Jharkhand Polytechnic Chemistry

Sample Paper – 8

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. An atom has 2 electrons in its K shell and 6 electrons in its L shell. Its atomic number is:

(A) 6

(B) 2

(C) 8

(D) 16

Q2. The correct chemical symbol of the element copper is:

(A) Cu

(B) Co

(C) Cr

(D) Ca

Q3. The molecular mass of calcium carbonate ($CaCO_3$) is (atomic masses: Ca $= 40$, C $= 12$, O $= 16$):

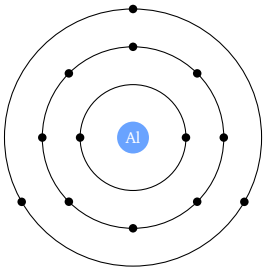
(A) 84 u

(B) 100 u

(C) 56 u

(D) 144 u

Q4. The electronic configuration of an aluminium atom ($Z = 13$), shown below, is:



(A) $2, 8, 1$

(B) $2, 8, 2$

(C) $2, 8, 3$

(D) $2, 3, 8$

Q5. An ion is formed when a neutral atom:

(A) loses or gains electrons

(B) loses or gains protons

(C) loses or gains neutrons

(D) shares electrons equally

Q6. The maximum number of electrons that the third (M) shell of an atom can hold is:

(A) 8

(B) 2

(C) 32

(D) 18

Q7. An atom contains 16 protons and 16 neutrons. Its mass number is:

(A) 16

(B) 32

(C) 48

(D) 8

Q8. The idea that an atom is the smallest indivisible particle of matter was first proposed by:

(A) Ernest Rutherford

(B) J. J. Thomson

(C) Niels Bohr

(D) John Dalton

Q9. Which one of the following is an element?

(A) water

(B) carbon dioxide

(C) oxygen

(D) common salt

Q10. The 18 vertical columns of the modern periodic table are called:

(A) periods

(B) groups

(C) series

(D) blocks

Q11. Group 1 metals such as sodium and potassium are stored under kerosene because they are:

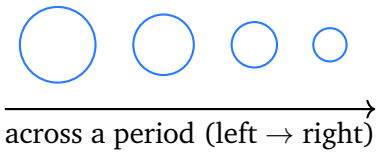
(A) highly reactive

(B) poisonous

(C) radioactive

(D) brightly coloured

Q12. The diagram below shows how atomic size changes along a period. Across a period from left to right, the atomic radius:



(A) increases

(B) remains constant

(C) first decreases then increases

(D) decreases

Q13. In any period, the element placed just before the noble gas belongs to the family of:

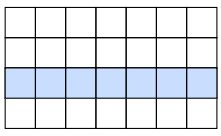
(A) alkali metals

(B) halogens

(C) alkaline earth metals

(D) transition metals

Q14. In the periodic table shown below, the highlighted horizontal row tells us that the number of electron shells in an atom is equal to its:



(A) group number

(B) atomic mass

(C) period number

(D) valency

Q15. When copper is heated strongly in air it forms a black layer of copper oxide. This reaction is an example of a:

(A) decomposition reaction

(B) displacement reaction

(C) double displacement reaction

(D) combination reaction

Q16. When white silver chloride is left in sunlight, it decomposes and turns:

(A) grey

(B) yellow

(C) blue

(D) colourless

Q17. An exothermic reaction is one which:

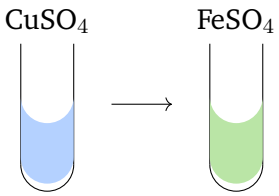
(A) absorbs heat from the surroundings

(B) releases heat and warms the surroundings

(C) shows no change in temperature

(D) takes place only on strong heating

Q18. An iron nail is dipped in blue copper sulphate solution; the solution slowly turns pale green as shown. The reaction $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$ is a:



(A) combination reaction

(B) decomposition reaction

(C) displacement reaction

(D) double displacement reaction

Q19. In a redox reaction, the substance that is itself reduced acts as the:

(A) oxidising agent

(B) reducing agent

(C) catalyst

(D) indicator

Q20. A chemical equation is balanced so that it obeys the:

(A) Boyle's law

(B) law of octaves

(C) law of constant pressure

(D) law of conservation of mass

Q21. The acid that gives oranges and lemons their sour taste is:

(A) acetic acid

(B) lactic acid

(C) citric acid

(D) tartaric acid

Q22. When moist red litmus paper is held in ammonia gas (a basic gas), its colour changes to:

(A) red

(B) blue

(C) colourless

(D) green

Q23. When a dilute acid reacts with an active metal, the gas evolved burns with a pop sound. This gas is:

(A) hydrogen

(B) oxygen

(C) carbon dioxide

(D) nitrogen

Q24. Which one of the following is used to remove the permanent hardness of water?

