Jharkhand Polytechnic Chemistry

Sample Paper – 4

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 substances undergoes sublimation, that is, it changes directly from a solid to vapour on heating?

(A) common salt

(B) sugar

(C) camphor

(D) sand

Q2. The chemical symbol of the element iron is:

(A) Ir

(B) Fe

(C) In

(D) I

Q3. The molecular mass of methane (CH_4) is (atomic masses: C $= 12$, H $= 1$):

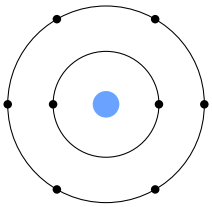
(A) 16 u

(B) 12 u

(C) 17 u

(D) 13 u

Q4. The figure shows the shell arrangement of an oxygen atom ($Z = 8$). Its electronic configuration is:



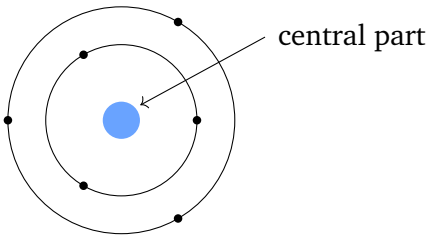
(A) $2, 8$

(B) $6, 2$

(C) 8

(D) $2, 6$

Q5. In the atom shown below, the small, dense, positively charged central part (marked in blue) is called the:



(A) shell

(B) nucleus

(C) orbit

(D) electron cloud

Q6. The maximum number of electrons that can be accommodated in a shell numbered n is given by the formula:

(A) $2n^2$

(B) n^2

(C) $2n$

(D) $n + 2$

Q7. An atom has atomic number $Z = 17$ and mass number $A = 35$. The number of neutrons present in it is:

(A) 17

(B) 35

(C) 18

(D) 52

Q8. The neutron was discovered by the scientist:

(A) J. J. Thomson

(B) Ernest Rutherford

(C) E. Goldstein

(D) James Chadwick

Q9. Which one of the following is a mixture?

(A) water

(B) air

(C) carbon dioxide

(D) common salt

Q10. The scientist who grouped elements into sets of three having similar properties, called triads, was:

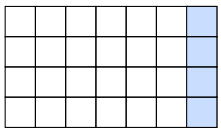
(A) Dobereiner

(B) Newlands

(C) Mendeleev

(D) Moseley

Q11. In the periodic table shown below, the highlighted right-most column holds a family of very unreactive gases known as the:



(A) halogens

(B) alkali metals

(C) noble gases

(D) alkaline earth metals

Q12. As we move from left to right across a period, the valency of the elements generally:

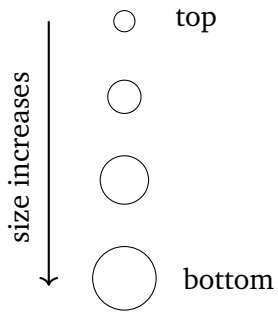
(A) decreases steadily

(B) first increases and then decreases

(C) increases steadily

(D) remains constant

Q13. In a group of the periodic table, the size of the atoms changes as shown below. The atom with the smallest size is located at the:



(A) middle

(B) bottom

(C) both ends

(D) top

Q14. The period number of an element in the modern periodic table is equal to the number of:

(A) electron shells in its atom

(B) valence electrons

(C) protons

(D) neutrons

Q15. The electrolysis of water, which splits it into hydrogen and oxygen, is an example of a:

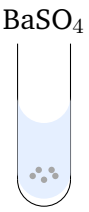
(A) combination reaction

(B) decomposition reaction

(C) displacement reaction

(D) neutralisation reaction

Q16. The reaction $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4\downarrow + 2NaCl$, which forms the white precipitate shown, is a:



(A) combination reaction

(B) displacement reaction

(C) double displacement reaction

(D) decomposition reaction

Q17. A chemical reaction in which heat energy is given out to the surroundings is called a/an:

(A) exothermic reaction

(B) endothermic reaction

(C) photochemical reaction

(D) thermal decomposition

Q18. In a chemical reaction, the substance that gains oxygen is said to be:

(A) reduced

(B) neutralised

(C) displaced

(D) oxidised

Q19. The slow eating up of iron when it is exposed to moist air, forming a reddish-brown layer, is called:

(A) galvanisation

(B) rusting

(C) electrolysis

(D) sublimation

Q20. In a redox reaction:

(A) only oxidation takes place

(B) only reduction takes place

(C) oxidation and reduction occur together

(D) no transfer of electrons occurs

Q21. The acid injected into the skin during the sting of an ant is:

(A) formic (methanoic) acid

(B) acetic acid

(C) citric acid

(D) lactic acid

Q22. Which indicator is pink in a basic solution but remains colourless in an acidic solution?

