Jharkhand Polytechnic Chemistry

Sample Paper – 3

Duration: 50 Minutes **Maximum Marks: 50**

Instructions

- This paper contains **50** Multiple Choice Questions (Single Correct Answer), modelled on the Chemistry section of the **Jharkhand Polytechnic (PECE)** entrance examination conducted by JCECEB.
- Each correct answer carries **+1 mark**. There is **a negative marking of 0.25 mark** for every wrong answer. Unattempted questions carry **no penalty**.
- Only **one** option is correct. Choose carefully.
- This is an offline OMR based test. Darken the correct bubble fully with a blue or black ball pen.
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.

Q1. Which one of the following is an example of a chemical change?

(A) melting of wax

(B) boiling of water

(C) burning of paper

(D) freezing of water

Q2. The chemical symbol of the element potassium is:

(A) K

(B) P

(C) Po

(D) Pt

Q3. The carbon dioxide molecule is shown below (C $= 12$ u, O $= 16$ u). Its molecular mass is:

O ═ C ═ O

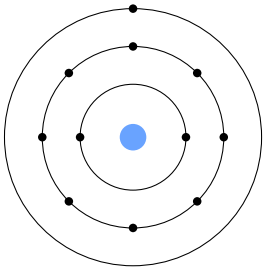
(A) 28 u

(B) 16 u

(C) 32 u

(D) 44 u

Q4. The Bohr model of a sodium atom ($Z = 11$) is shown below. Its electronic configuration is:



(A) $2, 8$

(B) $2, 8, 1$

(C) $2, 9$

(D) $2, 8, 3$

Q5. An atom that has gained one or more electrons and so carries a negative charge is called a/an:

(A) cation

(B) radical

(C) anion

(D) isotope

Q6. The maximum number of electrons that the M shell (third shell, $n = 3$) can hold is:

(A) 18

(B) 8

(C) 2

(D) 32

Q7. In a neutral atom, the number of electrons is exactly equal to:

(A) the number of neutrons

(B) the atomic number (number of protons)

(C) the mass number

(D) the sum of protons and neutrons

Q8. According to Rutherford's atomic model, almost the entire mass and the positive charge of an atom are concentrated in the:

(A) electron shells

(B) empty space of the atom

(C) outermost surface

(D) central nucleus

Q9. The number of atoms present in one molecule of an element (for example, 2 in O_2) is known as its:

(A) valency

(B) atomic number

(C) molecular mass

(D) atomicity

Q10. The law of octaves, which compared elements with the notes of music, was given by:

(A) Mendeleev

(B) Newlands

(C) Dobereiner

(D) Moseley

Q11. The elements placed in group 17 of the modern periodic table are collectively called:

(A) halogens

(B) noble gases

(C) alkali metals

(D) alkaline earth metals

Q12. In the modern periodic table, the noble (inert) gases are placed in group:

(A) 1

(B) 2

(C) 17

(D) 18

Q13. As we move down a group of the periodic table, the metallic character of the elements generally:

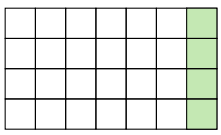
(A) decreases

(B) remains the same

(C) increases

(D) first increases then decreases

Q14. In the outline of the periodic table shown below, the highlighted column on the far right side mainly contains:



(A) metals

(B) non-metals

(C) only transition metals

(D) only radioactive elements

Q15. The reaction $2H_2 + O_2 \rightarrow 2H_2O$ is an example of a:

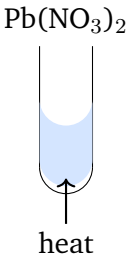
(A) combination reaction

(B) decomposition reaction

(C) displacement reaction

(D) double displacement reaction

Q16. When lead nitrate crystals are strongly heated in a test tube (as shown), they break down into simpler substances. This type of reaction is called:



(A) combination

(B) displacement

(C) thermal decomposition

(D) neutralisation

Q17. A chemical reaction in which heat energy is absorbed from the surroundings is called a/an:

(A) exothermic reaction

(B) combustion reaction

(C) oxidation reaction

(D) endothermic reaction

Q18. In a redox reaction, the substance that itself gets oxidised acts as the:

(A) oxidising agent

(B) reducing agent

(C) catalyst

(D) indicator

Q19. In the reaction $2Mg + O_2 \rightarrow 2MgO$, the substance that is oxidised is:

(A) magnesium

(B) oxygen

(C) magnesium oxide

(D) none of these

Q20. The unpleasant smell and taste developed in fat- or oil-containing food kept for a long time (rancidity) is mainly due to:

(A) reduction of proteins

(B) evaporation of water

(C) neutralisation by air

(D) oxidation of fats and oils

Q21. The acid responsible for the sour taste of curd (sour milk) is:

(A) acetic acid

(B) citric acid

(C) lactic acid

(D) tartaric acid

Q22. When added to an acidic solution, the indicator methyl orange turns:

(A) yellow

(B) red

(C) blue

(D) green

Q23. The dilute hydrochloric acid present in the human stomach mainly helps in:

(A) the digestion of food

(B) the formation of bones

(C) the clotting of blood

(D) the transport of oxygen

Q24. The chemical name of washing soda is:

(A) sodium chloride

(B) sodium bicarbonate

(C) calcium carbonate

(D) sodium carbonate

Q25. Which one of the following is a general property of acids?