(A) common salt

(B) baking soda

(C) washing soda

(D) bleaching powder

Q25. An alkali is best described as:

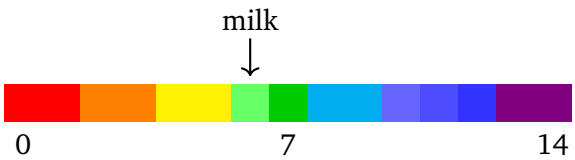
(A) an insoluble base

(B) a weak acid

(C) a salt of a strong acid

(D) a water-soluble base

Q26. The pH of fresh milk is about 6, as marked on the scale below. This shows that milk is:



(A) strongly acidic

(B) slightly acidic

(C) exactly neutral

(D) strongly basic

Q27. A freshly polished metal surface shines brightly. This property of metals is called:

(A) lustre

(B) ductility

(C) sonority

(D) malleability

Q28. Which one of the following substances is used for cutting glass?

(A) graphite

(B) copper

(C) sulphur

(D) diamond

Q29. An ore is best defined as:

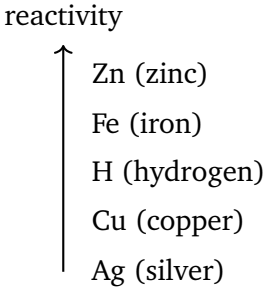
(A) an alloy of two metals

(B) a mineral from which a metal can be profitably extracted

(C) a pure sample of a metal

(D) a non-metallic compound

Q30. From the activity series shown below, the metal that can displace hydrogen from a dilute acid is:



(A) copper

(B) silver

(C) zinc

(D) gold

Q31. The green coating that forms on copper articles when left in moist air for a long time is mainly:

(A) copper oxide

(B) copper sulphate

(C) copper chloride

(D) basic copper carbonate

Q32. Stainless steel is an alloy made of:

(A) iron, chromium and nickel

(B) copper and zinc

(C) copper and tin

(D) lead and tin

Q33. Solid ionic compounds do not conduct electricity because:

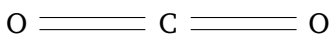
(A) they contain no ions

(B) their electrons are shared

(C) they melt very easily

(D) their ions are not free to move

Q34. In a carbon dioxide molecule (O=C=O), shown below, the bonds between the carbon and each oxygen atom are:



(A) two single bonds

(B) two double bonds

(C) two triple bonds

(D) one double and one single bond

Q35. The number of electrons that are mutually shared between two atoms in a single covalent bond is:

(A) 1

(B) 4

(C) 2

(D) 0

Q36. After losing one electron, a sodium atom $(2, 8, 1)$ attains the stable electronic configuration of:

(A) neon

(B) argon

(C) helium

(D) magnesium

Q37. Graphite, unlike diamond, is a good conductor of electricity because it has:

(A) ionic bonds

(B) a very hard structure

(C) no electrons at all

(D) free (mobile) electrons

Q38. In IUPAC naming, the suffix used for an alcohol is:

(A) $-$ol

(B) $-$al

(C) $-$oic acid

(D) $-$one

Q39. The straight-chain alkane shown below has five carbon atoms. Its molecular formula is:

C — C — C — C — C

(A) C_4H_{10}

(B) C_3H_8

(C) C_5H_{12}

(D) C_6H_{14}

Q40. Vinegar, used in the kitchen, is a dilute aqueous solution of:

(A) dilute hydrochloric acid

(B) ethanoic acid

(C) citric acid

(D) dilute sulphuric acid

Q41. The process of converting liquid vegetable oils into solid fats (vanaspati) by adding hydrogen is called:

(A) saponification

(B) esterification

(C) fermentation

(D) hydrogenation

Q42. The next member after methanol (CH_3OH) in the homologous series of alcohols, differing by a $-CH_2-$ unit, is:

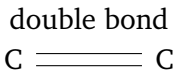
(A) ethanol

(B) propanol

(C) methanal

(D) methane

Q43. An unsaturated hydrocarbon contains a carbon–carbon double bond, as shown. Such a compound can be identified because it:



(A) turns blue litmus red

(B) gives a pop sound with a flame

(C) decolourises bromine water

(D) turns lime water milky

Q44. A few drops of dilute acid are added to water during its electrolysis in order to:

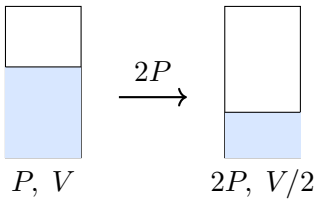
(A) speed up evaporation

(B) make the water conduct electricity

(C) change the colour of water

(D) increase the volume of water

Q45. At constant temperature, when the pressure on a fixed mass of gas is doubled (as shown), its volume becomes:



(A) half of the original volume

(B) double the original volume

(C) four times the original volume

(D) unchanged

Q46. Graphite is commonly used as an electrode in electrolysis because it:

(A) is cheap and brightly coloured

(B) reacts readily with the electrolyte

(C) is a soft non-metal

(D) conducts electricity and is chemically inert

Q47. Gases can be compressed much more easily than solids and liquids mainly because:

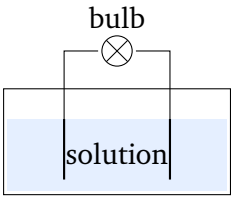
(A) their molecules are very tightly packed

(B) their molecules do not move at all

(C) there are large spaces between their molecules

(D) their molecules are very heavy

Q48. In the apparatus shown, the bulb glows when the electrodes are dipped in an acid or base solution. This solution conducts electricity because it contains:



(A) free electrons

(B) free ions

(C) free atoms

(D) free molecules

Q49. The main combustible gas present in biogas (gobar gas) is:

(A) methane

(B) carbon dioxide

(C) hydrogen

(D) butane

Q50. The harmful ultraviolet radiations coming from the Sun are largely blocked by the:

(A) carbon dioxide layer

(B) ozone layer

(C) nitrogen layer

(D) layer of water vapour

Detailed Solutions

Q1.

Solution

Concept — Atomic number: In a neutral atom the atomic number equals the total number of electrons, which is the sum of the electrons in all its shells.

Step 1 — Add the shell electrons: K shell $= 2$ and L shell $= 6$.

Step 2 — Total electrons: $2 + 6 = 8$.

Step 3 — State the atomic number: For a neutral atom, atomic number $=$ number of electrons $= 8$.

Why other options are wrong:

- 6 counts only the L shell.
- 2 counts only the K shell.
- 16 doubles the correct value.

Final Answer: Atomic number $= 8 \Rightarrow$ C

Answer: (C) Go Back to Q1

Q2.

Solution

Concept — Chemical symbols: The symbol of copper is taken from its Latin name *cuprum*, written as Cu.

Step 1 — Recall the symbol: Copper $=$ Cu.

Step 2 — Confirm: The first letter is capital and the second is small.

Why other options are wrong:

- Co is the symbol of cobalt.
- Cr is the symbol of chromium.
- Ca is the symbol of calcium.

Final Answer: The symbol of copper is Cu $\Rightarrow$ A

Answer: (A) Go Back to Q2

Q3.

Solution

Concept — Molecular mass: The molecular mass is the sum of the atomic masses of all atoms in the formula.

Step 1 — Count the atoms in $CaCO_3$: 1 calcium, 1 carbon and 3 oxygen atoms.

Step 2 — Multiply each by its atomic mass: Ca $= 1 \times 40 = 40$; C $= 1 \times 12 = 12$; O $= 3 \times 16 = 48$.

Step 3 — Add the values: $40 + 12 + 48 = 100$.

Why other options are wrong:

- 84 u and 56 u come from missing one or more oxygen atoms.
- 144 u over-counts the atoms.

Final Answer: Molecular mass of $CaCO_3 = 100$ u $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q3

Q4.

Solution

Concept — Electronic configuration: Electrons fill shells in order; the K shell holds up to 2, the L shell up to 8 and the rest go to the M shell. Aluminium has 13 electrons.

Step 1 — Fill the K shell: 2 electrons. Remaining $= 13 - 2 = 11$.

Step 2 — Fill the L shell: 8 electrons. Remaining $= 11 - 8 = 3$.

Step 3 — Fill the M shell: the last 3 electrons.

Step 4 — Write the configuration: $2, 8, 3$.

Why other options are wrong:

- $2, 8, 1$ and $2, 8, 2$ account for fewer than 13 electrons.
- $2, 3, 8$ fills the shells in the wrong order.

Final Answer: Aluminium is $2, 8, 3 \Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q4

Q5.

Solution

Concept — Formation of ions: An ion is a charged particle formed when a neutral atom gains or loses electrons. Losing electrons gives a positive ion (cation); gaining electrons gives a negative ion (anion).

Step 1 — Recall what changes: Only the electrons are transferred; the nucleus (protons and neutrons) stays the same.

Step 2 — Conclude: So an ion is formed when an atom loses or gains electrons.

Why other options are wrong:

- Protons and neutrons are not transferred in ordinary chemical changes.
- Sharing of electrons forms a covalent bond, not an ion.

Final Answer: An ion forms by loss or gain of electrons $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) 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. The M shell is the third shell, so $n = 3$.

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

Step 2 — Compute the square: $(3)^2 = 9$.

Step 3 — Multiply: $2 \times 9 = 18$.

Why other options are wrong:

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

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

Answer: (D) Go Back to Q6

Q7.

Solution

Concept — Mass number: The mass number A of an atom is the total number of protons and neutrons in its nucleus, $A = \text{protons} + \text{neutrons}$.

Step 1 — List the data: protons $= 16$, neutrons $= 16$.

Step 2 — Add them: $A = 16 + 16$.

Step 3 — Compute: $A = 32$.

Why other options are wrong:

- 16 is only the proton (or neutron) number.
- 48 adds an extra count of protons.
- 8 is unrelated to the data.

