Jharkhand Polytechnic Chemistry

Sample Paper – 6

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. Condensation is the process in which a substance changes from:

(A) a liquid to a solid

(B) a gas to a liquid

(C) a solid to a gas

(D) a liquid to a gas

Q2. The chemical symbol of the element silver is:

(A) Si

(B) S

(C) Au

(D) Ag

Q3. The molecular mass of an oxygen molecule (O_2) is (atomic mass of O $= 16$ u):

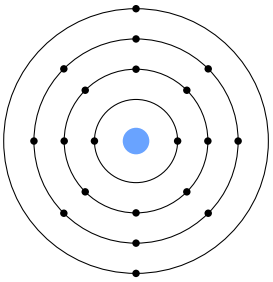
(A) 32 u

(B) 16 u

(C) 8 u

(D) 48 u

Q4. The electronic configuration of a calcium atom ($Z = 20$), shown below, is:



(A) $2, 8, 10$

(B) $2, 8, 2$

(C) $2, 8, 8, 2$

(D) $2, 10, 8$

Q5. In a neutral atom, the number of protons is always equal to the number of:

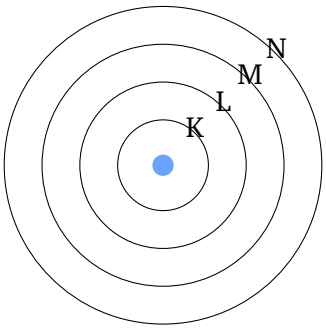
(A) neutrons

(B) nucleons

(C) shells

(D) electrons

Q6. Using the rule $2n^2$ for the shells shown below, the maximum number of electrons that the N shell (the fourth shell, $n = 4$) can hold is:



(A) 18

(B) 32

(C) 8

(D) 16

Q7. An atom has atomic number 6 and mass number 12. The number of neutrons present in it is:

(A) 6

(B) 12

(C) 18

(D) 0

Q8. The positively charged particle, the proton, was discovered through the study of canal rays by:

(A) James Chadwick

(B) J. J. Thomson

(C) E. Goldstein

(D) Niels Bohr

Q9. Which one of the following pairs are mixtures (alloys) and *not* compounds?

(A) water and carbon dioxide

(B) common salt and sugar

(C) methane and ammonia

(D) brass and bronze

Q10. While making his periodic table, Mendeleev left certain gaps. These gaps were meant for:

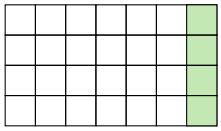
(A) elements that had not yet been discovered

(B) noble gases only

(C) radioactive elements only

(D) liquids only

Q11. In the periodic table shown below, the highlighted group of the most reactive non-metals (group 17) is called the:



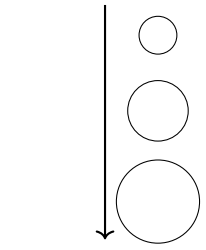
(A) noble gases

(B) alkali metals

(C) halogens

(D) alkaline earth metals

Q12. As we move down a group of the periodic table, the atomic radius (size of the atom) generally, as suggested by the figure:



(A) decreases

(B) increases

(C) remains the same

(D) first increases then decreases

Q13. On moving from left to right across a period, the non-metallic character of the elements generally:

(A) decreases

(B) remains constant

(C) becomes zero

(D) increases

Q14. The number of valence electrons present in the atoms of group 1 elements is:

(A) 1

(B) 2

(C) 7

(D) 8

Q15. When a magnesium ribbon is burnt in air to form magnesium oxide, the reaction is an example of a:

(A) decomposition reaction

(B) combination reaction

(C) displacement reaction

(D) double displacement reaction

Q16. On heating, green copper carbonate changes into black copper oxide and carbon dioxide gas. This change is a:

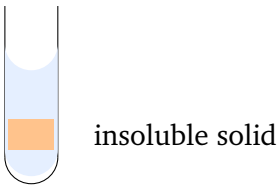
(A) combination reaction

(B) displacement reaction

(C) thermal decomposition reaction

(D) neutralisation reaction

Q17. A reaction in which two solutions react to form an insoluble solid (shown settling at the bottom of the tube) is called a:



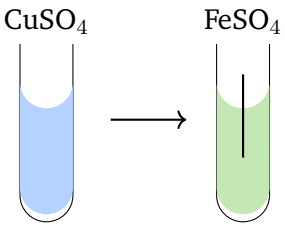
(A) precipitation reaction

(B) combustion reaction

(C) reduction reaction

(D) photochemical reaction

Q18. When an iron nail is dipped in blue copper sulphate solution, the solution slowly turns pale green (as shown). This happens because of a:



(A) combination reaction

(B) decomposition reaction

(C) neutralisation reaction

(D) displacement reaction

Q19. In a redox reaction, the species that loses electrons is said to be:

(A) reduced

(B) oxidised

(C) neutralised

(D) precipitated

Q20. The reaction of an acid with a base to give a salt and water can also be classified as a:

(A) double displacement reaction

(B) combination reaction

(C) decomposition reaction

(D) displacement reaction

Q21. The acid used in a car (lead storage) battery is:

(A) hydrochloric acid

(B) nitric acid

(C) sulphuric acid

(D) acetic acid

Q22. The natural indicator litmus is extracted from:

(A) rose petals

(B) turmeric

(C) red cabbage

(D) lichen

Q23. In the reaction $HCl + NaOH \rightarrow NaCl + H_2O$, the products formed are:

(A) two gases

(B) a salt and water

(C) two acids

(D) a base and a gas

Q24. The chemical commonly used to whiten clothes in textile mills and to disinfect drinking water is:

(A) washing soda

(B) baking soda

(C) bleaching powder

(D) plaster of Paris

Q25. A strong acid is one that, when dissolved in water:

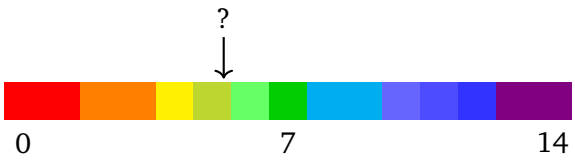
(A) ionises almost completely

(B) does not ionise at all

(C) ionises only slightly

(D) turns into a base

Q26. Rain water dissolves carbon dioxide from the air to form a weak acid. On the pH scale shown below, the pH of such rain water is:



(A) exactly 7

(B) exactly 14

(C) above 7

(D) slightly less than 7

Q27. Compared with most non-metals, metals generally have:

(A) very low melting and boiling points

(B) high melting and boiling points

(C) no fixed melting point

(D) melting points below 0°C

Q28. Which one of the following statements is generally true for non-metals?

(A) they have low density and are poor conductors of electricity

(B) they are good conductors of electricity

(C) they are highly malleable and ductile

(D) they are always shiny (lustrous)

Q29. A layer of zinc protects iron from rusting even when the layer gets scratched. This is because zinc:

(A) is much harder than iron

(B) is cheaper than iron

(C) is more reactive and corrodes in place of iron

(D) is a non-metal

Q30. Which one of the following metals is so soft that it can be cut easily with a knife?

(A) iron

(B) sodium

(C) copper

(D) aluminium

Q31. Solder, an alloy used for joining electrical wires, is made mainly of:

(A) copper and zinc

(B) iron and carbon

(C) copper and tin

(D) lead and tin

Q32. In the activity series of metals shown below, the metals placed right at the top (most reactive) are:

increasing reactivity ↑

K (potassium)
Na (sodium)
Zn (zinc)
Fe (iron)
Cu (copper)
Au (gold)

(A) gold and silver

(B) copper and iron

(C) potassium and sodium

(D) zinc and lead

Q33. Ionic compounds have high melting points mainly because:

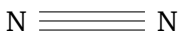
(A) the oppositely charged ions are held by strong electrostatic forces

(B) they are made up of gas molecules

(C) they share electrons only weakly

(D) they contain no charged particles

Q34. In a nitrogen molecule the two atoms share three pairs of electrons, as shown below. This bond is a:



(A) single bond

(B) triple bond

(C) double bond

(D) ionic bond

Q35. The atoms in a covalent molecule are held together by:

(A) transfer of electrons

(B) attraction between ions

(C) free (mobile) electrons

(D) shared pairs of electrons

Q36. In magnesium oxide (MgO), the magnesium ion carries a charge of:

(A) $1+$

(B) $1-$

(C) $2+$

(D) $2-$

Q37. Although it is a form of carbon, diamond does not conduct electricity because it has:

(A) no free electrons

(B) extra protons

(C) free ions

(D) a metallic structure

Q38. The functional group present in a ketone is:

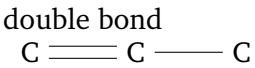
(A) $-OH$

(B) $>C=O$

(C) $-COOH$

(D) $-CHO$

Q39. The molecular formula of propene, the three-carbon member of the alkene series (skeleton shown), is:



(A) C_3H_8

(B) C_2H_4

(C) C_3H_6

(D) C_4H_8

Q40. The common name of ethanoic acid (CH_3COOH) is:

(A) formic acid

(B) citric acid

(C) lactic acid

(D) acetic acid

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

(A) saponification

(B) hydrogenation

(C) esterification

(D) fermentation

Q42. Butane (C_4H_{10}) can exist in two different structural arrangements. Compounds that have the same molecular formula but different structures are called:

(A) allotropes

(B) isomers

(C) isotopes

(D) homologues

Q43. In the presence of sunlight, alkanes react with chlorine by a:

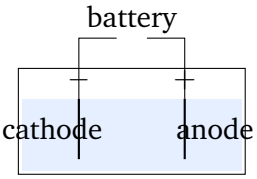
(A) addition reaction

(B) combustion reaction

(C) neutralisation reaction

(D) substitution reaction

Q44. During electrolysis (apparatus shown), the electrode at which reduction, that is gain of electrons, takes place is the:



(A) anode

(B) electrolyte

(C) cathode

(D) salt bridge

Q45. The combined gas law for a fixed mass of gas is correctly written as:

(A) $P_1V_1 = P_2V_2$

(B) $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

(C) $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

(D) $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

Q46. Which one of the following statements about the electrical conductivity of water is correct?