(A) methyl orange

(B) blue litmus

(C) turmeric

(D) phenolphthalein

Q23. When a metal oxide reacts with an acid, the products formed are:

(A) salt and hydrogen

(B) salt and water

(C) salt and carbon dioxide

(D) base and water

Q24. The chemical formula of bleaching powder is:

(A) $CaCO_3$

(B) $Ca(OH)_2$

(C) $CaOCl_2$

(D) $CaSO_4$

Q25. Bases (alkalis) can usually be recognised because they:

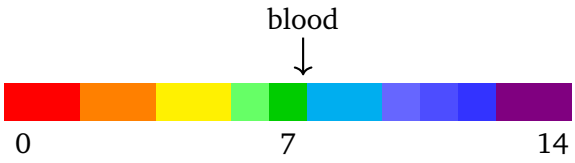
(A) feel soapy to touch and taste bitter

(B) feel rough and taste sour

(C) taste sour and turn blue litmus red

(D) have no effect on litmus paper

Q26. The pH of healthy human blood, marked by the arrow on the scale below, is about 7.4. This shows that blood is:



(A) strongly acidic

(B) slightly basic

(C) exactly neutral

(D) strongly basic

Q27. Which one of the following is a general property of metals?

(A) they are brittle

(B) they are poor conductors of heat

(C) they are dull in appearance

(D) they are good conductors of heat and electricity

Q28. Which one of the following is a non-metal that is brittle and a poor conductor of electricity?

(A) sulphur

(B) copper

(C) aluminium

(D) zinc

Q29. The freshly prepared mixture of concentrated hydrochloric acid and concentrated nitric acid that is able to dissolve gold is called:

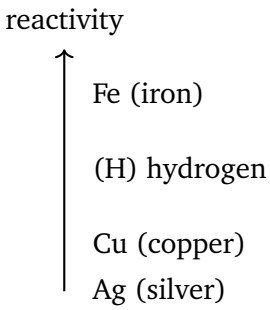
(A) brine

(B) milk of lime

(C) aqua regia

(D) plaster of Paris

Q30. Using the activity series shown below, the metal that can displace copper from copper sulphate solution is:



(A) silver

(B) iron

(C) gold

(D) mercury

Q31. When copper articles are left exposed to moist air for a long time, they acquire a green coating. This is due to the formation of:

(A) pure copper metal

(B) iron oxide

(C) black copper sulphide

(D) basic copper carbonate

Q32. Bronze is an alloy made mainly of:

(A) copper and tin

(B) copper and zinc

(C) iron and carbon

(D) lead and tin

Q33. Which one of the following is a property of ionic compounds?

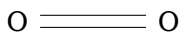
(A) they are gases at room temperature

(B) they have very low melting points

(C) they are solids with high melting points

(D) they do not dissolve in water at all

Q34. In an oxygen molecule (O_2), the two oxygen atoms are joined as shown by sharing two pairs of electrons. The bond between them is a:



(A) single bond

(B) double bond

(C) triple bond

(D) ionic bond

Q35. A covalent bond between two atoms is formed by the:

(A) complete transfer of electrons

(B) loss of electrons

(C) gain of electrons

(D) mutual sharing of electron pairs

Q36. Magnesium oxide (MgO) is an example of a/an:

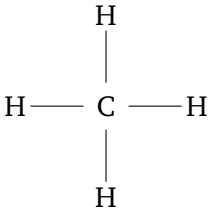
(A) ionic compound

(B) covalent compound

(C) metallic element

(D) mixture

Q37. As shown below, a carbon atom can form four bonds with other atoms. This ability of carbon, arising from its four valence electrons, is called:



(A) catenation

(B) isomerism

(C) tetravalency

(D) hydrogenation

Q38. A carbon compound that contains the functional group $-OH$ belongs to the class of:

(A) carboxylic acids

(B) alcohols

(C) aldehydes

(D) ketones

Q39. The molecular formula of butane is:

(A) C_3H_8

(B) C_2H_6

(C) C_5H_{12}

(D) C_4H_{10}

Q40. When ethanoic acid reacts with an alcohol in the presence of an acid catalyst, the sweet-smelling product formed is a/an:

(A) ester

(B) soap

(C) salt

(D) aldehyde

Q41. The process of making soap by reacting a fat or oil with an alkali is called:

(A) hydrogenation

(B) saponification

(C) esterification

(D) neutralisation

Q42. Two successive members of a homologous series differ from each other by a unit of:

(A) $-CH_3$

(B) $-H_2$

(C) $-CH_2$

(D) $-C_2H_2$

Q43. When carbon is burnt completely in plenty of air (as the flame shows), the main product formed is:

$C + O_2$

(A) carbon monoxide

(B) soot (unburnt carbon)

(C) hydrogen

(D) carbon dioxide

Q44. Depositing a thin layer of silver or gold over a cheaper metal using electricity is done mainly to:

(A) improve appearance and prevent corrosion

(B) make the object lighter

(C) make the object a good insulator

(D) increase the reactivity of the metal

Q45. At constant volume, the pressure of a fixed mass of gas is directly proportional to its absolute temperature. This statement is:

(A) Boyle's law

(B) Charles' law

(C) Gay-Lussac's law

(D) Avogadro's law

Q46. Which one of the following statements is correct?

