battery is connected across an unknown resistor, there is a current of 2.5 mA in the circuit. Find the value of resistance of that resistor.

Correct Answer: $4800\ \Omega$ or 4.8 kΩ

Solution:

Step 1: Understanding the Concept:

We use Ohm's law to find resistance from voltage and current.

Step 2: Key Formula or Approach:

Ohm's Law:

$$R = \frac{V}{I}$$

Step 3: Detailed Explanation:

Given values:

Voltage (V) = 12 V

Current (I) = 2.5 mA $= 2.5 \times 10^{-3}$ A $= 0.0025$ A

Calculation:

$$R = \frac{12}{0.0025}$$

$$R = \frac{12 \times 10000}{25}$$

$$R = 12 \times 400$$

$$R = 4800\ \Omega$$

Step 4: Final Answer:

The resistance of the unknown resistor is $4800\ \Omega$.

Quick Tip

Never forget to convert mA (milliampere) to A (ampere) by multiplying with 10^{-3} before doing calculations.

---

21. What is homologous series ? Explain with an example.

Correct Answer: Series of organic compounds with same functional group. Example: Alkanes.

Solution:

Step 1: Understanding the Concept:

Carbon compounds can be grouped into families where successive members differ in a predictable way.

Step 2: Detailed Explanation:

Definition: A homologous series is a series of carbon compounds that have the same functional group and similar chemical properties, but different physical properties.

Characteristics:

1. Any two adjacent members differ by a $-CH_2$ group.
2. Their molecular masses differ by 14 u.
3. They can be represented by a general formula.

Example: Alkanes

General Formula: C_nH_{2n+2}

1. Methane (CH_4)
2. Ethane (C_2H_6)
3. Propane (C_3H_8)

Notice that ethane has one more carbon and two more hydrogens than methane.

Step 3: Final Answer:

A homologous series is a family of organic compounds with same functional group, like the Alkane series (CH_4, C_2H_6, etc.).

Quick Tip

All members of a homologous series show similar chemical reactions because they contain the same functional group.

---

22. Define Oxidation, Reduction and Redox reactions.

Correct Answer: Oxidation is gain of O, Reduction is loss of O, Redox is both.

Solution:

Step 1: Understanding the Concept:

These definitions are based on the gain or loss of oxygen and hydrogen.

Step 2: Detailed Explanation:

1. **Oxidation:** A process which involves the gain of oxygen or the loss of hydrogen.

Example: $2Cu + O_2 \xrightarrow{\text{heat}} 2CuO$ (Copper is oxidized).

2. **Reduction:** A process which involves the loss of oxygen or the gain of hydrogen.

Example: $CuO + H_2 \xrightarrow{\text{heat}} Cu + H_2O$ (Copper oxide is reduced to copper).

3. **Redox Reaction:** A chemical reaction in which oxidation and reduction occur simultaneously. One substance gets oxidized while the other gets reduced.

Example: In the reaction $ZnO + C \rightarrow Zn + CO$, carbon is oxidized and zinc oxide is reduced.

Step 3: Final Answer:

Oxidation is oxygen gain, Reduction is oxygen loss, and Redox is a combined process.

Quick Tip

A more advanced definition (electronic concept) states: Oxidation is loss of electrons (**OIL**) and Reduction is gain of electrons (**RIG**).

---

23. Define saturated and unsaturated carbon compounds with examples.

Correct Answer: Saturated have single bonds; Unsaturated have double/triple bonds.

Solution:

Step 1: Understanding the Concept:

The classification is based on the type of bonding between carbon atoms.

Step 2: Detailed Explanation:

Saturated Carbon Compounds:

1. Compounds where the carbon atoms are linked by only **single bonds**.

2. They are generally less reactive.

3. Example: Alkanes like Methane (CH_4) or Ethane (C_2H_6).

Unsaturated Carbon Compounds:

1. Compounds where carbon atoms are linked by **double or triple bonds**.

2. They are generally more reactive than saturated ones.

3. Example: Alkenes like Ethene (C_2H_4) or Alkynes like Ethyne (C_2H_2).

Step 3: Final Answer:

Saturated compounds contain single C-C bonds (e.g., Methane), while unsaturated contain multiple bonds (e.g., Ethene).