(A) Pure water hardly conducts electricity, but salt water conducts well

(B) Pure water is a very good conductor of electricity

(C) Salt water cannot conduct electricity at all

(D) Neither pure water nor salt water can conduct electricity

Q47. At constant volume, when the temperature of a fixed mass of gas is increased, its pressure:

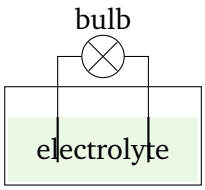
(A) decreases

(B) remains unchanged

(C) becomes zero

(D) increases

Q48. An electrochemical cell, such as the one shown below, is a device that converts:



(A) electrical energy into light energy

(B) heat energy into chemical energy

(C) chemical energy into electrical energy

(D) electrical energy into chemical energy

Q49. The gases mainly responsible for damaging the ozone layer in the upper atmosphere are:

(A) oxides of sulphur

(B) chlorofluorocarbons (CFCs)

(C) carbon dioxide

(D) water vapour

Q50. Coal and petroleum are described as non-renewable resources because they:

(A) take millions of years to form and will eventually get exhausted

(B) can be manufactured quickly in factories

(C) are formed again fully every year

(D) are unlimited in supply

Detailed Solutions

Q1.

Solution

Concept — Change of state: Condensation is the change of state in which a gas (or vapour) cools and turns into a liquid. It is the reverse of evaporation.

Step 1 — Recall the direction: In condensation the substance goes from the gaseous state to the liquid state.

Step 2 — Confirm with an example: Water vapour in the air condenses into tiny water droplets to form dew.

Why other options are wrong:

- Liquid to solid is freezing.
- Solid to gas is sublimation.
- Liquid to gas is evaporation (the opposite of condensation).

Final Answer: Condensation is gas to liquid $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q1

Q2.

Solution

Concept — Chemical symbols: The symbol of silver comes from its Latin name *argentum*, which gives the symbol Ag.

Step 1 — Recall the Latin name: Silver = argentum.

Step 2 — Write the symbol: The first two letters give Ag.

Why other options are wrong:

- Si is the symbol for silicon.
- S is the symbol for sulphur.
- Au (aurum) is the symbol for gold.

Final Answer: Silver is Ag $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q2

Q3.

Solution

Concept — Molecular mass: The molecular mass of a molecule is the sum of the atomic masses of all the atoms present in it.

Step 1 — Count the atoms: An oxygen molecule O_2 has 2 oxygen atoms.

Step 2 — Multiply by the atomic mass: 2×16 u.

Step 3 — Compute: $2 \times 16 = 32$ u.

Why other options are wrong:

- 16 u is the mass of a single oxygen atom, not the molecule.
- 8 u and 48 u do not match 2×16.

Final Answer: The molecular mass of O_2 is 32 u $\Rightarrow$ $\boxed{A}$

Answer: (A) Go Back to Q3

Q4.

Solution

Concept — Electronic configuration: Electrons fill shells in order: K holds up to 2, L up to 8, M up to 8 (for the first 20 elements), and the rest go to N. Calcium has 20 electrons.

Step 1 — Fill the K shell: 2 electrons. Remaining $= 20 - 2 = 18$.

Step 2 — Fill the L shell: 8 electrons. Remaining $= 18 - 8 = 10$.

Step 3 — Fill the M shell: 8 electrons. Remaining $= 10 - 8 = 2$.

Step 4 — Fill the N shell: the last 2 electrons.

Step 5 — Write the configuration: $2, 8, 8, 2$.

Why other options are wrong:

- $2, 8, 10$ overfills the M shell for calcium.
- $2, 8, 2$ accounts for only 12 electrons.
- $2, 10, 8$ overfills the L shell.

Final Answer: Calcium is $2, 8, 8, 2 \Rightarrow$ $\boxed{C}$

Answer: (C) Go Back to Q4

Q5.

Solution

Concept — Neutral atom: An atom is electrically neutral because the positive charge of its protons is exactly balanced by the negative charge of its electrons.

Step 1 — Balance the charges: For zero net charge, the number of protons must equal the number of electrons.

Step 2 — Confirm: For example, a neutral sodium atom has 11 protons and 11 electrons.

Why other options are wrong:

- Neutrons are uncharged and need not equal the protons.
- Nucleons (protons $+$ neutrons) give the mass number.
- The number of shells is unrelated to the proton count.

Final Answer: Protons $=$ electrons in a neutral atom $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q5

Q6.

Solution

Concept — Shell capacity: The maximum number of electrons that a shell can hold is given by $2n^2$, where n is the shell number. The N shell is the fourth shell, so $n = 4$.