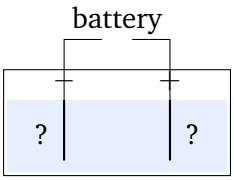
(A) all non-metals conduct electricity well

(B) metals conduct electricity while most non-metals do not

(C) metals do not conduct electricity at all

(D) graphite is a complete non-conductor

Q47. In the electrolysis set-up shown below, the electrode connected to the negative terminal of the battery is the:



(A) anode

(B) electrolyte

(C) positive plate

(D) cathode

Q48. An electrolyte conducts electricity because of the movement of:

(A) free electrons

(B) neutral atoms

(C) ions

(D) molecules

Q49. Which one of the following is a cleaner domestic fuel that produces far less smoke and pollution than coal?

(A) LPG (liquefied petroleum gas)

(B) coal dust

(C) firewood

(D) cow-dung cake

Q50. Waste that can be broken down into harmless substances by the action of microorganisms is described as:

(A) non-biodegradable

(B) radioactive

(C) synthetic

(D) biodegradable

Detailed Solutions

Q1.

Solution

Concept — Sublimation: Sublimation is the change of a substance directly from the solid state to the vapour state on heating, without passing through the liquid state.

Step 1 — Test each option: Common salt, sugar and sand do not sublime; they either melt, char or stay unchanged on gentle heating.

Step 2 — Identify the subliming solid: Camphor changes straight from solid to vapour, so it sublimes.

Why other options are wrong:

- Common salt and sand simply remain solid on mild heating.
- Sugar melts and then chars; it does not sublime.

Final Answer: Camphor undergoes sublimation $\Rightarrow$ C

Answer: (C) Go Back to Q1

Q2.

Solution

Concept — Symbols of elements: The symbol of iron comes from its Latin name *ferrum*, which gives the symbol Fe.

Step 1 — Recall the symbol: Iron $\rightarrow$ Fe.

Step 2 — Reject the look-alikes: Ir, In and I are symbols of other elements.

Why other options are wrong:

- Ir is the symbol of iridium.
- In is the symbol of indium.
- I is the symbol of iodine.

Final Answer: The symbol of iron is Fe $\Rightarrow$ B

Answer: (B) 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.

Step 1 — Count the atoms in CH_4: One carbon atom and four hydrogen atoms.

Step 2 — Multiply by atomic masses: carbon $= 1 \times 12 = 12$; hydrogen $= 4 \times 1 = 4$.

Step 3 — Add them up: $12 + 4 = 16$ u.

Why other options are wrong:

- 12 u counts only the carbon atom.
- 13 u and 17 u use the wrong number of hydrogen atoms.

Final Answer: The molecular mass of CH_4 is 16 u $\Rightarrow$ A

Answer: (A) Go Back to Q3

Q4.

Solution

Concept — Electronic configuration: Electrons fill shells from the innermost outward, with the K shell holding up to 2 and the L shell up to 8. Oxygen has 8 electrons.

Step 1 — Fill the K shell: 2 electrons. Remaining $= 8 - 2 = 6$.

Step 2 — Fill the L shell: the next 6 electrons (the L shell can take up to 8, so 6 fits).

Step 3 — Write the configuration: $2, 6$.

Why other options are wrong:

- $2, 8$ would need 10 electrons, but oxygen has only 8.
- $6, 2$ wrongly puts 6 in the K shell, which can hold only 2.
- 8 alone ignores the inner K shell.

Final Answer: Oxygen is $2, 6 \Rightarrow$ D

Answer: (D) Go Back to Q4

Q5.

Solution

Concept — Structure of the atom: An atom has a small, dense, positively charged centre called the nucleus, around which electrons revolve in shells.

Step 1 — Read the figure: The blue central blob is the part being asked about.

Step 2 — Name it: The central, positively charged part is the nucleus.

Why other options are wrong:

- Shells and orbits are the paths in which electrons move, not the centre.
- The electron cloud is the region of electrons outside the nucleus.

Final Answer: The central part of an atom is the nucleus $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q5

Q6.

Solution

Concept — Shell capacity rule: The maximum number of electrons that a shell can hold is given by the Bohr–Bury formula $2n^2$, where n is the shell number.

Step 1 — State the formula: maximum electrons $= 2n^2$.

Step 2 — Check with examples: for $n = 1$, $2(1)^2 = 2$; for $n = 2$, $2(2)^2 = 8$; for $n = 3$, $2(3)^2 = 18$. These match the known K, L and M capacities.

Why other options are wrong:

- n^2, $2n$ and $n + 2$ do not give the correct capacities $2, 8, 18, \ldots$

Final Answer: The maximum is $2n^2$ $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q6

Q7.

Solution

Concept — Neutron number: The number of neutrons in an atom is the mass number minus the atomic number, neutrons $= A - Z$.

Step 1 — List the data: $A = 35$ and $Z = 17$.