Final Answer: Mass number $= 32 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q7

Q8.

Solution

Concept — Atomic theory: John Dalton was the first to propose that all matter is made of tiny indivisible particles called atoms.

Step 1 — Match the idea: The indivisible-atom idea belongs to Dalton's atomic theory.

Step 2 — Confirm: Later work showed atoms do have internal parts, but the original idea is Dalton's.

Why other options are wrong:

- Rutherford proposed the nuclear model of the atom.
- Thomson discovered the electron.
- Bohr explained electron shells.

Final Answer: The indivisible atom was proposed by John Dalton $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q8

Q9.

Solution

Concept — Elements and compounds: An element is made of only one kind of atom, while a compound is made of two or more elements chemically combined.

Step 1 — Test each option: Water (H_2O), carbon dioxide (CO_2) and common salt (NaCl) are all compounds.

Step 2 — Identify the element: Oxygen is made of only oxygen atoms, so it is an element.

Why other options are wrong:

- Water and carbon dioxide are made of two different elements each.
- Common salt is a compound of sodium and chlorine.

Final Answer: Oxygen is the element $\Rightarrow$ $\boxed{C}$

Answer: (C) Go Back to Q9

Q10.

Solution

Concept — Groups and periods: In the modern periodic table the 18 vertical columns are called groups and the 7 horizontal rows are called periods.

Step 1 — Read the question: The 18 vertical columns are asked about.

Step 2 — Name them: Vertical columns are groups.

Why other options are wrong:

- Periods are the horizontal rows.
- Series and blocks are not the names of these 18 columns.

Final Answer: The 18 vertical columns are groups $\Rightarrow$ $\boxed{B}$

Answer: (B) Go Back to Q10

Q11.

Solution

Concept — Alkali metals: Group 1 metals (alkali metals) such as sodium and potassium are very reactive and react vigorously with air and water. To keep them safe they are stored under kerosene.

Step 1 — Find the reason: They must be kept away from air and moisture because they are highly reactive.

Step 2 — Confirm: Kerosene keeps out air and water, preventing a reaction.

Why other options are wrong:

- They are not stored because they are poisonous or coloured.
- Ordinary sodium and potassium are not radioactive.

Final Answer: They are stored under kerosene because they are highly reactive $\Rightarrow$ A

Answer: (A) Go Back to Q11

Q12.

Solution

Concept — Trend in atomic radius: As we move across a period from left to right, the nuclear charge increases while electrons are added to the same shell. The stronger pull of the nucleus draws the electrons closer.

Step 1 — Read the figure: The circles get smaller from left to right.

Step 2 — State the trend: So the atomic radius decreases across a period.

Why other options are wrong:

- It does not increase or stay constant across a period.
- It does not first decrease and then increase within a period.

Final Answer: Atomic radius decreases across a period $\Rightarrow$ D

Answer: (D) Go Back to Q12

Q13.

Solution

Concept — Position of halogens: In each period the noble gas (group 18) comes last. The element just before it belongs to group 17, the halogens.

Step 1 — Locate the element: It sits one place before the noble gas.

Step 2 — Name the family: Group 17 elements are the halogens (for example fluorine, chlorine).

Why other options are wrong:

- Alkali metals are in group 1 (start of a period).
- Alkaline earth metals are in group 2.
- Transition metals lie in the middle of the table.

Final Answer: The element before a noble gas is a halogen $\Rightarrow$ B

Answer: (B) Go Back to Q13

Q14.

Solution

Concept — Periods and shells: A period is a horizontal row of the periodic table. The period number of an element is equal to the number of electron shells in its atom.

Step 1 — Read the figure: The highlighted row is a period.

Step 2 — Link to shells: Atoms in period n have n occupied shells, so number of shells $=$ period number.

Why other options are wrong:

- The group number relates to valence electrons, not the number of shells.
- Atomic mass and valency do not give the number of shells.

Final Answer: Number of shells equals the period number $\Rightarrow$ C

Answer: (C) Go Back to Q14

Q15.

Solution

Concept — Combination reaction: In a combination reaction two or more substances join to form a single new product.

Step 1 — Write the reaction: $2Cu + O_2 \rightarrow 2CuO$.

Step 2 — Identify the type: Copper and oxygen combine to form a single product, copper oxide, so it is a combination reaction (it is also an oxidation).

Why other options are wrong:

- Decomposition breaks one substance into many.
- Displacement and double displacement involve replacement or exchange, not combining into one product.

Final Answer: Copper + oxygen $\rightarrow$ copper oxide is a combination reaction $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q15

Q16.

Solution

Concept — Photochemical decomposition: Silver chloride is white but it decomposes in sunlight into silver and chlorine: $2AgCl \xrightarrow{light} 2Ag + Cl_2$.

Step 1 — Note the product: The free silver metal that is set free has a grey colour.