Step 1 — Substitute $n = 4$: maximum $= 2 \times (4)^2$.

Step 2 — Square the shell number: $(4)^2 = 16$.

Step 3 — Multiply by 2: $2 \times 16 = 32$.

Why other options are wrong:

- 18 is the capacity of the M shell ($n = 3$).
- 8 is the capacity of the L shell ($n = 2$).
- 16 is n^2, not $2n^2$.

Final Answer: The N shell can hold 32 electrons $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q6

Q7.

Solution

Concept — Neutrons: The number of neutrons in an atom equals its mass number minus its atomic number, that is neutrons $= A - Z$.

Step 1 — List the data: $A = 12$ and $Z = 6$.

Step 2 — Subtract: neutrons $= 12 - 6$.

Step 3 — Compute: neutrons $= 6$.

Why other options are wrong:

- 12 is the mass number, not the neutron count.
- 18 would be $A + Z$, which is incorrect.
- 0 would mean no neutrons, which is wrong here.

Final Answer: The atom has 6 neutrons $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q7

Q8.

Solution

Concept — Discovery of the proton: E. Goldstein discovered positively charged rays, called canal rays (anode rays), and the positive particle in them was later identified as the proton.

Step 1 — Match the scientist: Goldstein $\rightarrow$ canal rays $\rightarrow$ proton.

Step 2 — Confirm: The proton is the positively charged particle in the nucleus.

Why other options are wrong:

- James Chadwick discovered the neutron.
- J. J. Thomson discovered the electron.
- Niels Bohr proposed the shell model of the atom.

Final Answer: Goldstein discovered the proton $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q8

Q9.

Solution

Concept — Mixtures and compounds: An alloy is a homogeneous mixture of a metal with other elements; its components are not chemically combined in a fixed ratio. A compound has its elements chemically combined in a fixed ratio.

Step 1 — Test the options: Water, carbon dioxide, common salt, sugar, methane and ammonia are all compounds.

Step 2 — Identify the mixtures: Brass (copper and zinc) and bronze (copper and tin) are alloys, which are mixtures.

Why other options are wrong:

- Each of the other pairs lists two pure compounds.

Final Answer: Brass and bronze are mixtures (alloys) $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q9

Q10.

Solution

Concept — Mendeleev's predictions: Mendeleev arranged the known elements by increasing atomic mass and left some empty spaces in his table for elements that had not yet been discovered, even predicting their properties.

Step 1 — Recall the reason for the gaps: The gaps were placeholders for undiscovered elements.

Step 2 — Confirm: Elements like gallium and germanium were later discovered and fitted these gaps.

Why other options are wrong:

- The gaps were not reserved only for noble gases or radioactive elements.
- They had nothing to do with the physical state of elements.

Final Answer: The gaps were for undiscovered elements $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q10

Q11.

Solution

Concept — Halogens: The elements of group 17 (fluorine, chlorine, bromine, iodine) are the most reactive non-metals and are together called the halogens.

Step 1 — Read the figure: The highlighted vertical column is group 17.

Step 2 — Name the family: Group 17 elements are the halogens.

Why other options are wrong:

- Noble gases are in group 18.
- Alkali metals are in group 1.
- Alkaline earth metals are in group 2.

Final Answer: Group 17 elements are halogens $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — Trend in atomic size: On going down a group, a new shell of electrons is added at each step, so the outermost electrons lie farther from the nucleus and the atomic radius increases.

Step 1 — Note what changes down a group: The number of shells increases.

Step 2 — Conclude the trend: More shells means a larger atom, so the atomic radius increases.

Why other options are wrong:

- It decreases across a period, not down a group.
- It does not stay the same.
- It does not first increase and then decrease down a group.

Final Answer: Atomic radius increases down a group $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q12

Q13.

Solution

Concept — Trend in non-metallic character: Across a period from left to right, the tendency of atoms to gain electrons increases, so the non-metallic character increases while the metallic character decreases.

Step 1 — Recall the period trend: Left side has metals; the right side has non-metals.

Step 2 — Conclude: Moving left to right, the non-metallic character increases.

Why other options are wrong:

- It does not decrease across a period.
- It does not remain constant.
- It does not become zero.

Final Answer: Non-metallic character increases across a period $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q13

Q14.

Solution

Concept — Valence electrons of group 1: Group 1 elements (alkali metals such as Li, Na, K) all have a single electron in their outermost shell.

Step 1 — Recall the group rule: For the main groups, group 1 has 1 valence electron.

Step 2 — Confirm: Sodium $(2, 8, 1)$ clearly has one outer electron.

Why other options are wrong:

- 2 valence electrons belong to group 2.
- 7 belongs to group 17 and 8 to group 18.

Final Answer: Group 1 elements have 1 valence electron $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q14

Q15.

Solution

Concept — Combination reaction: In a combination reaction two or more reactants join to form a single product. Burning magnesium combines with oxygen to give one product, magnesium oxide.