Step 2 — Subtract: neutrons $= 35 - 17$.

Step 3 — Compute: neutrons $= 18$.

Why other options are wrong:

- 17 is the atomic number (number of protons).
- 35 is the mass number.
- 52 wrongly adds A and Z instead of subtracting.

Final Answer: The atom has 18 neutrons $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q7

Q8.

Solution

Concept — Discovery of sub-atomic particles: The neutron, a particle with no charge, was discovered by James Chadwick in 1932.

Step 1 — Match the scientist: Chadwick $\rightarrow$ neutron.

Step 2 — Confirm: The neutron explained the extra mass in the nucleus.

Why other options are wrong:

- J. J. Thomson discovered the electron.
- Rutherford discovered the nucleus (and is linked with the proton).
- Goldstein discovered the proton through canal rays.

Final Answer: Chadwick discovered the neutron $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q8

Q9.

Solution

Concept — Mixtures and pure substances: A mixture contains two or more substances that are not chemically combined and can be present in any ratio. A pure substance (element or compound) has a fixed composition.

Step 1 — Test each option: Water and carbon dioxide are compounds; common salt is a compound.

Step 2 — Identify the mixture: Air is a mixture of gases such as nitrogen, oxygen and carbon dioxide in no fixed ratio.

Why other options are wrong:

- Water (H_2O) and carbon dioxide (CO_2) are compounds.
- Common salt (NaCl) is a compound.

Final Answer: Air is a mixture $\Rightarrow$ B

Answer: (B) Go Back to Q9

Q10.

Solution

Concept — Early classification (triads): Johann Dobereiner grouped elements with similar properties into sets of three, called triads, in which the atomic mass of the middle element was nearly the average of the other two.

Step 1 — Match the idea: Triads $\rightarrow$ Dobereiner.

Step 2 — Confirm: An example triad is lithium, sodium and potassium.

Why other options are wrong:

- Newlands proposed the law of octaves.
- Mendeleev arranged elements by atomic mass in a full table.
- Moseley introduced atomic number as the basis of arrangement.

Final Answer: Dobereiner gave the triads $\Rightarrow$ A

Answer: (A) Go Back to Q10

Q11.

Solution

Concept — Noble gases: The right-most vertical column of the periodic table (group 18) contains the noble gases such as helium, neon and argon, which have completely filled outer shells and are very unreactive.

Step 1 — Read the figure: The highlighted column is the last (extreme right) column.

Step 2 — Name the family: This column holds the noble (inert) gases.

Why other options are wrong:

- Halogens are in group 17, just before the noble gases.
- Alkali metals (group 1) and alkaline earth metals (group 2) lie on the left side.

Final Answer: The right-most column holds the noble gases $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — Valency trend across a period: Across a period, valency with respect to hydrogen first increases from 1 to 4 and then decreases back to 0 at the noble gas.

Step 1 — Trace period 2: Li $= 1$, Be $= 2$, B $= 3$, C $= 4$, then N $= 3$, O $= 2$, F $= 1$, Ne $= 0$.

Step 2 — Read the pattern: The valency first rises to 4 and then falls.

Why other options are wrong:

- It neither decreases steadily nor increases steadily throughout.
- It does not stay constant.

Final Answer: Valency first increases then decreases $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q12

Q13.

Solution

Concept — Atomic size down a group: Moving down a group, new shells are added, so the atomic size increases. Hence the smallest atom is at the top of the group.

Step 1 — Read the figure: The circles grow larger from top to bottom, showing increasing size.

Step 2 — Locate the smallest: The smallest circle is at the top of the group.

Why other options are wrong:

- The bottom atom is the largest, not the smallest.
- The middle and both ends are not where the minimum size occurs.

Final Answer: The smallest atom is at the top $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q13

Q14.

Solution

Concept — Periods and shells: The period number of an element equals the number of electron shells (energy levels) present in its atom.

Step 1 — Recall the rule: period number $=$ number of shells.

Step 2 — Check an example: Sodium $(2, 8, 1)$ has 3 shells, so it lies in period 3.

Why other options are wrong:

- The number of valence electrons relates to the group, not the period.
- Protons and neutrons do not fix the period.

Final Answer: Period number $=$ number of shells $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q14

Q15.

Solution

Concept — Decomposition reaction: In a decomposition reaction, a single compound breaks down into two or more simpler substances.

Step 1 — Look at the change: Water (one compound) splits into hydrogen and oxygen (two products).

Step 2 — Name the type: One reactant giving more than one product is a decomposition reaction (here driven by electricity, so electrolytic decomposition).

Why other options are wrong:

- Combination joins substances into one product.
- Displacement involves one element replacing another.
- Neutralisation is an acid–base reaction.

Final Answer: Electrolysis of water is a decomposition reaction $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q15

Q16.

Solution

Concept — Double displacement reaction: In a double displacement reaction, two compounds exchange their ions to form two new compounds, and one of them is often an insoluble precipitate.