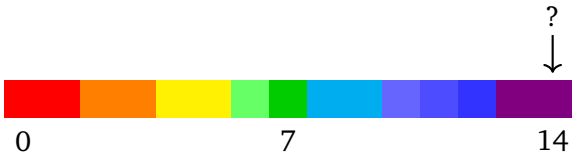
(A) they taste bitter

(B) they taste sour

(C) they feel soapy to touch

(D) they turn red litmus blue

Q26. On the pH scale shown below, a strongly basic (alkaline) solution has a pH value close to:



(A) 0

(B) 7

(C) 14

(D) 4

Q27. The property of metals by which they can be drawn into thin wires is called:

(A) ductility

(B) malleability

(C) sonority

(D) brittleness

Q28. In the solid state, most non-metals are:

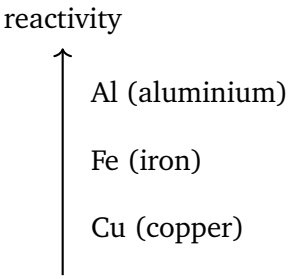
(A) malleable

(B) ductile

(C) lustrous

(D) brittle

Q29. In the thermite reaction, used to join broken railway tracks, iron is obtained from iron oxide by using the more reactive metal shown at the top of the ladder below:



(A) carbon

(B) aluminium

(C) zinc

(D) copper

Q30. When a small piece of potassium is dropped into water, the reaction is:

(A) very slow

(B) does not take place

(C) highly vigorous (the hydrogen formed may catch fire)

(D) only possible on strong heating

Q31. Which one of the following is an amphoteric oxide?

(A) zinc oxide

(B) sodium oxide

(C) magnesium oxide

(D) calcium oxide

Q32. The most ductile metal, which can be drawn into the longest and thinnest wire, is:

(A) silver

(B) gold

(C) copper

(D) aluminium

Q33. Compared with ionic compounds, covalent compounds generally have:

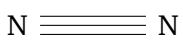
(A) very high melting points

(B) very high electrical conductivity

(C) a hard crystalline ionic lattice

(D) low melting and boiling points

Q34. In the nitrogen molecule shown below, the two atoms are joined by a triple bond. The number of shared electron pairs between them is:



(A) 1

(B) 2

(C) 3

(D) 4

Q35. Ionic compounds are able to conduct electricity only when they are:

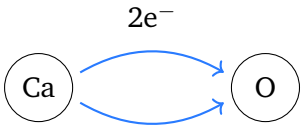
(A) in the molten or aqueous (dissolved) state

(B) in the dry solid state

(C) cooled below 0°C

(D) kept as dry crystals in air

Q36. The formation of calcium oxide (CaO) from its atoms is shown below. In this bond the calcium atom:



(A) shares one electron with oxygen

(B) transfers two electrons to oxygen

(C) gains two electrons from oxygen

(D) shares two pairs of electrons

Q37. Which one of the following sets contains only allotropes of carbon?

(A) diamond, sand and chalk

(B) coal, coke and charcoal

(C) diamond, graphite and fullerene

(D) soot, lime and ash

Q38. The general molecular formula of the alkyne series of hydrocarbons is:

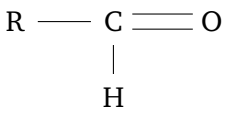
(A) C_nH_{2n-2}

(B) C_nH_{2n}

(C) C_nH_{2n+2}

(D) C_nH_n

Q39. The functional group $-CHO$, whose structure is shown below, is characteristic of the family of:



(A) alcohols

(B) carboxylic acids

(C) ketones

(D) aldehydes

Q40. The molecular formula of propane is:

(A) C_2H_6

(B) C_3H_8

(C) C_4H_{10}

(D) C_3H_6

Q41. Two compounds that have the same molecular formula but different structural arrangements of atoms are called:

(A) allotropes

(B) isotopes

(C) isomers

(D) homologues

Q42. Which one of the following carbon compounds is used as a fuel and is also the alcohol present in alcoholic drinks?

(A) ethanol

(B) methane

(C) benzene

(D) chloroform

Q43. A substitution reaction (for example, with chlorine in the presence of sunlight) is characteristic of:

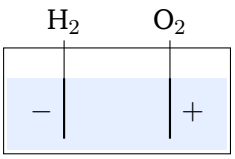
(A) alkenes

(B) alkynes

(C) aromatic acids

(D) saturated hydrocarbons (alkanes)

Q44. During the electrolysis of water (apparatus shown), the gases collected are in a fixed volume ratio. The ratio of hydrogen to oxygen by volume is:



(A) $1:1$

(B) $2:1$

(C) $1:2$

(D) $4:1$

Q45. Standard temperature and pressure (STP) for gases refers to a temperature and pressure of:

(A) 0°C and 1 atm

(B) 25°C and 2 atm

(C) 100°C and 1 atm

(D) 0°C and 2 atm

Q46. Two gases mix with each other very quickly (they diffuse) mainly because their molecules:

(A) are very heavy

(B) are fixed in position

(C) move freely at high speeds

(D) attract each other strongly

Q47. The combined gas law relates which set of quantities for a fixed mass of gas?