Step 2 — State the change: So the white solid turns grey in sunlight.

Why other options are wrong:

- It does not turn yellow, blue or colourless.
- Yellow is the colour of silver bromide-type changes, not this one.

Final Answer: Silver chloride turns grey in sunlight $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q16

Q17.

Solution

Concept — Exothermic reaction: An exothermic reaction is one that releases heat to the surroundings, so the temperature of the surroundings rises.

Step 1 — Recall the meaning: "Exo" means out, so heat goes out of the system.

Step 2 — State the effect: The surroundings get warmer.

Why other options are wrong:

- Absorbing heat describes an endothermic reaction.
- There is a definite temperature rise, not no change.
- Exothermic reactions are not limited to strong heating.

Final Answer: An exothermic reaction releases heat and warms the surroundings $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q17

Q18.

Solution

Concept — Displacement reaction: In a displacement reaction a more reactive element pushes out a less reactive element from its compound.

Step 1 — Compare reactivity: Iron is more reactive than copper.

Step 2 — Apply to the reaction: Iron displaces copper from copper sulphate, giving iron sulphate and copper; the blue solution turns pale green.

Why other options are wrong:

- Combination joins substances into one product.
- Decomposition breaks one substance into many.
- Double displacement is an exchange between two compounds.

Final Answer: $\text{Fe} + \text{CuSO}_4$ is a displacement reaction $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q18

Q19.

Solution

Concept — Oxidising and reducing agents: The substance that is reduced (gains electrons or loses oxygen) is the oxidising agent, because it causes another substance to be oxidised.

Step 1 — Link the words: "Itself reduced" $\rightarrow$ oxidising agent.

Step 2 — Confirm: The oxidising agent takes electrons from the other reactant.

Why other options are wrong:

- The reducing agent is the substance that is itself oxidised.
- A catalyst and an indicator do not change oxidation states in this way.

Final Answer: The substance reduced is the oxidising agent $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q19

Q20.

Solution

Concept — Law of conservation of mass: Mass can neither be created nor destroyed in a chemical reaction. So the number of atoms of each element must be the same on both sides of an equation.

Step 1 — Recall the reason for balancing: We balance to keep atoms equal on both sides.

Step 2 — Name the law: This requirement comes from the law of conservation of mass.

Why other options are wrong:

- Boyle's law is a gas law, not about balancing equations.
- The law of octaves is a periodic-classification idea.
- There is no "law of constant pressure" governing balancing.

Final Answer: Balancing obeys the law of conservation of mass $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q20

Q21.

Solution

Concept — Acids in foods: Different fruits contain different natural acids. Citrus fruits such as oranges and lemons owe their sour taste to citric acid.

Step 1 — Match the fruit to its acid: Citrus fruits $\rightarrow$ citric acid.

Step 2 — Confirm: This acid is found in good amount in lemon and orange juice.

Why other options are wrong:

- Acetic acid is found in vinegar.
- Lactic acid is found in sour milk and curd.
- Tartaric acid is found in tamarind.

Final Answer: Citrus fruits are sour due to citric acid $\Rightarrow$ C

Answer: (C) Go Back to Q21

Q22.

Solution

Concept — Litmus with bases: Red litmus turns blue in the presence of a base or a basic gas. Ammonia is a basic gas.

Step 1 — Identify the nature of the gas: Ammonia is basic.

Step 2 — Apply to litmus: Moist red litmus turns blue in a basic gas.

Why other options are wrong:

- Staying red would mean an acidic or neutral gas.
- Litmus does not turn colourless or green here.

Final Answer: Moist red litmus turns blue in ammonia $\Rightarrow$ B

Answer: (B) Go Back to Q22

Q23.

Solution

Concept — Metal–acid reaction: An active metal reacts with a dilute acid to give a salt and hydrogen gas. Hydrogen burns with a characteristic pop sound.

Step 1 — Recall the products: metal + dilute acid → salt + hydrogen.

Step 2 — Match the test: The gas that gives a pop sound with a burning splinter is hydrogen.

Why other options are wrong:

- Oxygen relights a glowing splinter; it does not pop.
- Carbon dioxide turns lime water milky and puts out a flame.
- Nitrogen does not burn at all.

Final Answer: The pop-sound gas is hydrogen ⇒ A

Answer: (A) Go Back to Q23

Q24.

Solution

Concept — Removing hardness of water: Permanent hardness is caused by dissolved calcium and magnesium salts. Washing soda (sodium carbonate) reacts with these salts and removes them.

Step 1 — Recall the action: Washing soda precipitates the calcium and magnesium ions as insoluble carbonates.

Step 2 — Conclude: So washing soda removes the permanent hardness of water.

Why other options are wrong:

- Common salt and baking soda do not remove permanent hardness.
- Bleaching powder is used for disinfecting and bleaching, not softening.

Final Answer: Washing soda removes permanent hardness ⇒ C

Answer: (C) Go Back to Q24

Q25.