Step 1 — Look at the exchange: $BaCl_2$ and Na_2SO_4 swap partners to give $BaSO_4$ and NaCl.

Step 2 — Note the precipitate: $BaSO_4$ is an insoluble white solid that settles out.

Step 3 — Name the type: The mutual exchange of ions makes it a double displacement (precipitation) reaction.

Why other options are wrong:

- Combination forms a single product; decomposition breaks one into many.
- Displacement involves only a single element replacing another.

Final Answer: It is a double displacement reaction $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q16

Q17.

Solution

Concept — Exothermic reaction: An exothermic reaction is one that releases heat energy to the surroundings, so the surroundings become warmer.

Step 1 — Match the definition: Heat given out $\rightarrow$ exothermic.

Step 2 — Example: Burning of fuels and respiration are exothermic.

Why other options are wrong:

- An endothermic reaction absorbs heat.
- Photochemical reactions need light; thermal decomposition needs heat input.

Final Answer: Heat given out means exothermic $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q17

Q18.

Solution

Concept — Oxidation: Oxidation is defined as the gain of oxygen (or loss of hydrogen/electrons) by a substance during a reaction.

Step 1 — Apply the definition: The substance that gains oxygen is being oxidised.

Step 2 — Example: In $2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$, copper gains oxygen and is oxidised.

Why other options are wrong:

- Reduction is the loss of oxygen, the opposite change.
- Neutralisation and displacement do not describe oxygen gain.

Final Answer: Gaining oxygen means the substance is oxidised $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q18

Q19.

Solution

Concept — Rusting: Rusting is the corrosion of iron in which iron slowly reacts with oxygen and moisture in the air to form a reddish-brown layer of hydrated iron oxide (rust).

Step 1 — Match the description: Iron eaten up by moist air with a reddish-brown layer is rusting.

Step 2 — Confirm: Both air (oxygen) and water are needed for rusting.

Why other options are wrong:

- Galvanisation is the coating of iron with zinc to prevent rust.
- Electrolysis uses electricity; sublimation is a change of state.

Final Answer: The corrosion of iron is called rusting $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q19

Q20.

Solution

Concept — Redox reaction: A redox reaction is one in which oxidation and reduction take place at the same time. The substance oxidised loses electrons and the substance reduced gains them.

Step 1 — State the rule: Oxidation and reduction always occur together in a redox reaction.

Step 2 — Example: In $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$, zinc oxide is reduced while carbon is oxidised.

Why other options are wrong:

- Oxidation cannot happen alone without an accompanying reduction.
- A redox reaction always involves transfer of electrons.

Final Answer: Oxidation and reduction occur together $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q20

Q21.

Solution

Concept — Natural acids: Many natural substances contain acids. The painful, burning sensation of an ant sting is due to formic acid, also called methanoic acid.

Step 1 — Match the source: Ant sting $\rightarrow$ formic (methanoic) acid.

Step 2 — Confirm: A mild base such as baking soda can soothe the sting by neutralising this acid.

Why other options are wrong:

- Acetic acid is found in vinegar.
- Citric acid is found in citrus fruits and lactic acid in sour milk.

Final Answer: An ant sting injects formic acid $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q21

Q22.

Solution

Concept — Phenolphthalein indicator: Phenolphthalein is a synthetic indicator that is pink in a basic solution and colourless in an acidic or neutral solution.

Step 1 — Recall the colours: Base $\rightarrow$ pink; acid $\rightarrow$ colourless.

Step 2 — Match the description: The indicator described is phenolphthalein.

Why other options are wrong:

- Methyl orange is red in acid and yellow in base.
- Blue litmus turns red in acid; turmeric turns red in base, not pink/colourless.

Final Answer: The indicator is phenolphthalein $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q22

Q23.

Solution

Concept — Metal oxide with acid: Metal oxides are basic in nature. When a basic metal oxide reacts with an acid, it forms a salt and water, just like a base does.

Step 1 — Write the general reaction: metal oxide + acid → salt + water.

Step 2 — Example: $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$.

Why other options are wrong:

- Hydrogen is released when a metal (not its oxide) reacts with acid.
- Carbon dioxide is released by carbonates, not oxides.

Final Answer: The products are salt and water $\Rightarrow$ B

Answer: (B) Go Back to Q23

Q24.

Solution

Concept — Bleaching powder: Bleaching powder (calcium oxychloride) is made by passing chlorine gas over dry slaked lime. Its formula is $CaOCl_2$.

Step 1 — Recall the formula: Bleaching powder = $CaOCl_2$.

Step 2 — Confirm its use: It is used for bleaching cloth and disinfecting water.

Why other options are wrong:

- $CaCO_3$ is limestone/marble.
- $Ca(OH)_2$ is slaked lime and $CaSO_4$ is the basis of plaster of Paris.

Final Answer: Bleaching powder is $CaOCl_2 \Rightarrow$ C

Answer: (C) Go Back to Q24

Q25.