Quick Tip

Unsaturated compounds can undergo "addition reactions" (like hydrogenation) to become saturated, while saturated ones cannot.

---

24. Draw label diagram of human respiratory system.

Correct Answer: [A correctly labeled diagram showing organs from nose to lungs.]

Solution:

Step 1: Understanding the Concept:

The respiratory system is responsible for gas exchange.

Step 2: Key Formula or Approach:

Key parts to include in your drawing:

1. **Nasal passage:** Entrance for air.

2. **Trachea:** Windpipe supported by cartilaginous rings.

3. **Bronchi:** Trachea split into two branches entering lungs.

4. **Bronchioles:** Finer divisions of bronchi.

5. **Alveoli:** Tiny air sacs at the end of bronchioles (site of gas exchange).

6. **Lungs:** Primary organs.

7. **Diaphragm:** Muscle layer at the bottom.

Step 3: Final Answer:

sert a biological diagram showing the pathway from nasal cavity to alveoli.

Quick Tip

Alveoli provide a very large surface area to make gas exchange more efficient. Cartilaginous rings in the trachea prevent it from collapsing when air pressure is low.

---

25. How does our body respond when adrenalin is secreted into the blood ?

Correct Answer: ”Fight or flight” response—increased heart rate and breathing.

Solution:

Step 1: Understanding the Concept:

Adrenaline is a hormone secreted by the adrenal glands during emergency or stressful situations.

Step 2: Detailed Explanation:

1. **Heart Rate:** The heart beats faster, resulting in supply of more oxygen to the muscles.
2. **Breathing Rate:** The breathing rate increases because of contractions of the diaphragm and rib muscles.
3. **Blood Flow:** Blood is diverted away from the digestive system and skin towards the skeletal muscles.
4. **Energy:** Glycogen in the liver is converted into glucose for immediate energy.

All these changes combined prepare the body to either fight the danger or run away from it (fight or flight response).

Step 3: Final Answer:

The body enters a state of high alert with increased heartbeat and respiration to deal with an emergency.

Quick Tip

Adrenaline acts directly on the heart and other target organs to produce a very rapid response compared to other hormones.

---

26. How do Mendel's experiments show that traits are inherited independently ?

Correct Answer: Through the dihybrid cross and the 9:3:3:1 ratio.

Solution:

Step 1: Understanding the Concept:

Mendel conducted "dihybrid crosses" where he studied two different pairs of contrasting characters at once.

Step 2: Detailed Explanation:

He crossed a pea plant having **Round Yellow** seeds ($RRYY$) with one having **Wrinkled Green** seeds ($rryy$).

The F_1 generation all had Round Yellow seeds ($RrYy$).

When the F_1 plants were self-pollinated, the F_2 generation showed four types of seeds:

1. Round Yellow (Parental)
2. Round Green (**New combination**)
3. Wrinkled Yellow (**New combination**)
4. Wrinkled Green (Parental)

The appearance of "Round Green" and "Wrinkled Yellow" proves that the gene for seed shape and the gene for seed color do not stay together; they separate and recombine independently.

Step 3: Final Answer:

Independent inheritance is proved by the appearance of new combinations of traits in the F_2 generation of a dihybrid cross.

Quick Tip

This is known as Mendel's "Law of Independent Assortment". It only applies to genes located on different chromosomes.

---

27. Write uses of convex mirror and concave mirror.

Correct Answer: Concave for shaving/dentists; Convex for rear-view in vehicles.

Solution:

Step 1: Understanding the Concept:

Mirrors are chosen based on the type of image (magnified, diminished, erect, or real) they produce.