Solution

Concept — Alkalis: A base that dissolves in water is called an alkali. It gives hydroxide ions in solution.

Step 1 — Recall the definition: Alkali = a water-soluble base.

Step 2 — Example: Sodium hydroxide and potassium hydroxide are alkalis.

Why other options are wrong:

- An insoluble base is not called an alkali.
- A weak acid and a salt are not bases.

Final Answer: An alkali is a water-soluble base $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q25

Q26.

Solution

Concept — pH and acidity: On the pH scale, 7 is neutral, values below 7 are acidic and values above 7 are basic. A pH a little below 7 means a weakly (slightly) acidic solution.

Step 1 — Read the value: pH of milk = 6, just below 7.

Step 2 — Classify: A value of 6 means milk is slightly acidic.

Why other options are wrong:

- Strongly acidic would be a pH close to 0 or 1.
- Exactly neutral would be pH 7.
- Strongly basic would be a pH close to 14.

Final Answer: Milk with pH 6 is slightly acidic $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q26

Q27.

Solution

Concept — Metallic lustre: The shine of a freshly cut or polished metal surface is called metallic lustre. It is a typical physical property of metals.

Step 1 — Match the property: Shiny surface → lustre.

Step 2 — Confirm: This is why metals like silver and gold look bright.

Why other options are wrong:

- Ductility is being drawn into wires.
- Sonority is producing a ringing sound when struck.
- Malleability is being beaten into sheets.

Final Answer: The shine of a metal is its lustre ⇒ $\boxed{A}$

Answer: (A) Go Back to Q27

Q28.

Solution

Concept — Hardness of diamond: Diamond is the hardest natural substance known, so it is used for cutting and grinding hard materials such as glass.

Step 1 — Pick the hardest substance: Diamond.

Step 2 — Match the use: Its extreme hardness lets it cut glass.

Why other options are wrong:

- Graphite is soft and slippery.
- Copper and sulphur are far too soft to cut glass.

Final Answer: Diamond is used for cutting glass ⇒ $\boxed{D}$

Answer: (D) Go Back to Q28

Q29.

Solution

Concept — Minerals and ores: A mineral from which a metal can be extracted easily and at a reasonable (profitable) cost is called an ore.

Step 1 — Recall the definition: Ore = a mineral that yields a metal profitably.

Step 2 — Confirm: All ores are minerals, but not all minerals are ores.

Why other options are wrong:

- An alloy is a mixture of metals, not an ore.
- A pure metal sample is not an ore.
- An ore need not be a non-metallic compound.

Final Answer: An ore is a mineral from which a metal is profitably extracted $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q29

Q30.

Solution

Concept — Reactivity series and acids: A metal placed above hydrogen in the activity series is more reactive than hydrogen, so it can displace hydrogen from a dilute acid.

Step 1 — Read the ladder: Zinc lies above hydrogen, while copper and silver lie below it.

Step 2 — Choose the metal: Zinc, being above hydrogen, displaces hydrogen from dilute acid.

Why other options are wrong:

- Copper, silver and gold are below hydrogen, so they cannot displace it.

Final Answer: Zinc can displace hydrogen from dilute acid $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q30

Q31.

Solution

Concept — Corrosion of copper: When copper is exposed to moist air for a long time, it reacts with carbon dioxide and moisture to form a green layer of basic copper carbonate.

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

Step 2 — Confirm: This is the corrosion (tarnishing) of copper.

Why other options are wrong:

- Copper oxide is black, not green.
- Copper sulphate and copper chloride are not formed simply in moist air.

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

Answer: (D) Go Back to Q31

Q32.

Solution

Concept — Alloys: Stainless steel is an alloy of iron mixed with chromium and nickel. The chromium and nickel make it resistant to rust.

Step 1 — Recall the composition: Iron + chromium + nickel.

Step 2 — Confirm: This is why stainless steel does not rust like ordinary iron.

Why other options are wrong:

- Copper + zinc is brass.
- Copper + tin is bronze.
- Lead + tin is solder.

Final Answer: Stainless steel is iron, chromium and nickel $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q32

Q33.

Solution

Concept — Conduction in ionic compounds: Ionic compounds conduct electricity only when their ions are free to move, that is in the molten state or in solution. In the solid state the ions are locked in a fixed lattice.

Step 1 — Look at the solid state: In a solid the ions cannot move from their positions.

Step 2 — Conclude: With no free-moving ions, a solid ionic compound cannot conduct electricity.

Why other options are wrong:

- Ionic solids do contain ions, so "no ions" is wrong.
- Their electrons are not shared (that is covalent bonding).
- Easy melting is not the reason for non-conduction in the solid state.

Final Answer: Solid ionic compounds do not conduct because their ions are not free to move $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q33

Q34.

Solution

Concept — Bonds in carbon dioxide: In a carbon dioxide molecule the carbon atom is joined to each oxygen atom by sharing two pairs of electrons, that is by a double bond. The structure is O=C=O.