Solution

Concept — Properties of bases: Bases (alkalis) feel soapy or slippery to touch, taste bitter, and turn red litmus blue.

Step 1 — Recall the feel and taste: Soapy touch and bitter taste are typical of bases.

Step 2 — Contrast with acids: Acids taste sour and turn blue litmus red.

Why other options are wrong:

- Rough feel with a sour taste, or a sour taste turning litmus red, describe acids.
- Bases do affect litmus (red to blue), so "no effect" is wrong.

Final Answer: Bases feel soapy and taste bitter $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q25

Q26.

Solution

Concept — pH scale: On the pH scale, 7 is neutral, below 7 is acidic, and above 7 is basic. A value just above 7 means slightly basic.

Step 1 — Read the value: The arrow points to pH ≈ 7.4.

Step 2 — Classify: Since 7.4 is a little above 7, blood is slightly basic (slightly alkaline).

Why other options are wrong:

- Strongly acidic would be near 0–2; strongly basic would be near 13–14.
- Exactly neutral would be pH 7, but 7.4 is above it.

Final Answer: A pH of 7.4 means blood is slightly basic $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q26

Q27.

Solution

Concept — Properties of metals: Metals are generally good conductors of heat and electricity, lustrous, malleable, ductile and sonorous.

Step 1 — Pick the correct property: Good conduction of heat and electricity is a key metallic property.

Step 2 — Reject non-metallic descriptions: Brittleness, dullness and poor conduction are properties of non-metals.

Why other options are wrong:

- Metals are not generally brittle; they are malleable and ductile.
- Metals are shiny (lustrous) and conduct heat well.

Final Answer: Metals are good conductors of heat and electricity $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q27

Q28.

Solution

Concept — Non-metals: Non-metals are generally brittle (in the solid state), dull, and poor conductors of heat and electricity.

Step 1 — Test the options: Copper, aluminium and zinc are all metals and good conductors.

Step 2 — Identify the non-metal: Sulphur is a brittle, non-conducting non-metal.

Why other options are wrong:

- Copper, aluminium and zinc are metals, not non-metals.

Final Answer: Sulphur is the non-metal $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q28

Q29.

Solution

Concept — Aqua regia: Aqua regia is a freshly prepared mixture of concentrated hydrochloric acid and concentrated nitric acid (in a $3:1$ ratio). It is highly corrosive and can dissolve even gold and platinum.

Step 1 — Match the description: The acid mixture that dissolves gold is aqua regia.

Step 2 — Confirm: Gold does not dissolve in either acid alone, only in the mixture.

Why other options are wrong:

- Brine is a salt solution; milk of lime is calcium hydroxide.
- Plaster of Paris is a calcium sulphate compound, not an acid mixture.

Final Answer: The mixture is aqua regia $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q29

Q30.

Solution

Concept — Displacement and the activity series: A more reactive metal can displace a less reactive metal from its salt solution. The activity series ranks metals by reactivity.

Step 1 — Read the series: Iron lies above copper, so iron is more reactive than copper.

Step 2 — Apply to the options: Among silver, iron, gold and mercury, only iron is more reactive than copper, so it can displace copper from $CuSO_4$.

Why other options are wrong:

- Silver, gold and mercury are all less reactive than copper, so they cannot displace it.

Final Answer: Iron displaces copper $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q30

Q31.

Solution

Concept — Corrosion of copper: When copper is exposed to moist air containing carbon dioxide for a long time, it forms a green layer of basic copper carbonate on its surface.

Step 1 — Identify the green coating: The green layer is basic copper carbonate.

Step 2 — Confirm: This is why old copper statues and utensils develop a green tarnish.

Why other options are wrong:

- Pure copper would not be green; iron oxide forms on iron, not copper.
- Copper sulphide is black, not green.

Final Answer: The green coating is basic copper carbonate $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q31

Q32.

Solution

Concept — Alloys: An alloy is a homogeneous mixture of a metal with one or more other metals or non-metals. Bronze is an alloy of copper and tin.

Step 1 — Recall the composition: Bronze $=$ copper $+$ tin.

Step 2 — Distinguish from brass: Brass is copper $+$ zinc, which is different.

Why other options are wrong:

- Copper and zinc make brass, not bronze.
- Iron and carbon make steel; lead and tin make solder.

Final Answer: Bronze is copper and tin $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q32

Q33.

Solution

Concept — Properties of ionic compounds: Ionic compounds are usually hard crystalline solids with high melting and boiling points, because strong electrostatic forces hold the oppositely charged ions together. They generally dissolve in water.

Step 1 — Pick the correct property: Ionic compounds are solids with high melting points.

Step 2 — Reject the wrong descriptions: They are not gases and do not have very low melting points.

Why other options are wrong:

- They are not gases at room temperature.
- Their melting points are high, and most do dissolve in water.

Final Answer: Ionic compounds are solids with high melting points $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q33

Q34.

Solution

Concept — Double bond: When two atoms share two pairs of electrons (four electrons in all), the bond between them is a double bond, shown by two lines.