Step 1 — Write the reaction: $2Mg + O_2 \rightarrow 2MgO$.

Step 2 — Identify the type: Two reactants form a single product, so it is a combination reaction.

Why other options are wrong:

- Decomposition breaks one substance into many.
- Displacement and double displacement involve exchange of elements or ions.

Final Answer: Burning of magnesium is a combination reaction $\Rightarrow$ B

Answer: (B) Go Back to Q15

Q16.

Solution

Concept — Thermal decomposition: Thermal decomposition is the breaking down of a single compound into two or more products on heating.

Step 1 — Write the reaction: $CuCO_3 \xrightarrow{heat} CuO + CO_2$.

Step 2 — Identify the type: One compound splits into two products on heating, so it is a thermal decomposition.

Why other options are wrong:

- Combination joins substances into one product.
- Displacement and neutralisation are different reaction types.

Final Answer: It is a thermal decomposition reaction $\Rightarrow$ C

Answer: (C) Go Back to Q16

Q17.

Solution

Concept — Precipitation reaction: A precipitation reaction is one in which two solutions are mixed and an insoluble solid, called a precipitate, is formed and settles down.

Step 1 — Read the figure: An insoluble solid has settled at the bottom of the tube.

Step 2 — Name the reaction: The formation of an insoluble solid means it is a precipitation reaction.

Why other options are wrong:

- Combustion is burning in oxygen.
- Reduction is loss of oxygen or gain of electrons.
- A photochemical reaction is driven by light.

Final Answer: Formation of an insoluble solid is precipitation $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q17

Q18.

Solution

Concept — Displacement reaction: A more reactive metal displaces a less reactive metal from its salt solution. Iron is more reactive than copper.

Step 1 — Write the reaction: $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$.

Step 2 — Explain the colour change: Blue copper sulphate is replaced by pale green iron sulphate, so the solution turns green.

Step 3 — Name the type: Iron displaces copper, so it is a displacement reaction.

Why other options are wrong:

- Combination forms a single product.
- Decomposition breaks one substance into many.
- Neutralisation is an acid–base reaction.

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

Answer: (D) Go Back to Q18

Q19.

Solution

Concept — Oxidation and reduction (electron view): In terms of electrons, oxidation is the loss of electrons and reduction is the gain of electrons.

Step 1 — Identify the change: The species loses electrons.

Step 2 — Name it: Loss of electrons is oxidation, so the species is oxidised.

Why other options are wrong:

- A reduced species would gain electrons, not lose them.
- Neutralisation and precipitation do not describe electron loss.

Final Answer: Loss of electrons means the species is oxidised $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q19

Q20.

Solution

Concept — Neutralisation as double displacement: In a neutralisation, an acid and a base exchange their ions to form a salt and water. This exchange of ions makes it a type of double displacement reaction.

Step 1 — Write a general example: $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$.

Step 2 — Spot the ion exchange: H^+ pairs with OH^- and Na^+ pairs with Cl^-, which is a double displacement.

Why other options are wrong:

- Combination forms one product only.
- Decomposition breaks one substance into many.
- Simple displacement involves only one element being replaced.

Final Answer: Neutralisation is a double displacement reaction $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q20

Q21.

Solution

Concept — Battery acid: A car (lead storage) battery uses sulphuric acid (H_2SO_4) as its electrolyte.

Step 1 — Recall the electrolyte: Lead storage batteries contain sulphuric acid.

Step 2 — Confirm: The acid is dilute sulphuric acid, which conducts current between the plates.

Why other options are wrong:

- Hydrochloric and nitric acids are not used in car batteries.
- Acetic acid is a weak acid found in vinegar.

Final Answer: Car batteries use sulphuric acid $\Rightarrow$ $\boxed{C}$

Answer: (C) Go Back to Q21

Q22.

Solution

Concept — Litmus indicator: Litmus is a natural dye obtained from lichens. It is used to test whether a solution is acidic or basic.

Step 1 — Recall the source: Litmus comes from lichen.

Step 2 — Confirm: It turns red in acid and blue in base.

Why other options are wrong:

- Rose petals and red cabbage give other natural indicators, not litmus.
- Turmeric is a different natural indicator.

Final Answer: Litmus is obtained from lichen $\Rightarrow$ $\boxed{D}$

Answer: (D) Go Back to Q22

Q23.

Solution

Concept — Neutralisation reaction: When an acid reacts with a base, they neutralise each other to form a salt and water.

Step 1 — Read the equation: HCl (acid) + NaOH (base) react together.

Step 2 — Identify the products: The products are NaCl (a salt) and H_2O (water).

Why other options are wrong:

- No gases are produced in this reaction.
- The products are not two acids or a base plus a gas.

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

Answer: (B) Go Back to Q23

Q24.

Solution

Concept — Bleaching powder: Bleaching powder (calcium oxychloride, $CaOCl_2$) is used to whiten cloth and paper and to disinfect drinking water.

Step 1 — Match the uses: Whitening clothes and disinfecting water point to bleaching powder.