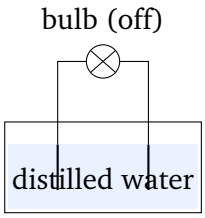
(A) pressure and amount of gas only

(B) temperature and mass only

(C) volume and density only

(D) pressure, volume and temperature

Q48. In the circuit shown below, the bulb does not glow when the electrodes are dipped in distilled water. This is because distilled water is:



(A) a very good conductor

(B) a poor conductor of electricity

(C) a strong acid

(D) a metal

Q49. The substances mainly responsible for the depletion of the ozone layer are:

(A) chlorofluorocarbons (CFCs)

(B) carbon dioxide

(C) oxygen

(D) nitrogen

Q50. The poisonous gas produced by the incomplete combustion of fuels such as coal and petrol is:

(A) carbon dioxide

(B) sulphur dioxide

(C) carbon monoxide

(D) nitrogen

Detailed Solutions

Q1.

Solution

Concept — Physical and chemical change: In a physical change no new substance is formed and the change is usually reversible. In a chemical change one or more new substances with new properties are formed.

Step 1 — Test each option: Melting of wax, boiling of water and freezing of water are physical changes (only the state changes).

Step 2 — Identify the chemical change: Burning of paper forms new substances (ash, carbon dioxide and water vapour) and cannot be reversed.

Why other options are wrong:

- Melting of wax and freezing of water are reversible state changes.
- Boiling of water only converts liquid water to steam.

Final Answer: Burning of paper is a chemical change $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q1

Q2.

Solution

Concept — Symbols of elements: The symbol of potassium comes from its Latin name *kalium*, so its symbol is K.

Step 1 — Recall the symbol: Potassium $\rightarrow$ K.

Step 2 — Confirm: This is one of the symbols derived from a Latin name.

Why other options are wrong:

- P is the symbol of phosphorus.
- Po is the symbol of polonium.
- Pt is the symbol of platinum.

Final Answer: The symbol of potassium is K $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q2

Q3.

Solution

Concept — Molecular mass: The molecular mass of a compound is the sum of the atomic masses of all the atoms in one molecule. For CO_2 there is 1 carbon atom and 2 oxygen atoms.

Step 1 — Write the masses: carbon $= 12$ u, each oxygen $= 16$ u.

Step 2 — Add the oxygen atoms: $2 \times 16 = 32$ u.

Step 3 — Add the carbon: $12 + 32 = 44$ u.

Why other options are wrong:

- 28 u and 16 u are too small for CO_2.
- 32 u counts only the two oxygen atoms.

Final Answer: Molecular mass of $CO_2 = 44$ u $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q3

Q4.

Solution

Concept — Electronic configuration: Electrons fill shells in order: K holds up to 2, L up to 8, and the rest go to M. Sodium has 11 electrons.

Step 1 — Fill the K shell: 2 electrons. Remaining $= 11 - 2 = 9$.

Step 2 — Fill the L shell: 8 electrons. Remaining $= 9 - 8 = 1$.

Step 3 — Fill the M shell: the last 1 electron.

Step 4 — Write the configuration: $2, 8, 1$.

Why other options are wrong:

- $2, 8$ accounts for only 10 electrons.
- $2, 9$ overfills the L shell (maximum 8).
- $2, 8, 3$ has 13 electrons (that is aluminium).

Final Answer: Sodium is $2, 8, 1 \Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q4

Q5.

Solution

Concept — Ions: When an atom gains electrons it becomes negatively charged and is called an anion. When it loses electrons it becomes positively charged and is called a cation.

Step 1 — Read the clue: The atom has gained electrons and carries a negative charge.

Step 2 — Name it: A negatively charged ion is an anion.

Why other options are wrong:

- A cation is positively charged.
- A radical is a group of atoms acting as one ion, not the definition asked.
- An isotope is a different form of the same element, not an ion.

Final Answer: A negatively charged ion is an anion $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q5

Q6.

Solution

Concept — Shell capacity: The maximum number of electrons in a shell is $2n^2$, where n is the shell number. For the M shell, $n = 3$.

Step 1 — Substitute $n = 3$: maximum $= 2 \times (3)^2$.

Step 2 — Compute: $2 \times 9 = 18$.

Why other options are wrong:

- 8 is the capacity of the L shell ($n = 2$).
- 2 is the capacity of the K shell ($n = 1$).
- 32 is the capacity of the N shell ($n = 4$).

Final Answer: The M shell holds a maximum of 18 electrons $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q6

Q7.

Solution

Concept — Neutral atom: An atom is electrically neutral because the number of negative electrons equals the number of positive protons. The number of protons is the atomic number.

Step 1 — Balance the charges: electrons = protons in a neutral atom.

Step 2 — Link to atomic number: number of protons = atomic number, so electrons = atomic number.

Why other options are wrong:

- Neutrons can differ in number and are uncharged.
- The mass number counts protons plus neutrons.
- Protons plus neutrons gives the mass number, not the electron count.

Final Answer: Electrons = atomic number $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q7

Q8.