Step 1 — Read the figure: The two oxygen atoms are joined by two parallel lines.

Step 2 — Name the bond: Two shared pairs of electrons make a double bond, so O_2 has a double bond (O=O).

Why other options are wrong:

- A single bond shares one pair; a triple bond shares three pairs.
- An ionic bond involves transfer, not sharing, of electrons.

Final Answer: O_2 has a double bond $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q34

Q35.

Solution

Concept — Covalent bond: A covalent bond is formed when two atoms share one or more pairs of electrons, so that both atoms achieve a stable electronic configuration.

Step 1 — Recall the mechanism: Covalent bonding $\rightarrow$ mutual sharing of electron pairs.

Step 2 — Contrast with ionic bonding: Ionic bonding involves complete transfer of electrons, not sharing.

Why other options are wrong:

- Complete transfer, loss or gain of electrons describes ionic bonding.

Final Answer: A covalent bond is formed by mutual sharing of electron pairs $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q35

Q36.

Solution

Concept — Ionic compounds: An ionic compound is formed when a metal transfers electrons to a non-metal. Magnesium (a metal) gives two electrons to oxygen (a non-metal) to form MgO.

Step 1 — Identify the elements: Magnesium is a metal and oxygen is a non-metal.

Step 2 — Classify the compound: Metal + non-metal with electron transfer gives an ionic compound.

Why other options are wrong:

- It is not covalent, since electrons are transferred, not shared.
- MgO is a compound, not a single element or a mixture.

Final Answer: MgO is an ionic compound $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q36

Q37.

Solution

Concept — Tetravalency of carbon: A carbon atom has four electrons in its outermost shell, so it needs four more to complete its octet. It does this by forming four covalent bonds. This property is called tetravalency.

Step 1 — Read the figure: The carbon atom is joined to four other atoms.

Step 2 — Name the property: Forming four bonds because of four valence electrons is tetravalency.

Why other options are wrong:

- Catenation is the linking of carbon atoms into chains.
- Isomerism is having the same formula but different structures; hydrogenation is the addition of hydrogen.

Final Answer: The property is tetravalency $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q37

Q38.

Solution

Concept — Functional groups: A functional group is an atom or group of atoms that decides the chemical properties of a carbon compound. The $-$OH group is the functional group of alcohols.

Step 1 — Identify the group: $-$OH $\rightarrow$ alcohol.

Step 2 — Example: Ethanol (CH_3CH_2OH) contains the $-$OH group.

Why other options are wrong:

- Carboxylic acids contain $-$COOH; aldehydes contain $-$CHO.
- Ketones contain the $>$C=O group.

Final Answer: The $-$OH group belongs to alcohols $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q38

Q39.

Solution

Concept — Alkane formula: Butane is the fourth member of the alkane series. Using the general formula C_nH_{2n+2} with $n = 4$ gives the molecular formula.

Step 1 — Put $n = 4$: carbon atoms $= 4$.

Step 2 — Find hydrogen: $2n + 2 = 2(4) + 2 = 10$.

Step 3 — Write the formula: C_4H_{10}.

Why other options are wrong:

- C_3H_8 is propane and C_2H_6 is ethane.
- C_5H_{12} is pentane.

Final Answer: Butane is $C_4H_{10} \Rightarrow \boxed{D}$

Answer: (D) Go Back to Q39

Q40.

Solution

Concept — Esterification: When a carboxylic acid (such as ethanoic acid) reacts with an alcohol in the presence of an acid catalyst, it forms a sweet-smelling compound called an ester. The reaction is called esterification.

Step 1 — Identify the product: acid + alcohol $\rightarrow$ ester + water.

Step 2 — Note the property: Esters have pleasant, fruity smells and are used in perfumes and flavourings.

Why other options are wrong:

- Soap is formed when a fat reacts with an alkali (saponification).
- A salt and water form in neutralisation, not here.

Final Answer: The product is an ester $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q40

Q41.

Solution

Concept — Saponification: Saponification is the reaction in which a fat or oil is heated with an alkali (such as sodium hydroxide) to form soap and glycerol.

Step 1 — Match the process: fat/oil + alkali $\rightarrow$ soap. This is saponification.

Step 2 — Confirm: Glycerol is obtained as a useful by-product.

Why other options are wrong:

- Hydrogenation adds hydrogen across double bonds.
- Esterification forms an ester; neutralisation is an acid–base reaction.

Final Answer: Making soap from fat and alkali is saponification $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q41

Q42.

Solution

Concept — Homologous series: A homologous series is a family of carbon compounds with the same functional group and similar properties, in which each member differs from the next by a $-CH_2$ group (a mass of 14 u).

Step 1 — Recall the common difference: successive members differ by $-CH_2$.

Step 2 — Example: Methane (CH_4) and ethane (C_2H_6) differ by exactly one CH_2 unit.

Why other options are wrong:

- $-CH_3$, $-H_2$ and $-C_2H_2$ are not the constant difference between successive homologues.