Step 2 — Confirm: It releases chlorine, which acts as the bleaching and disinfecting agent.

Why other options are wrong:

- Washing soda is used for cleaning and softening water.
- Baking soda is used in cooking and as an antacid.
- Plaster of Paris is used for casts and moulds.

Final Answer: The chemical is bleaching powder $\Rightarrow$ C

Answer: (C) Go Back to Q24

Q25.

Solution

Concept — Strong acids: A strong acid ionises (dissociates) almost completely in water, releasing a large number of H^+ ions.

Step 1 — Recall the definition: Strong acid $\rightarrow$ near-complete ionisation in water.

Step 2 — Confirm: Examples are HCl, H_2SO_4 and HNO_3.

Why other options are wrong:

- Not ionising at all would not make it an acid.
- Ionising only slightly describes a weak acid.
- An acid does not turn into a base in water.

Final Answer: A strong acid ionises almost completely $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q25

Q26.

Solution

Concept — pH of rain water: Carbon dioxide from the air dissolves in rain water to form carbonic acid, a weak acid. This makes rain water slightly acidic, so its pH is a little below 7 (about 5.6 to 6).

Step 1 — Identify the change: Dissolved CO_2 makes the water weakly acidic.

Step 2 — Read the scale: The arrow points just below the neutral mark of 7.

Why other options are wrong:

- Exactly 7 would be neutral, not acidic.
- 14 and any value above 7 would be basic.

Final Answer: Rain water has a pH slightly less than 7 $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q26

Q27.

Solution

Concept — Physical properties of metals: Metals are usually hard solids with strong metallic bonding, which gives them high melting and boiling points (except a few like sodium or mercury).

Step 1 — Recall the property: Strong metallic bonds need a lot of energy to break.

Step 2 — Conclude: Therefore metals generally have high melting and boiling points.

Why other options are wrong:

- Very low melting points are typical of most non-metals.
- Metals do have fixed melting points.
- Most metals melt well above 0°C.

Final Answer: Metals have high melting and boiling points $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q27

Q28.

Solution

Concept — Properties of non-metals: Non-metals generally have low density, are poor conductors of heat and electricity (except graphite), and are neither malleable nor ductile.

Step 1 — Recall the typical behaviour: Non-metals are poor conductors with low density.

Step 2 — Match the statement: This matches the first option.

Why other options are wrong:

- Being good conductors is a property of metals.
- Being malleable and ductile is a property of metals.
- Most non-metals are dull, not shiny.

Final Answer: Non-metals have low density and are poor conductors $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q28

Q29.

Solution

Concept — Sacrificial protection: Zinc is more reactive than iron. When iron is coated with zinc, the zinc corrodes first and protects the iron even if the coating is scratched. This is called sacrificial protection.

Step 1 — Compare reactivity: Zinc is higher than iron in the reactivity series.

Step 2 — Explain the protection: Being more reactive, zinc is attacked first, so the iron stays safe.

Why other options are wrong:

- Hardness and cost do not stop rusting once the layer is scratched.
- Zinc is a metal, not a non-metal.

Final Answer: Zinc is more reactive and corrodes in place of iron $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q29

Q30.

Solution

Concept — Soft metals: Alkali metals such as sodium and potassium are very soft and can be cut easily with a knife.

Step 1 — Test the options: Iron, copper and aluminium are hard metals.

Step 2 — Identify the soft metal: Sodium is soft enough to be cut with a knife.

Why other options are wrong:

- Iron, copper and aluminium are too hard to cut with a knife.

Final Answer: Sodium can be cut with a knife $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q30

Q31.

Solution

Concept — Solder: Solder is an alloy of lead and tin. Its low melting point makes it useful for joining (soldering) electrical wires and metal parts.

Step 1 — Recall the composition: Solder = lead + tin.

Step 2 — Confirm: Its low melting point lets it flow and join wires easily.

Why other options are wrong:

- Copper and zinc make brass.
- Iron and carbon make steel.
- Copper and tin make bronze.

Final Answer: Solder is an alloy of lead and tin $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q31

Q32.

Solution

Concept — Activity series: In the activity series, the most reactive metals are placed at the top. Potassium and sodium sit right at the top, above zinc, iron, copper and gold.

Step 1 — Read the ladder: The two metals shown at the very top are potassium and sodium.

Step 2 — Identify the most reactive: Potassium and sodium are the most reactive.

Why other options are wrong:

- Gold and silver are at the bottom (least reactive).
- Copper, iron, zinc and lead lie lower than sodium and potassium.

Final Answer: Potassium and sodium are at the top $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q32

Q33.

Solution

Concept — Ionic compounds: Ionic compounds are made of oppositely charged ions held together by strong electrostatic forces of attraction. Breaking these forces needs a lot of heat energy.

Step 1 — Identify the bonding force: Strong attraction between positive and negative ions.

Step 2 — Link to melting point: Strong forces need much energy to break, giving high melting points.