Step 2: Detailed Explanation:

Uses of Concave Mirror:

1. **Shaving/Makeup mirrors:** To see a magnified, erect image of the face.
2. **Dentist's mirrors:** To see large images of the patient's teeth.
3. **Solar furnaces:** To concentrate sunlight at a single point to produce high heat.
4. **Headlights:** To get powerful parallel beams of light.

Uses of Convex Mirror:

1. **Rear-view mirrors in vehicles:** They always give an erect image and have a wide field of view, allowing the driver to see more traffic behind them.
2. **Blind turns/Street security:** Used in sharp curves or parking lots to see around corners.

Step 3: Final Answer:

Concave mirrors are used for magnification (shaving, dentists), while convex mirrors are used for wide coverage (vehicle rear-view).

Quick Tip

A convex mirror is also called a "diverging mirror," while a concave mirror is called a "converging mirror."

28. Explain Ohm's Law with the help of Electric Circuit.

Correct Answer: Ohm's Law states that the current flowing through a conductor is directly proportional to the potential difference across its ends, provided physical conditions like temperature remain constant ($V \propto I$).

Solution:

Step 1: Understanding the Concept:

Ohm's law defines the relationship between Voltage (V), Current (I), and Resistance (R).

Step 2: Key Formula or Approach:

The mathematical expression is:

$$V = IR$$

where R is the constant of proportionality called resistance.

Step 3: Detailed Explanation:

Circuit Diagram Components: To verify this law, we need a battery, an ammeter (in series), a voltmeter (in parallel to the resistor), a resistor (nichrome wire), a rheostat (variable resistor), and a switch.

Procedure:

1. Connect the circuit as described.
2. Initially, use one cell and record the ammeter reading (I) and voltmeter reading (V).
3. Gradually increase the number of cells (or adjust the rheostat) to increase current.
4. Record several sets of V and I values.
5. Plot a graph of V vs I. The graph will be a straight line passing through the origin.
6. The constant slope (V/I) represents the resistance (R) of the conductor.

Step 4: Final Answer:

Ohm's law is verified by a linear V-I graph, showing that V increases proportionally with I at constant temperature.

Quick Tip

In a V-I graph, the slope is equal to the Resistance (R). In an I-V graph, the slope is equal to the reciprocal of resistance ($1/R$). Always check which axis represents which variable.

OR

28(a). How can three resistors of resistances $2\ \Omega, 3\ \Omega$ and $6\ \Omega$ be connected to give a total resistance of $4\ \Omega$?

Correct Answer: Connect $3\ \Omega$ and $6\ \Omega$ in parallel, then connect this combination in series with the $2\ \Omega$ resistor.

Solution:

Step 1: Understanding the Concept:

We need to combine resistors in series and parallel to achieve a target resistance that is between the lowest and highest individual values.

Step 2: Key Formula or Approach:

Parallel resistance:

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

Series resistance:

$$R_s = R_1 + R_2$$

Step 3: Detailed Explanation:

Let's try connecting $3\ \Omega$ and $6\ \Omega$ in parallel.

$$\frac{1}{R_p} = \frac{1}{3} + \frac{1}{6} = \frac{2+1}{6} = \frac{3}{6} = \frac{1}{2}$$

So, $R_p = 2\ \Omega$.

Now, connect this $2\ \Omega$ equivalent in series with the remaining $2\ \Omega$ resistor.

Total Resistance $R_{total} = R_p + 2\ \Omega = 2\ \Omega + 2\ \Omega = 4\ \Omega$.

Step 4: Final Answer:

To get $4\ \Omega$, connect $3\ \Omega$ and $6\ \Omega$ in parallel and the result in series with $2\ \Omega$.

Quick Tip

To get a resistance higher than the individual parts, use series. To get lower than the smallest part, use parallel. For middle values, use a combination.

28(b). How can three resistors of resistances $2\ \Omega, 3\ \Omega$ and $6\ \Omega$ be connected to give a total resistance of $1\ \Omega$?

Correct Answer: Connect all three resistors in parallel.