Solution

Concept — Rutherford's model: From his alpha-particle scattering experiment, Rutherford proposed that an atom has a very small, dense, positively charged centre called the nucleus, where nearly all the mass is concentrated.

Step 1 — Recall the finding: Most alpha particles passed straight through, while a few bounced back, showing a tiny dense core.

Step 2 — Name the core: This dense centre is the nucleus.

Why other options are wrong:

- Electron shells contain very little mass.
- The empty space carries no mass or charge.
- The atom has no special charged outer surface.

Final Answer: Mass and positive charge lie in the central nucleus $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q8

Q9.

Solution

Concept — Atomicity: The atomicity of an element is the number of atoms present in one molecule of that element. For example, O_2 has atomicity 2 and O_3 (ozone) has atomicity 3.

Step 1 — Read the definition: number of atoms in one molecule.

Step 2 — Match the term: This is called atomicity.

Why other options are wrong:

- Valency is the combining capacity of an atom.
- Atomic number is the number of protons.
- Molecular mass is the total mass of the molecule.

Final Answer: The number of atoms in a molecule is the atomicity $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q9

Q10.

Solution

Concept — Law of octaves: John Newlands arranged the known elements in order of increasing atomic mass and found that every eighth element had properties similar to the first, like the eighth note in music. This is the law of octaves.

Step 1 — Match the scientist: Law of octaves $\rightarrow$ Newlands.

Step 2 — Confirm: The musical-note comparison is the clue.

Why other options are wrong:

- Mendeleev gave the periodic table based on atomic mass.
- Dobereiner grouped elements into triads.
- Moseley introduced the atomic-number basis.

Final Answer: The law of octaves was given by Newlands $\Rightarrow \boxed{B}$

Answer: (B) Go Back to Q10

Q11.

Solution

Concept — Halogens: Group 17 of the periodic table contains fluorine, chlorine, bromine, iodine and astatine. These are very reactive non-metals known as the halogens.

Step 1 — Identify the group: Group 17.

Step 2 — Name the family: These elements are the halogens.

Why other options are wrong:

- Noble gases belong to group 18.
- Alkali metals belong to group 1.
- Alkaline earth metals belong to group 2.

Final Answer: Group 17 elements are halogens $\Rightarrow$ A

Answer: (A) Go Back to Q11

Q12.

Solution

Concept — Noble gases: The noble (inert) gases such as helium, neon, argon and krypton have completely filled outer shells and are placed in group 18 (the last vertical column) of the modern periodic table.

Step 1 — Recall the position: Noble gases occupy the extreme right column.

Step 2 — Name the group: This is group 18.

Why other options are wrong:

- Group 1 holds the alkali metals.
- Group 2 holds the alkaline earth metals.
- Group 17 holds the halogens.

Final Answer: Noble gases are in group 18 $\Rightarrow$ D

Answer: (D) Go Back to Q12

Q13.

Solution

Concept — Metallic character: Metallic character is the tendency of an atom to lose electrons. Down a group the atomic size increases and the outer electrons are held less tightly, so they are lost more easily.

Step 1 — Note the trend down a group: atomic size increases, attraction on outer electrons decreases.

Step 2 — Conclude: Electrons are lost more easily, so metallic character increases down a group.

Why other options are wrong:

- It does not decrease down a group (that is the trend across a period).
- It does not stay the same.
- It does not first increase then decrease.

Final Answer: Metallic character increases down a group $\Rightarrow$ C

Answer: (C) Go Back to Q13

Q14.

Solution

Concept — Position of non-metals: In the periodic table, metals lie on the left side, while non-metals are placed towards the right side (above the zig-zag line). The figure highlights the right-hand column.

Step 1 — Read the figure: The shaded region is on the far right.

Step 2 — Identify the elements: The right side mainly contains non-metals.

Why other options are wrong:

- Metals are placed on the left of the table.
- Transition metals occupy the central block, not the far right.
- Radioactive elements are not confined to this column.

Final Answer: The right side mainly contains non-metals $\Rightarrow$ B

Answer: (B) Go Back to Q14

Q15.

Solution

Concept — Combination reaction: A combination reaction is one in which two or more reactants join together to form a single product.

Step 1 — Read the reaction: $2H_2 + O_2 \rightarrow 2H_2O$.

Step 2 — Count the products: Hydrogen and oxygen combine to give only one product, water.

Step 3 — Name the type: Two reactants forming one product is a combination reaction.

Why other options are wrong:

- Decomposition breaks one substance into many.
- Displacement involves one element replacing another.
- Double displacement involves an exchange of ions between two compounds.

Final Answer: It is a combination reaction $\Rightarrow$ $\boxed{A}$

Answer: (A) Go Back to Q15

Q16.

Solution

Concept — Thermal decomposition: A decomposition reaction breaks a single compound into two or more simpler substances. When heat supplies the energy for this, it is called thermal decomposition.

Step 1 — Read the change: Heating lead nitrate splits it into lead oxide, nitrogen dioxide and oxygen.

Step 2 — Identify the energy source: Heat is used, so it is thermal decomposition.

Why other options are wrong:

- Combination joins substances rather than splitting them.
- Displacement involves one element replacing another.
- Neutralisation is an acid–base reaction.