Step 1 — Read the structure: Each C–O link shows two lines, meaning a double bond.

Step 2 — Count them: There are two such double bonds in the molecule.

Why other options are wrong:

- Single bonds would show only one shared pair each.
- Triple bonds would need three shared pairs.
- Both bonds are double, not a mix of double and single.

Final Answer: Carbon dioxide has two double bonds $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q34

Q35.

Solution

Concept — Single covalent bond: A single covalent bond is formed when two atoms share one pair of electrons. One pair means two electrons.

Step 1 — Recall a single bond: It is one shared pair of electrons.

Step 2 — Count the electrons: One pair $= 2$ electrons.

Why other options are wrong:

- 1 is only half a pair.
- 4 electrons make a double bond (two pairs).
- 0 would mean no bond at all.

Final Answer: A single bond shares 2 electrons $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q35

Q36.

Solution

Concept — Achieving a stable octet: Atoms lose or gain electrons to attain the stable configuration of the nearest noble gas. Sodium has the configuration $2, 8, 1$.

Step 1 — Remove one electron: Losing the single outer electron gives $2, 8$.

Step 2 — Match the noble gas: The configuration $2, 8$ is that of neon.

Why other options are wrong:

- Argon has the configuration $2, 8, 8$.
- Helium has the configuration 2.
- Magnesium is not a noble gas.

Final Answer: A sodium ion has the configuration of neon $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q36

Q37.

Solution

Concept — Structure of graphite: In graphite each carbon atom is bonded to only three others, leaving one electron of each carbon free to move. These free electrons let graphite conduct electricity.

Step 1 — Find the reason: Graphite has free (delocalised) electrons.

Step 2 — Conclude: The moving electrons carry the current, so graphite conducts.

Why other options are wrong:

- Graphite has covalent, not ionic, bonds.
- It is actually soft, not hard, and it does contain electrons.

Final Answer: Graphite conducts because of its free electrons $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q37

Q38.

Solution

Concept — IUPAC suffixes: Each family of carbon compounds has its own ending in IUPAC names. Alcohols take the suffix $-$ol.

Step 1 — Recall the suffix: Alcohol $\rightarrow$ $-$ol.

Step 2 — Example: CH_3OH is named methanol.

Why other options are wrong:

- $-$al is the suffix for aldehydes.
- $-$oic acid is for carboxylic acids.
- $-$one is for ketones.

Final Answer: The suffix for an alcohol is $-$ol $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q38

Q39.

Solution

Concept — Formula of an alkane: The general formula of an alkane is C_nH_{2n+2}, where n is the number of carbon atoms. Pentane has $n = 5$.

Step 1 — Substitute $n = 5$: hydrogen atoms $= 2(5) + 2$.

Step 2 — Compute: $2(5) + 2 = 10 + 2 = 12$.

Step 3 — Write the formula: C_5H_{12}.

Why other options are wrong:

- C_4H_{10} is butane ($n = 4$).
- C_3H_8 is propane ($n = 3$).
- C_6H_{14} is hexane ($n = 6$).

Final Answer: Pentane is $C_5H_{12} \Rightarrow \boxed{C}$

Answer: (C) Go Back to Q39

Q40.

Solution

Concept — Ethanoic acid: Ethanoic acid (acetic acid) is a weak organic acid. Its dilute aqueous solution (about 5–8%) is known as vinegar.

Step 1 — Identify the acid in vinegar: It is ethanoic acid.

Step 2 — Confirm: Vinegar is used in cooking and food preservation.

Why other options are wrong:

- Hydrochloric and sulphuric acids are strong mineral acids, not present in vinegar.
- Citric acid is found in citrus fruits, not in vinegar.

Final Answer: Vinegar is dilute ethanoic acid $\Rightarrow \boxed{B}$

Answer: (B) Go Back to Q40

Q41.

Solution

Concept — Hydrogenation: Adding hydrogen across the double bonds of an unsaturated oil, using a nickel catalyst, turns the liquid oil into a solid fat. This process is called hydrogenation.

Step 1 — Identify the change: Liquid oil + hydrogen $\rightarrow$ solid fat.

Step 2 — Name the process: This is hydrogenation (used to make vanaspati).

Why other options are wrong:

- Saponification is the making of soap.
- Esterification forms an ester from an acid and an alcohol.
- Fermentation produces alcohol from sugars.

Final Answer: Hardening of oils by adding hydrogen is hydrogenation $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q41

Q42.

Solution

Concept — Homologous series: In a homologous series, each member differs from the next by a $-CH_2-$ unit. The alcohols start with methanol (CH_3OH).

Step 1 — Add one CH_2 unit: $CH_3OH + CH_2$ gives C_2H_5OH.

Step 2 — Name the next member: C_2H_5OH is ethanol.