Why other options are wrong:

- Ionic compounds are not made of gas molecules.
- Sharing of electrons describes covalent bonding, not ionic.
- Ionic compounds do contain charged particles (ions).

Final Answer: Strong electrostatic forces give high melting points $\Rightarrow$ A

Answer: (A) Go Back to Q33

Q34.

Solution

Concept — Multiple bonds: Sharing one pair of electrons gives a single bond, two pairs a double bond, and three pairs a triple bond.

Step 1 — Read the figure: Three lines join the two nitrogen atoms, meaning three shared pairs.

Step 2 — Name the bond: Three shared pairs make a triple bond (N≡N).

Why other options are wrong:

- A single bond is one shared pair.
- A double bond is two shared pairs.
- An ionic bond involves transfer, not sharing.

Final Answer: Three shared pairs make a triple bond $\Rightarrow$ B

Answer: (B) Go Back to Q34

Q35.

Solution

Concept — Covalent bonding: A covalent bond is formed when two atoms share one or more pairs of electrons, so the molecule is held together by these shared pairs.

Step 1 — Recall the mechanism: Covalent bonding means sharing of electron pairs.

Step 2 — Confirm: For example, in H_2O the atoms are joined by shared pairs.

Why other options are wrong:

- Transfer of electrons and attraction between ions describe ionic bonding.
- Free electrons hold metals together (metallic bonding).

Final Answer: Covalent molecules are held by shared pairs of electrons $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q35

Q36.

Solution

Concept — Ion formation in MgO: Magnesium $(2, 8, 2)$ loses its two outermost electrons to form the Mg^{2+} ion, and oxygen gains them to form O^{2-}.

Step 1 — Count the electrons lost: Magnesium loses 2 electrons.

Step 2 — Find the charge: Losing 2 electrons gives a $2+$ charge, so the ion is Mg^{2+}.

Why other options are wrong:

- $1+$ or $1-$ would mean only one electron is involved.
- $2-$ is the charge on the oxide ion, not the magnesium ion.

Final Answer: The magnesium ion carries a $2+$ charge $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q36

Q37.

Solution

Concept — Diamond: In diamond each carbon atom is bonded to four other carbon atoms by strong covalent bonds. All four valence electrons are used in bonding, so none are free to move and carry current.

Step 1 — Look at the bonding: Every carbon uses all four electrons in covalent bonds.

Step 2 — Conclude: With no free electrons, diamond cannot conduct electricity.

Why other options are wrong:

- Diamond does not have extra protons or free ions.
- Diamond does not have a metallic structure.

Final Answer: Diamond has no free electrons $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q37

Q38.

Solution

Concept — Functional groups: A ketone contains the carbonyl group, $>C{=}O$, joined to two carbon atoms on either side.

Step 1 — Recall the ketone group: Ketones have $>C{=}O$.

Step 2 — Confirm: For example, propanone (acetone) is CH_3COCH_3.

Why other options are wrong:

- $-OH$ is the alcohol group.
- $-COOH$ is the carboxylic acid group.
- $-CHO$ is the aldehyde group.

Final Answer: The ketone group is $>C{=}O \Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q38

Q39.

Solution

Concept — Alkenes: Alkenes are unsaturated hydrocarbons with one double bond and the general formula C_nH_{2n}. Propene has three carbon atoms, so $n = 3$.

Step 1 — Substitute $n = 3$ in C_nH_{2n}: carbon $= 3$, hydrogen $= 2 \times 3$.

Step 2 — Compute the hydrogens: $2 \times 3 = 6$.

Step 3 — Write the formula: C_3H_6.

Why other options are wrong:

- C_3H_8 is propane (an alkane).
- C_2H_4 is ethene and C_4H_8 is butene.

Final Answer: Propene is $C_3H_6 \Rightarrow \boxed{C}$

Answer: (C) Go Back to Q39

Q40.

Solution

Concept — Common name: Ethanoic acid (CH_3COOH) is commonly known as acetic acid. Its dilute solution is vinegar.

Step 1 — Match the name: Ethanoic acid $=$ acetic acid.

Step 2 — Confirm: It is a weak organic acid with a sour taste.

Why other options are wrong:

- Formic acid is methanoic acid (found in ant stings).
- Citric acid is found in lemons and lactic acid in sour milk.

Final Answer: Ethanoic acid is commonly called acetic acid $\Rightarrow \boxed{D}$

Answer: (D) 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 produce soap and glycerol.

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

Step 2 — Confirm: The word saponification literally means soap-making.

Why other options are wrong:

- Hydrogenation adds hydrogen across double bonds.
- Esterification forms an ester from an acid and an alcohol.
- Fermentation uses microbes to make products like alcohol.

Final Answer: Soap making is saponification $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q41

Q42.

Solution

Concept — Isomers: Isomers are compounds that have the same molecular formula but different structural arrangements of their atoms. Butane (C_4H_{10}) has two isomers: normal butane and iso-butane.

Step 1 — Read the definition needed: Same molecular formula, different structures.