Final Answer: Heating lead nitrate is thermal decomposition $\Rightarrow$ $\boxed{C}$

Answer: (C) Go Back to Q16

Q17.

Solution

Concept — Endothermic reaction: A reaction that absorbs heat energy from the surroundings is called endothermic. The surroundings usually feel cooler. The opposite, which releases heat, is exothermic.

Step 1 — Read the clue: Heat is absorbed from the surroundings.

Step 2 — Name the type: Absorbing heat means the reaction is endothermic.

Why other options are wrong:

- An exothermic reaction releases heat.
- Combustion and oxidation generally release heat.

Final Answer: A heat-absorbing reaction is endothermic $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q17

Q18.

Solution

Concept — Oxidising and reducing agents: In a redox reaction the substance that is oxidised (loses electrons or gains oxygen) causes the other substance to be reduced, so it acts as the reducing agent.

Step 1 — Identify the role: The substance getting oxidised donates electrons.

Step 2 — Name it: By donating electrons it reduces the other species, so it is the reducing agent.

Why other options are wrong:

- The oxidising agent is the substance that gets reduced.
- A catalyst speeds up a reaction without being changed.
- An indicator only shows acidity or basicity.

Final Answer: The substance oxidised is the reducing agent $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q18

Q19.

Solution

Concept — Oxidation as gain of oxygen: In a reaction, the substance that gains oxygen is said to be oxidised.

Step 1 — Read the reaction: $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$.

Step 2 — Track the oxygen: Magnesium combines with oxygen to form magnesium oxide, so magnesium gains oxygen.

Step 3 — Conclude: Magnesium is oxidised.

Why other options are wrong:

- Oxygen is the species being added, not the one oxidised.
- Magnesium oxide is the product, not a reactant being oxidised.

Final Answer: Magnesium is oxidised $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q19

Q20.

Solution

Concept — Rancidity: Rancidity is the spoiling of fat- or oil-containing food because the fats and oils slowly react with oxygen in the air (oxidation), producing an unpleasant smell and taste.

Step 1 — Identify the cause: Oxygen of the air oxidises the fats and oils.

Step 2 — Confirm: This is why such food is kept in airtight packs or with antioxidants.

Why other options are wrong:

- Proteins are not reduced here.
- Evaporation of water does not cause the bad smell.
- No acid–base neutralisation is involved.

Final Answer: Rancidity is due to oxidation of fats and oils $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q20

Q21.

Solution

Concept — Acids in food: Many foods contain natural acids. Curd and sour milk turn sour because of lactic acid produced during fermentation.

Step 1 — Match the source: Curd / sour milk $\rightarrow$ lactic acid.

Step 2 — Confirm: Lactic acid is formed when bacteria act on the milk sugar.

Why other options are wrong:

- Acetic acid is present in vinegar.
- Citric acid is found in citrus fruits.
- Tartaric acid is found in tamarind.

Final Answer: The sour taste of curd is due to lactic acid $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q21

Q22.

Solution

Concept — Methyl orange indicator: Methyl orange is an acid–base indicator. It is red in acidic solutions and yellow in basic (alkaline) solutions.

Step 1 — Apply to an acid: In an acidic solution, methyl orange turns red.

Step 2 — Confirm: It would turn yellow only in a base.

Why other options are wrong:

- Yellow is the colour in a basic solution.
- Blue and green are not methyl orange colours.

Final Answer: Methyl orange turns red in acid $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q22

Q23.

Solution

Concept — Stomach acid: The stomach secretes dilute hydrochloric acid, which provides an acidic medium for the digestive enzymes (such as pepsin) and helps digest the food.

Step 1 — Recall the function: HCl creates the acidic medium needed for digestion.

Step 2 — Confirm: It also kills many harmful germs in the food.

Why other options are wrong:

- Bone formation needs calcium and phosphate, not stomach acid.
- Blood clotting and oxygen transport are unrelated to stomach HCl.

Final Answer: Stomach HCl helps in the digestion of food $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q23

Q24.

Solution

Concept — Washing soda: Washing soda is the common name of sodium carbonate, with the chemical formula $Na_2CO_3 \cdot 10H_2O$. It is used for cleaning and for softening hard water.

Step 1 — Recall the name: Washing soda $=$ sodium carbonate.

Step 2 — Confirm: Its formula is Na_2CO_3 (with water of crystallisation).

Why other options are wrong:

- Sodium chloride (NaCl) is common salt.
- Sodium bicarbonate ($NaHCO_3$) is baking soda.
- Calcium carbonate ($CaCO_3$) is limestone/marble.

Final Answer: Washing soda is sodium carbonate $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q24

Q25.

Solution

Concept — Properties of acids: Acids have a sour taste, turn blue litmus red, and release hydrogen gas with active metals. Bases, in contrast, taste bitter and feel soapy.

Step 1 — Test the options: A sour taste is a typical property of acids.

Step 2 — Confirm: Lemon juice and vinegar taste sour because they contain acids.

Why other options are wrong:

- Bitter taste and a soapy feel are properties of bases.
- Turning red litmus blue is a property of bases, not acids.

Final Answer: Acids taste sour $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q25

Q26.