Final Answer: Successive members differ by $-CH_2$ $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q42

Q43.

Solution

Concept — Complete combustion: When a fuel burns in plenty of air (enough oxygen), it undergoes complete combustion. Complete combustion of carbon gives carbon dioxide.

Step 1 — Write the reaction: $C + O_2 \rightarrow CO_2$.

Step 2 — Identify the product: With enough oxygen, the product is carbon dioxide, not carbon monoxide.

Why other options are wrong:

- Carbon monoxide and soot form during incomplete combustion (limited air).
- Hydrogen is not a product of burning carbon.

Final Answer: Complete combustion of carbon gives carbon dioxide $\Rightarrow$ $\boxed{D}$

Answer: (D) Go Back to Q43

Q44.

Solution

Concept — Electroplating: Electroplating is the process of depositing a thin layer of one metal over another using electricity. A coat of silver or gold improves the appearance of an object and protects the underlying metal from corrosion.

Step 1 — Identify the purpose: The coating makes the article attractive and prevents corrosion.

Step 2 — Confirm: This is why cheaper metals are silver- or gold-plated in jewellery and cutlery.

Why other options are wrong:

- It does not make the object lighter or a better insulator.
- It protects the metal rather than increasing its reactivity.

Final Answer: Electroplating improves appearance and prevents corrosion $\Rightarrow$ $\boxed{A}$

Answer: (A) Go Back to Q44

Q45.

Solution

Concept — Gay-Lussac's law: Gay-Lussac's law states that, at constant volume, the pressure of a fixed mass of gas is directly proportional to its absolute (Kelvin) temperature, $P \propto T$.

Step 1 — Match the statement: Pressure directly proportional to temperature at constant volume is Gay-Lussac's law.

Step 2 — Confirm: So $\frac{P}{T} =$ constant when the volume is fixed.

Why other options are wrong:

- Boyle's law relates pressure and volume; Charles' law relates volume and temperature.
- Avogadro's law relates volume and the amount of gas.

Final Answer: This is Gay-Lussac's law $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q45

Q46.

Solution

Concept — Electrical conduction: Metals are good conductors of electricity because of their free electrons. Most non-metals do not conduct electricity; graphite is the main exception.

Step 1 — Compare metals and non-metals: Metals conduct; most non-metals do not.

Step 2 — Note the exception: Graphite, a form of carbon, does conduct because it has free electrons.

Why other options are wrong:

- Not all non-metals conduct; most are insulators.
- Metals do conduct electricity, so saying they do not is wrong.
- Graphite is actually a good conductor, so calling it a non-conductor is wrong.

Final Answer: Metals conduct while most non-metals do not $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q46

Q47.

Solution

Concept — Electrodes in electrolysis: The electrode joined to the negative terminal of the battery is the cathode, and the one joined to the positive terminal is the anode.

Step 1 — Read the figure: The electrode marked $-$ is connected to the negative terminal.

Step 2 — Name it: The negative electrode is the cathode, where positive ions (cations) are attracted.

Why other options are wrong:

- The anode (positive plate) is connected to the positive terminal.
- The electrolyte is the conducting solution, not an electrode.

Final Answer: The negative electrode is the cathode $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q47

Q48.

Solution

Concept — Conduction in electrolytes: An electrolyte conducts electricity because it contains freely moving ions. When current is passed, the positive ions move to the cathode and the negative ions move to the anode.

Step 1 — Identify the charge carriers: In an electrolyte, ions carry the current.

Step 2 — Contrast with metals: In metals the carriers are free electrons, but in electrolytes they are ions.

Why other options are wrong:

- Free electrons carry current in metals, not in electrolyte solutions.
- Neutral atoms and molecules carry no charge.

Final Answer: Conduction in an electrolyte is due to ions $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q48

Q49.

Solution

Concept — Clean fuels: A good fuel burns cleanly, leaving little smoke or ash. LPG (liquefied petroleum gas) burns with a clean flame and produces far less pollution than coal.

Step 1 — Compare the fuels: Coal, firewood and cow-dung cake produce a lot of smoke and ash.

Step 2 — Identify the clean fuel: LPG is a clean domestic fuel.

Why other options are wrong:

- Coal dust and firewood produce heavy smoke.
- Cow-dung cake gives a lot of smoke and leaves ash.

Final Answer: LPG is the cleaner fuel $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q49

Q50.

Solution

Concept — Biodegradable waste: Biodegradable substances are those that can be broken down into simple, harmless substances by the action of microorganisms such as bacteria and fungi.

Step 1 — Match the definition: Waste broken down by microorganisms is biodegradable.

Step 2 — Example: Vegetable peels, paper and cow dung are biodegradable.

Why other options are wrong:

- Non-biodegradable waste (plastic, glass) is not broken down by microorganisms.
- Radioactive and synthetic materials do not match this definition.

Final Answer: Such waste is biodegradable $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q50

Answer Key

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