Solution:

Step 1: Understanding the Concept:

To obtain a total resistance ($1\ \Omega$) that is smaller than the smallest individual resistor ($2\ \Omega$), all resistors must be connected in parallel.

Step 2: Key Formula or Approach:

For parallel combination:

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Step 3: Detailed Explanation:

Given $R_1 = 2\ \Omega, R_2 = 3\ \Omega, R_3 = 6\ \Omega$.

$$\frac{1}{R_p} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6}$$

Find the LCM of 2, 3, and 6, which is 6.

$$\frac{1}{R_p} = \frac{3+2+1}{6} = \frac{6}{6} = 1$$

Taking the reciprocal: $R_p = 1\ \Omega$.

Step 4: Final Answer:

To get $1\ \Omega$, connect all three resistors in parallel.

Quick Tip

Parallel combinations always result in an equivalent resistance that is strictly less than the smallest individual resistance in the group.

29(a). Why lemon or tamarind is used for cleaning tarnished copper vessels ?

Correct Answer: The acids in lemon/tamarind dissolve the basic copper carbonate layer that causes tarnishing.

Solution:

Step 1: Understanding the Concept:

Copper vessels tarnish because they react with moist air to form a green layer of basic copper carbonate ($CuCO_3 \cdot Cu(OH)_2$).

Step 2: Detailed Explanation:

Lemon contains citric acid and tamarind contains tartaric acid.

Basic copper carbonate, as the name suggests, is basic in nature.

When lemon or tamarind juice is rubbed on the tarnished surface, the acid reacts with the basic carbonate layer (Neutralization).

This reaction converts the insoluble basic carbonate into soluble salts, which are then washed away with water.

As the green layer is removed, the shiny reddish-brown copper surface is revealed again.

Step 3: Final Answer:

Acids in these fruits neutralize and dissolve the basic tarnish layer, restoring the copper's shine.

Quick Tip

This is a real-world application of the Acid-Base neutralization reaction. Basic tarnish + Acidic juice $\rightarrow$ Soluble salt + Water.

29(b). Why copper is used to make hot water tanks and not steel ?

Correct Answer: Copper is a better conductor of heat and does not react with water or steam, unlike iron/steel.

Solution:

Step 1: Understanding the Concept:

Materials for water tanks must have high thermal conductivity and excellent corrosion resistance against hot water and steam.

Step 2: Detailed Explanation:

1. **Conductivity:** Copper has much higher thermal conductivity than steel (an alloy of iron). This allows for faster heating of water.

2. **Reactivity:** Copper does not react with water or steam at any temperature.

3. **Steel's drawback:** Steel contains iron, which reacts with steam when heated to form iron oxide (rust). Over time, this causes the tank to corrode and leak.

$$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$$

Copper avoids this chemical degradation entirely.

Step 3: Final Answer:

Copper is used because of its superior heat conduction and its chemical inertness towards water and steam.

Quick Tip

Remember: In the reactivity series, Copper is below Hydrogen, so it cannot displace hydrogen from water or acids. Iron is above Hydrogen and reacts readily with steam.

OR

29(a). Differentiate between non-metal and metal on the basis of their chemical properties.

Correct Answer: Metals form basic oxides and lose electrons; non-metals form acidic/neutral oxides and gain electrons.

Solution:

Step 1: Understanding the Concept:

Chemical differentiation is based on how elements react with oxygen, water, acids, and their electron-sharing behavior.

Step 2: Detailed Explanation:

1. Nature of Oxides: Metals react with oxygen to form basic oxides (e.g., MgO, Na_2O). Non-metals react with oxygen to form acidic or neutral oxides (e.g., SO_2, CO_2, H_2O).

2. Action with Acids: Metals (above hydrogen) react with dilute acids to displace hydrogen gas. Non-metals generally do not react with dilute acids to displace hydrogen.

3. Electronic Nature: Metals are electropositive; they lose electrons to form positive ions (cations). Non-metals are electronegative; they gain or share electrons to form negative ions (anions) or covalent bonds.