Why other options are wrong:

- Propanol is two steps after methanol, not the immediate next member.
- Methanal is an aldehyde, not an alcohol.
- Methane is a hydrocarbon, not an alcohol.

Final Answer: The member after methanol is ethanol $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q42

Q43.

Solution

Concept — Test for unsaturation: Unsaturated hydrocarbons (with C=C or C≡C bonds) react with bromine water and remove its brown-orange colour. This decolourisation is the test for unsaturation.

Step 1 — Recall the test: Add bromine water to the compound.

Step 2 — Observe: An unsaturated compound decolourises bromine water, while a saturated one does not.

Why other options are wrong:

- Hydrocarbons do not turn blue litmus red.
- The pop-sound test is for hydrogen gas.
- Turning lime water milky is a test for carbon dioxide.

Final Answer: An unsaturated hydrocarbon decolourises bromine water $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q43

Q44.

Solution

Concept — Electrolysis of water: Pure water is a very poor conductor of electricity. A few drops of a dilute acid (such as dilute sulphuric acid) supply ions and make the water conduct, so electrolysis can take place.

Step 1 — Note the problem: Pure water hardly conducts current.

Step 2 — Find the purpose of the acid: The acid provides ions and makes the water conduct electricity.

Why other options are wrong:

- The acid is not added to evaporate water or change its colour.
- It does not increase the volume of the water.

Final Answer: The acid is added to make water conduct electricity $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q44

Q45.

Solution

Concept — Boyle's law: At constant temperature, the volume of a fixed mass of gas is inversely proportional to its pressure, so $PV =$ constant.

Step 1 — Write the relation: $P_1V_1 = P_2V_2$.

Step 2 — Double the pressure: put $P_2 = 2P_1$, so $P_1V_1 = 2P_1 \times V_2$.

Step 3 — Solve for the new volume: $V_2 = \dfrac{P_1V_1}{2P_1} = \dfrac{V_1}{2}$.

Why other options are wrong:

- Doubling the pressure cannot double or quadruple the volume.
- The volume does not stay unchanged.

Final Answer: The volume becomes half $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q45

Q46.

Solution

Concept — Choice of electrodes: A good electrode must conduct electricity and must not react with the electrolyte. Graphite conducts electricity and is chemically inert, so it is widely used as an electrode.

Step 1 — State the two needs: conduct current and stay unreactive.

Step 2 — Match graphite: Graphite meets both requirements.

Why other options are wrong:

- It is not chosen for being coloured.
- A reactive electrode would be a drawback, not a reason.
- Being soft or a non-metal is not the reason it is used.

Final Answer: Graphite is used because it conducts and is inert $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q46

Q47.

Solution

Concept — States of matter: In a gas the molecules are far apart with large empty spaces between them, so they can be pushed closer together. This makes gases highly compressible.

Step 1 — Compare the states: In solids and liquids the particles are already close together.

Step 2 — Explain compressibility: The large gaps between gas molecules allow the gas to be squeezed into a smaller volume.

Why other options are wrong:

- Tightly packed molecules describe a solid, not a gas.
- Gas molecules move freely and rapidly.
- The mass of the molecules does not decide compressibility.

Final Answer: Large spaces between molecules make gases compressible $\Rightarrow$ C

Answer: (C) Go Back to Q47

Q48.

Solution

Concept — Conduction in solutions: Acids and bases dissolve in water to give ions. These free ions move towards the electrodes and carry the current, so the solution conducts electricity and the bulb glows.

Step 1 — Identify the charge carriers: In an acid or base solution they are ions.

Step 2 — Conclude: The free ions make the solution conduct electricity.

Why other options are wrong:

- Free electrons carry current in metals, not in solutions.
- Free atoms and neutral molecules cannot carry charge.

Final Answer: An acid or base solution conducts because of free ions $\Rightarrow$ B

Answer: (B) Go Back to Q48

Q49.

Solution

Concept — Biogas: Biogas (gobar gas) is produced by the decomposition of animal dung and plant waste by bacteria. Its main combustible gas is methane (about 60% or more).

Step 1 — Recall the main gas: The chief burning gas in biogas is methane.

Step 2 — Confirm: Methane gives biogas its fuel value.

Why other options are wrong:

- Carbon dioxide is present but does not burn.
- Hydrogen and butane are not the main gases of biogas.

Final Answer: The main gas in biogas is methane $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q49

Q50.

Solution

Concept — The ozone layer: A layer of ozone (O_3) high up in the atmosphere absorbs most of the harmful ultraviolet (UV) radiation coming from the Sun, protecting living things on Earth.

Step 1 — Identify the protective layer: It is the ozone layer.

Step 2 — State its role: It blocks the Sun's harmful UV rays.

Why other options are wrong:

- There is no protective "carbon dioxide layer" or "nitrogen layer" for UV.
- Water vapour does not block UV radiation in this way.

Final Answer: The ozone layer blocks harmful UV rays $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q50

Answer Key

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