Solution

Concept — pH scale: The pH scale runs from 0 to 14. A value of 7 is neutral, values below 7 are acidic, and values above 7 are basic. The closer to 14, the more strongly basic the solution.

Step 1 — Locate the basic end: The arrow points to the far right of the scale.

Step 2 — Read the value: A strongly basic solution has a pH close to 14.

Why other options are wrong:

- 0 and 4 are acidic values.
- 7 is neutral, not strongly basic.

Final Answer: A strongly basic solution has pH near 14 $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q26

Q27.

Solution

Concept — Ductility: Ductility is the property of metals by which they can be drawn into thin wires. Malleability, in contrast, is the property of being beaten into thin sheets.

Step 1 — Read the clue: Drawn into thin wires.

Step 2 — Name the property: This is ductility.

Why other options are wrong:

- Malleability is being hammered into sheets.
- Sonority is producing a ringing sound when struck.
- Brittleness is a property of non-metals, not a useful metal property here.

Final Answer: Drawing into wires is ductility $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q27

Q28.

Solution

Concept — Properties of non-metals: Most solid non-metals are brittle, which means they break or crumble into pieces when hammered. They are not malleable or ductile like metals.

Step 1 — Recall the property: Solid non-metals such as sulphur and phosphorus break easily.

Step 2 — Name the property: They are brittle.

Why other options are wrong:

- Malleability and ductility are properties of metals.
- Most non-metals are not lustrous (iodine is an exception).

Final Answer: Most solid non-metals are brittle $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q28

Q29.

Solution

Concept — Thermite reaction: In the thermite reaction, aluminium powder reduces iron(III) oxide to molten iron because aluminium is more reactive than iron. The molten iron is used to weld railway tracks.

Step 1 — Read the ladder: Aluminium is shown above iron, so it is more reactive.

Step 2 — Identify the reducing metal: The more reactive aluminium displaces iron from its oxide.

Why other options are wrong:

- Carbon is not used in the thermite reaction.
- Zinc and copper are not the metals used to extract iron here.

Final Answer: The thermite reaction uses aluminium $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q29

Q30.

Solution

Concept — Reactivity of potassium: Potassium lies at the top of the reactivity series. It reacts with water very vigorously, and the heat produced ignites the hydrogen gas that is released.

Step 1 — Recall the position: Potassium is one of the most reactive metals.

Step 2 — Describe the reaction: It reacts violently with cold water and the hydrogen catches fire.

Why other options are wrong:

- The reaction is not slow.
- It certainly takes place; potassium is highly reactive.
- No heating is needed; it reacts even with cold water.

Final Answer: Potassium reacts highly vigorously with water $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q30

Q31.

Solution

Concept — Amphoteric oxides: Amphoteric oxides react with both acids and bases to form salt and water. Zinc oxide and aluminium oxide are common examples.

Step 1 — Test the options: Sodium, magnesium and calcium oxides are basic oxides.

Step 2 — Identify the amphoteric oxide: Zinc oxide reacts with both acids and bases, so it is amphoteric.

Why other options are wrong:

- Sodium oxide and calcium oxide are strongly basic oxides.
- Magnesium oxide is also a basic oxide.

Final Answer: Zinc oxide is amphoteric $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q31

Q32.

Solution

Concept — Most ductile metal: Gold is the most ductile (and most malleable) metal. A very small amount of gold can be drawn into a very long, thin wire.

Step 1 — Compare the options: All are ductile, but gold is the most ductile of all.

Step 2 — Confirm: Gold can also be beaten into extremely thin sheets.

Why other options are wrong:

- Silver, copper and aluminium are ductile but less so than gold.

Final Answer: The most ductile metal is gold $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q32

Q33.

Solution

Concept — Covalent compounds: Covalent compounds are made of separate molecules held by weak forces between molecules. Because these forces are weak, covalent compounds usually have low melting and boiling points and do not conduct electricity.

Step 1 — Recall the forces: Weak inter-molecular forces are easy to break.

Step 2 — Conclude: Less energy is needed to melt or boil them, so the melting and boiling points are low.

Why other options are wrong:

- Very high melting points belong to ionic compounds.
- Covalent compounds do not conduct electricity well.
- A crystalline ionic lattice is a feature of ionic compounds.

Final Answer: Covalent compounds have low melting and boiling points $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q33

Q34.

Solution

Concept — Triple bond: A triple bond is formed when two atoms share three pairs of electrons. In a nitrogen molecule (N_2) the two atoms are joined by a triple bond.

Step 1 — Read the figure: Three lines join the two nitrogen atoms.

Step 2 — Count the shared pairs: Each line stands for one shared pair, so there are 3 shared pairs.

Why other options are wrong:

- 1 shared pair is a single bond.
- 2 shared pairs is a double bond.
- 4 shared pairs is not possible between two atoms here.

Final Answer: A triple bond has 3 shared electron pairs $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q34

Q35.

Solution

Concept — Conduction by ionic compounds: Ionic compounds conduct electricity only when their ions are free to move. In the solid state the ions are fixed, but in the molten or aqueous (dissolved) state the ions become free and can carry current.

Step 1 — Recall the condition: Free movement of ions is needed for conduction.

Step 2 — Identify the state: Ions are free in the molten or dissolved state.