4. Reaction with Water: Many metals react with water to form hydroxides/oxides and H_2 gas. Non-metals do not react with water.

Step 3: Final Answer:

Metals are electron donors forming basic oxides, whereas non-metals are electron acceptors forming acidic/neutral oxides.

Quick Tip

Physical properties (lustre, ductility) can be deceptive (e.g., Iodine is lustrous but a non-metal). Always rely on chemical properties like oxide nature for a more reliable classification.

29(b). What are amphoteric oxides ? Give two examples.

Correct Answer: Oxides that show both acidic and basic behavior. Examples: Al_2O_3 and ZnO.

Solution:

Step 1: Understanding the Concept:

Usually, metal oxides are basic and non-metal oxides are acidic. However, some metal oxides can react with both acids and bases.

Step 2: Detailed Explanation:

Definition: Amphoteric oxides are metal oxides which react with both acids as well as bases to produce salt and water.

Examples and Reactions:

1. **Aluminium Oxide (Al_{2O3}):**

With Acid: $Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$

With Base: $Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2$(Sodium aluminate) $+ H_2O$

2. **Zinc Oxide (ZnO):**

With Acid: $ZnO + 2HCl \rightarrow ZnCl_2 + H_2O$

With Base: $ZnO + 2NaOH \rightarrow Na_2ZnO_2$(Sodium zincate) $+ H_2O$

Step 3: Final Answer:

Amphoteric oxides are dual-natured metal oxides like Aluminium oxide and Zinc oxide.

Quick Tip

The word "amphi" means both. Just like amphibians live on both land and water, amphoteric oxides react with both acids and bases.

---

30. Draw labelled diagram of human-female reproductive system.

Correct Answer: [A correctly labeled diagram showing the ovaries, fallopian tubes, uterus, cervix, and vagina.]

Solution:

Step 1: Understanding the Concept:

The female reproductive system is designed for egg production, fertilization, and supporting the development of a fetus.

Step 2: Detailed Explanation:

In your diagram, ensure the following parts are clearly labeled:

1. **Ovaries:** A pair of almond-shaped organs that produce eggs and hormones (Estrogen/Progesterone).

2. **Fallopian Tubes (Oviducts):** Tubes that carry the egg from the ovary to the uterus. Fertilization usually occurs here.

3. **Uterus (Womb):** A muscular bag-like structure where the embryo implants and grows.

4. **Cervix:** The narrow lower part or neck of the uterus.

5. **Vagina:** The muscular canal leading from the cervix to the outside of the body.

Step 3: Final Answer:

sert biological diagram here with neat labels for Ovaries, Oviduct, Uterus, Cervix, and Vagina.

Quick Tip

Always use straight lines for labeling and keep them on one side of the diagram if possible for better clarity in exam papers.

OR

30. With the help of diagram explain asexual reproduction in Amoeba and Hydra.

Correct Answer: Amoeba reproduces by Binary Fission; Hydra reproduces by Budding.

Solution:

Step 1: Understanding the Concept:

Asexual reproduction involves a single parent producing offspring without gamete fusion.

Step 2: Detailed Explanation:

1. Binary Fission in Amoeba:

- When an Amoeba reaches maximum size, its nucleus begins to elongate.

- The nucleus eventually divides into two daughter nuclei.

- This is followed by the division of the cytoplasm (cytokinesis) across the middle.

- Finally, two separate daughter Amoebae are formed, which are identical to the parent.

2. Budding in Hydra:

- Due to repeated cell division at one specific site, a small outgrowth called a 'bud' develops on the body wall.
- This bud grows into a tiny individual while still attached to the parent.
- It develops a mouth and tentacles.
- Once fully mature, it detaches from the parent body to lead an independent life as a new organism.

Step 3: Final Answer:

Amoeba splits into two (Binary Fission), while Hydra grows a miniature version of itself that later detaches (Budding).

Quick Tip

In binary fission, the identity of the parent is lost as it becomes two daughters. In budding, the parent remains intact even after the offspring detaches.