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 one element with different mass numbers.
- Homologues differ by a CH_2 unit.

Final Answer: They are called isomers $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q42

Q43.

Solution

Concept — Substitution reaction: In a substitution reaction, one or more hydrogen atoms of a saturated hydrocarbon (alkane) are replaced by other atoms. Alkanes react with chlorine in sunlight in this way.

Step 1 — Note the conditions: Alkane + chlorine in sunlight.

Step 2 — Identify the type: Hydrogen atoms are replaced by chlorine, which is a substitution reaction.

Why other options are wrong:

- Addition reactions are typical of unsaturated hydrocarbons.
- Combustion is burning, and neutralisation is an acid–base reaction.

Final Answer: Alkanes react with chlorine by substitution $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q43

Q44.

Solution

Concept — Electrodes in electrolysis: The cathode is the negative electrode. Positive ions (cations) move to it and gain electrons, so reduction takes place at the cathode.

Step 1 — Recall the rule: Reduction is gain of electrons.

Step 2 — Match the electrode: Cations gain electrons at the cathode, so reduction happens there.

Why other options are wrong:

- Oxidation, not reduction, occurs at the anode.
- The electrolyte and salt bridge are not the site of reduction.

Final Answer: Reduction occurs at the cathode $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q44

Q45.

Solution

Concept — Combined gas law: The combined gas law brings together Boyle's law and Charles' law for a fixed mass of gas. It states that $\frac{PV}{T}$ stays constant, so $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$.

Step 1 — Combine the laws: Boyle's law ($P \propto 1/V$) and Charles' law ($V \propto T$) together give $\frac{PV}{T} =$ constant.

Step 2 — Write for two states: $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$.

Why other options are wrong:

- $P_1V_1 = P_2V_2$ is Boyle's law alone (constant temperature).
- $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ is Charles' law alone.
- $\frac{P_1}{T_1} = \frac{P_2}{T_2}$ is Gay-Lussac's law alone.

Final Answer: The combined gas law is $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q45

Q46.

Solution

Concept — Conduction in liquids: Electricity is carried through a liquid by free ions. Pure (distilled) water has very few ions, but dissolving salt provides many ions.

Step 1 — Pure water: It contains almost no free ions, so it hardly conducts electricity.

Step 2 — Salt water: Dissolved salt releases ions that carry the current, so salt water conducts well.

Why other options are wrong:

- Pure water is a poor conductor, not a very good one.
- Salt water does conduct electricity.
- Salt water clearly conducts, so the last option is wrong.

Final Answer: Pure water hardly conducts; salt water conducts well $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q46

Q47.

Solution

Concept — Gay-Lussac's law: At constant volume, the pressure of a fixed mass of gas is directly proportional to its absolute temperature. So heating the gas increases its pressure.

Step 1 — State the relation: $P \propto T$ at constant volume.

Step 2 — Apply heating: As T increases, P increases.

Why other options are wrong:

- The pressure does not decrease or stay unchanged on heating.
- The pressure does not become zero.

Final Answer: At constant volume, pressure increases with temperature $\Rightarrow$ D

Answer: (D) Go Back to Q47

Q48.

Solution

Concept — Electrochemical cell: An electrochemical (galvanic) cell uses a spontaneous chemical reaction to produce an electric current, so it converts chemical energy into electrical energy.

Step 1 — Identify the energy change: A chemical reaction inside the cell drives the current.

Step 2 — State the conversion: Chemical energy is converted into electrical energy.

Why other options are wrong:

- Converting electrical energy into chemical energy describes electrolysis, the opposite process.
- The cell does not mainly convert heat into chemical energy or electrical energy into light.

Final Answer: A cell converts chemical energy into electrical energy $\Rightarrow$ C

Answer: (C) Go Back to Q48

Q49.

Solution

Concept — Ozone layer depletion: Chlorofluorocarbons (CFCs), once used in refrigerators and sprays, rise into the upper atmosphere and break down the protective ozone layer.

Step 1 — Identify the harmful gases: CFCs are the main ozone-destroying gases.

Step 2 — Confirm: Chlorine released from CFCs breaks ozone molecules.

Why other options are wrong:

- Oxides of sulphur cause acid rain.
- Carbon dioxide is a greenhouse gas, not a major ozone destroyer.
- Water vapour does not damage the ozone layer in this way.

Final Answer: CFCs damage the ozone layer $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q49

Q50.

Solution

Concept — Non-renewable resources: Coal and petroleum are fossil fuels that took millions of years to form from buried plant and animal remains. They are used much faster than they form, so they will eventually be exhausted. Hence they are non-renewable.

Step 1 — Note the formation time: They take millions of years to form.

Step 2 — Conclude: Because they cannot be replaced quickly, they are non-renewable and will get exhausted.

Why other options are wrong:

- They cannot be manufactured quickly in factories.
- They are not formed afresh every year and are not unlimited.

Final Answer: Coal and petroleum take ages to form and will run out $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q50

Answer Key

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