Why other options are wrong:

- In the solid state the ions cannot move.
- Cooling below 0°C does not free the ions.
- Dry crystals do not conduct because the ions are locked in place.

Final Answer: Ionic compounds conduct in the molten or aqueous state $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q35

Q36.

Solution

Concept — Ionic bonding in CaO: Calcium has 2 electrons in its outermost shell and oxygen needs 2 electrons to complete its octet. So calcium transfers its 2 outer electrons to oxygen, forming Ca^{2+} and O^{2-} ions that attract each other.

Step 1 — Read the figure: The arrows show 2 electrons moving from calcium to oxygen.

Step 2 — Describe the bond: Calcium transfers two electrons to oxygen.

Why other options are wrong:

- Sharing electrons would give a covalent bond, not ionic.
- Calcium loses electrons; it does not gain them.
- Sharing two pairs is a double covalent bond.

Final Answer: Calcium transfers two electrons to oxygen $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q36

Q37.

Solution

Concept — Allotropes of carbon: Allotropes are different physical forms of the same element. The main allotropes of carbon are diamond, graphite and fullerene.

Step 1 — Recall the allotropes: diamond, graphite and fullerene.

Step 2 — Match the option: Only one set lists exactly these three.

Why other options are wrong:

- Sand, chalk, lime and ash are compounds, not allotropes of carbon.
- Coal, coke, charcoal and soot are impure forms of carbon, not pure allotropes.

Final Answer: Diamond, graphite and fullerene are allotropes of carbon $\Rightarrow$ C

Answer: (C) Go Back to Q37

Q38.

Solution

Concept — Alkynes: Alkynes are unsaturated hydrocarbons that contain a carbon–carbon triple bond. Their general molecular formula is C_nH_{2n-2}.

Step 1 — Recall the series: Alkynes have one triple bond.

Step 2 — Write the general formula: C_nH_{2n-2} (for example, ethyne C_2H_2).

Why other options are wrong:

- C_nH_{2n} is the general formula of alkenes.
- C_nH_{2n+2} is the general formula of alkanes.
- C_nH_n does not represent the alkyne series.

Final Answer: The alkyne general formula is C_nH_{2n-2} $\Rightarrow$ A

Answer: (A) Go Back to Q38

Q39.

Solution

Concept — Aldehyde group: The functional group $-CHO$, in which a carbon atom is double bonded to oxygen and single bonded to a hydrogen at the end of a chain, is the aldehyde group.

Step 1 — Read the structure: Carbon is joined to H by a single bond and to O by a double bond.

Step 2 — Name the family: A $-CHO$ group belongs to the aldehydes.

Why other options are wrong:

- Alcohols have the $-OH$ group.
- Carboxylic acids have the $-COOH$ group.
- Ketones have the $>C{=}O$ group between two carbon atoms.

Final Answer: $-CHO$ is the aldehyde group $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q39

Q40.

Solution

Concept — Propane: Propane is the third member of the alkane series. Using the alkane formula C_nH_{2n+2} with $n = 3$ gives C_3H_8.

Step 1 — Set $n = 3$: hydrogen atoms $= 2(3) + 2 = 8$.

Step 2 — Write the formula: C_3H_8.

Why other options are wrong:

- C_2H_6 is ethane.
- C_4H_{10} is butane.
- C_3H_6 is propene (an alkene), not propane.

Final Answer: Propane is $C_3H_8 \Rightarrow \boxed{B}$

Answer: (B) Go Back to Q40

Q41.

Solution

Concept — Isomers: Isomers are compounds that have the same molecular formula but different structural arrangements of their atoms, which gives them different properties.

Step 1 — Read the clue: Same molecular formula, different structure.

Step 2 — Name them: Such compounds are called isomers.

Why other options are wrong:

- Allotropes are different forms of the same element.
- Isotopes are atoms of the same element with different mass numbers.
- Homologues differ by a $-CH_2-$ unit, not just in structure.

Final Answer: Same formula, different structure means isomers $\Rightarrow$ $\boxed{C}$

Answer: (C) Go Back to Q41

Q42.

Solution

Concept — Ethanol: Ethanol (C_2H_5OH) is a common alcohol. It is used as a fuel (for example, blended with petrol) and is the alcohol present in alcoholic drinks.

Step 1 — Test the options: Ethanol is the only one that is both a fuel and the alcohol in drinks.

Step 2 — Confirm: Methane is a gaseous fuel but not in drinks; benzene and chloroform are not consumed.

Why other options are wrong:

- Methane is a fuel gas but is not present in alcoholic drinks.
- Benzene and chloroform are toxic and not used as drinking alcohol.

Final Answer: Ethanol is the fuel and drinking alcohol $\Rightarrow$ $\boxed{A}$

Answer: (A) Go Back to Q42

Q43.

Solution

Concept — Substitution reactions: A substitution reaction is one in which one atom of a molecule is replaced by another atom or group. Saturated hydrocarbons (alkanes) have only single bonds and typically undergo substitution, for example with chlorine in sunlight.

Step 1 — Recall the bond type: Alkanes have single bonds and are unreactive towards addition.

Step 2 — Match the reaction: Such saturated compounds undergo substitution.

Why other options are wrong:

- Alkenes and alkynes are unsaturated and mainly undergo addition reactions.
- Aromatic acids are not the general answer asked here.

Final Answer: Substitution is typical of saturated hydrocarbons (alkanes) $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q43

Q44.

Solution

Concept — Electrolysis of water: Water (H_2O) splits into hydrogen and oxygen during electrolysis. Because each water molecule has 2 hydrogen atoms for every 1 oxygen atom, twice as much hydrogen is collected by volume.

Step 1 — Recall the products: hydrogen at the cathode and oxygen at the anode.

Step 2 — Compare the volumes: hydrogen : oxygen $= 2 : 1$ by volume.

Why other options are wrong:

- $1 : 1$ ignores the $2 : 1$ atom ratio in water.
- $1 : 2$ reverses the correct ratio.
- $4 : 1$ is not the ratio for water.

Final Answer: The volume ratio of H_2 to O_2 is $2 : 1 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q44

Q45.

Solution

Concept — STP: Standard temperature and pressure (STP) is a fixed reference condition used to compare gases. It is defined as a temperature of $0°C$ (273 K) and a pressure of 1 atmosphere.

Step 1 — Recall the temperature: $0°C$.

Step 2 — Recall the pressure: 1 atm.

Why other options are wrong:

- $25°C$ and 2 atm are not the standard values.
- $100°C$ and 2 atm do not match the definition of STP.

Final Answer: STP is $0°C$ and 1 atm $\Rightarrow$ $\boxed{A}$

Answer: (A) Go Back to Q45

Q46.

Solution

Concept — Diffusion of gases: Gas molecules are far apart and move continuously at high speeds in all directions. This rapid, random motion lets two gases mix into each other quickly, a process called diffusion.

Step 1 — Recall the nature of gas molecules: They move freely and very fast.

Step 2 — Link to diffusion: This free, fast motion causes quick mixing.

Why other options are wrong:

- Gas molecules are light, not heavy, and motion (not weight) drives diffusion.
- Gas molecules are not fixed in position; that describes solids.
- Gas molecules attract one another only very weakly.

Final Answer: Gases diffuse because their molecules move freely at high speeds $\Rightarrow$ $\boxed{C}$

Answer: (C) Go Back to Q46

Q47.

Solution

Concept — Combined gas law: The combined gas law brings together Boyle's law and Charles' law for a fixed mass of gas. It relates pressure (P), volume (V) and temperature (T) as $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$.

Step 1 — List the quantities: pressure, volume and temperature.

Step 2 — Confirm: These three are linked in one equation.

Why other options are wrong:

- Pressure and amount only is incomplete.
- Temperature and mass only is not the combined gas law.
- Volume and density only does not describe it.

Final Answer: The combined gas law links pressure, volume and temperature $\Rightarrow$ D

Answer: (D) Go Back to Q47

Q48.

Solution

Concept — Conduction in water: Electricity is carried through a solution by free ions. Distilled (pure) water has almost no dissolved ions, so it is a very poor conductor and the bulb does not glow.

Step 1 — Read the circuit: The bulb stays off when the electrodes are in distilled water.

Step 2 — Explain why: With no free ions, distilled water cannot carry current, so it is a poor conductor.

Why other options are wrong:

- A good conductor would make the bulb glow.
- Distilled water is neutral, not a strong acid.
- Water is not a metal.

Final Answer: Distilled water is a poor conductor of electricity $\Rightarrow$ B

Answer: (B) Go Back to Q48

Q49.

Solution

Concept — Ozone depletion: The ozone layer protects us from harmful ultraviolet rays. Chlorofluorocarbons (CFCs), used earlier in refrigerators and sprays, release chlorine that destroys ozone, causing ozone-layer depletion.

Step 1 — Identify the cause: CFCs are the main ozone-depleting substances.

Step 2 — Confirm: Their use is now being phased out worldwide.

Why other options are wrong:

- Carbon dioxide is a greenhouse gas, not the main ozone destroyer.
- Oxygen and nitrogen are normal, harmless atmospheric gases.

Final Answer: CFCs deplete the ozone layer $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q49

Q50.

Solution

Concept — Incomplete combustion: When a fuel burns in a limited supply of air (incomplete combustion), it does not form carbon dioxide fully; instead it produces poisonous carbon monoxide (CO) gas.

Step 1 — Recall the condition: Limited oxygen leads to incomplete combustion.

Step 2 — Identify the gas: The poisonous product is carbon monoxide.

Why other options are wrong:

- Carbon dioxide forms during complete combustion.
- Sulphur dioxide comes from sulphur impurities, not from incomplete burning of carbon.
- Nitrogen is not a product of combustion here.

Final Answer: Incomplete combustion produces carbon monoxide $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q50

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	C	2	A	3	D	4	B	5	C
6	A	7	B	8	D	9	D	10	B
11	A	12	D	13	C	14	B	15	A
16	C	17	D	18	B	19	A	20	D
21	C	22	B	23	A	24	D	25	B
26	C	27	A	28	D	29	B	30	C
31	A	32	B	33	D	34	C	35	A
36	B	37	C	38	A	39	D	40	B
41	C	42	A	43	D	44	B	45	A
46	C	47	D	48	B	49	A	50	C