Jharkhand Polytechnic Chemistry

Sample Paper – 9

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 the electronic configuration $2, 8, 1$. The total number of electrons present in the atom is:

(A) 1

(B) 8

(C) 11

(D) 3

Q2. The chemical symbol of the element zinc is:

(A) Zn

(B) Zr

(C) Zi

(D) Z

Q3. The molecular mass of sulphur dioxide (SO_2) is (atomic masses: S $= 32$ u, O $= 16$ u):

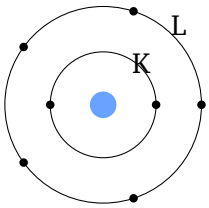
(A) 48 u

(B) 32 u

(C) 80 u

(D) 64 u

Q4. The figure shows the electron shells of a nitrogen atom ($Z = 7$). Its electronic configuration is:



(A) $2, 8$

(B) $2, 5$

(C) 7

(D) $2, 3, 2$

Q5. A positively charged ion (cation) is formed when an atom:

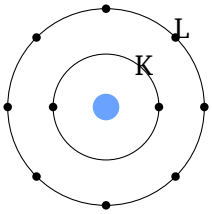
(A) loses one or more electrons

(B) gains one or more electrons

(C) loses one or more protons

(D) gains one or more neutrons

Q6. In the shell diagram shown, the maximum number of electrons that the first (K) and second (L) shells can hold are, respectively:



(A) 8 and 18

(B) 2 and 18

(C) 2 and 8

(D) 8 and 2

Q7. An atom has a mass number of 14 and contains 6 protons. The number of neutrons in it is:

(A) 6

(B) 8

(C) 14

(D) 20

Q8. The existence of a small, dense, positively charged nucleus inside the atom was established by:

(A) J. J. Thomson's cathode ray experiment

(B) Chadwick's experiment

(C) Dalton's atomic theory

(D) Rutherford's alpha-particle scattering experiment

Q9. Sugar completely dissolved in water forms a:

(A) mixture (solution)

(B) compound

(C) pure element

(D) suspension

Q10. Newlands' law of octaves compared the repeating properties of elements to:

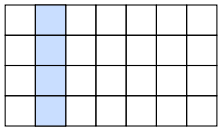
(A) the rungs of a ladder

(B) the notes of a musical octave

(C) the spokes of a wheel

(D) the layers of an onion

Q11. In the periodic table outline below, the highlighted second column (Group 2) contains the:



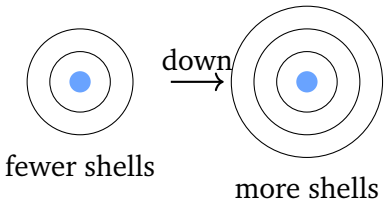
(A) alkali metals

(B) halogens

(C) alkaline earth metals

(D) noble gases

Q12. As we move down a group in the periodic table, the number of electron shells (compare the two atoms shown):



(A) increases

(B) decreases

(C) remains the same

(D) first increases then decreases

Q13. On moving down a group in the periodic table, the metallic character of the elements:

(A) decreases

(B) remains constant

(C) becomes zero

(D) increases

Q14. An element belonging to Group 17 (the halogens) needs how many electrons to complete its octet?

(A) 2

(B) 1

(C) 7

(D) 3

Q15. The burning of cooking gas (LPG) in air to give carbon dioxide, water and a large amount of heat is an example of a:

(A) combustion (oxidation) reaction

(B) decomposition reaction

(C) displacement reaction

(D) double displacement reaction

Q16. Heating green ferrous sulphate crystals, which give off a smell of burning sulphur, is an example of a:

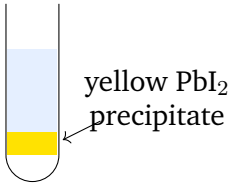
(A) combination reaction

(B) displacement reaction

(C) decomposition reaction

(D) neutralisation reaction

Q17. When potassium iodide solution is added to lead nitrate solution (as shown), a yellow precipitate of lead iodide forms. This type of reaction is called:



(A) combination

(B) displacement

(C) decomposition

(D) double displacement (precipitation)

Q18. Chlorine displaces bromine from sodium bromide solution. This observation shows that:

(A) bromine is more reactive than chlorine

(B) a more reactive halogen displaces a less reactive one from its salt

(C) chlorine and bromine are equally reactive

(D) bromine displaces chlorine

Q19. In terms of hydrogen, oxidation is defined as the:

(A) loss of hydrogen

(B) gain of hydrogen

(C) loss of oxygen

(D) gain of electrons

Q20. A reaction in which heat is absorbed from the surroundings is called:

(A) exothermic

(B) combustion

(C) endothermic

(D) oxidation

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

(A) citric acid

(B) lactic acid

(C) acetic acid

(D) tartaric acid

Q22. In a basic (alkaline) solution, the indicator methyl orange turns:

(A) red

(B) pink

(C) colourless

(D) yellow

Q23. When an acid reacts with a metal hydrogencarbonate (bicarbonate), the gas released is:

(A) carbon dioxide

(B) hydrogen

(C) oxygen

(D) sulphur dioxide

Q24. Sodium hydrogencarbonate (baking soda) is commonly used:

(A) as a strong cleaning bleach

(B) to harden water

(C) in baking and as a mild antacid

(D) as a car battery acid

Q25. While diluting a concentrated acid, the correct and safe procedure is to:

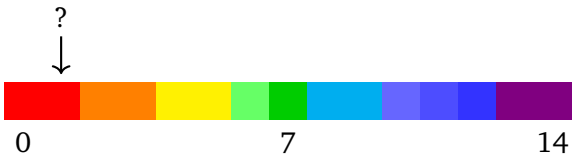
(A) add water to the acid quickly

(B) add the acid slowly to water with constant stirring

(C) mix equal amounts of acid and water all at once

(D) heat the acid before adding water

Q26. On the pH scale shown below, the pH of a strongly acidic solution such as dilute hydrochloric acid is about:



(A) 7

(B) 10

(C) 14

(D) 1

Q27. At room temperature most metals are solids. The metal that is an exception, being a liquid, is:

(A) mercury

(B) sodium

(C) zinc

(D) iron

Q28. Most non-metals are dull (non-lustrous). The non-metal that is an exception, showing a shiny lustre, is:

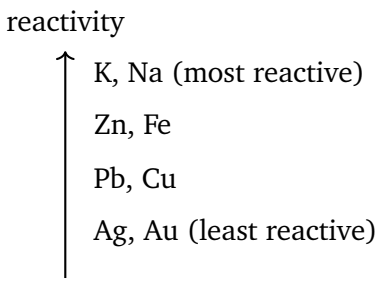
(A) sulphur

(B) carbon (coal)

(C) iodine

(D) phosphorus

Q29. Highly reactive metals such as sodium and potassium (at the top of the activity series shown) are extracted from their molten compounds by:



(A) heating the ore with carbon

(B) simply heating the ore in air

(C) displacement using iron

(D) electrolysis of their molten compounds

Q30. Copper cannot displace zinc from zinc sulphate solution. The reason is that:

(A) copper is more reactive than zinc

(B) a less reactive metal cannot displace a more reactive metal from its salt

(C) zinc sulphate is insoluble in water

(D) copper is a non-metal

Q31. Brass, widely used for utensils and decorative items, is an alloy of:

(A) copper and tin

(B) iron and carbon

(C) copper and zinc

(D) lead and tin

Q32. The purest form of iron, containing the least amount of carbon, is:

(A) wrought iron

(B) cast iron

(C) steel

(D) pig iron

Q33. An ionic bond is generally formed between:

(A) two non-metals

(B) two metals

(C) two noble gases

(D) a metal and a non-metal

Q34. In a molecule of hydrogen chloride (HCl), shown below with its shared electron pair, the number of covalent bonds present is:

shared pair
H •• Cl

(A) 2

(B) 1

(C) 3

(D) 0

Q35. Ionic compounds in the solid state are generally:

(A) hard and brittle

(B) soft and waxy

(C) liquid and volatile

(D) gaseous at room temperature

Q36. A calcium atom (electronic configuration $2, 8, 8, 2$) attains a stable octet by:

(A) gaining 2 electrons

(B) sharing 2 electrons

(C) losing 2 electrons

(D) losing 8 electrons

Q37. The unique ability of carbon to form long chains and rings by bonding with other carbon atoms, more than any other element, is called:

(A) isomerism

(B) catenation

(C) hydrogenation

(D) oxidation

Q38. A halogen atom such as chlorine or bromine attached to a carbon chain represents the functional group of a:

(A) alcohol

(B) carboxylic acid

(C) ketone

(D) haloalkane (halo group)

Q39. Butene is the second member of the alkene series, whose skeleton is shown below. Its molecular formula is:

(A) C_4H_8

(B) C_4H_{10}

(C) C_3H_6

(D) C_4H_6

Q40. The conversion of ethanol to ethene by removing a molecule of water (using hot concentrated sulphuric acid) is called:

(A) hydrogenation

(B) hydration

(C) dehydration

(D) hydrolysis

Q41. Soaps are chemically the:

(A) esters of glycerol

(B) sodium or potassium salts of long-chain fatty acids

(C) alcohols of long carbon chains

(D) simple mineral acids

Q42. An unsaturated hydrocarbon containing a carbon-carbon triple bond (shown below) belongs to the:

C ≡ C

(A) alkane series

(B) alkene series

(C) aromatic series

(D) alkyne series

Q43. Complete combustion of a hydrocarbon in plenty of air (oxygen) gives:

(A) carbon dioxide and water

(B) carbon monoxide and water

(C) carbon (soot) and hydrogen

(D) only carbon dioxide

Q44. During electrolysis, the electrode at which oxidation takes place is the:

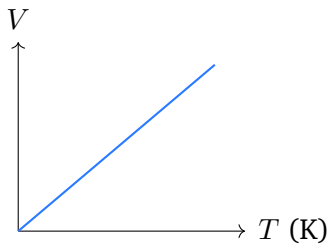
(A) cathode

(B) negative electrode

(C) anode

(D) salt bridge

Q45. For a fixed mass of gas at constant pressure, the graph of volume versus absolute temperature, shown below, is:



(A) a curve bending downwards

(B) a straight line passing through the origin

(C) a horizontal straight line

(D) a hyperbola

Q46. Compared with distilled water, common salt solution (salt water):

(A) conducts electricity much better

(B) does not conduct at all

(C) conducts exactly the same

(D) conducts less than distilled water

Q47. The number of particles (molecules) present in one mole of any substance is called:

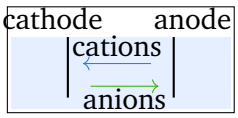
(A) the mole fraction

(B) the molar mass

(C) the atomic number

(D) Avogadro's number

Q48. In the electrolytic cell shown, the substance that conducts the current by providing free-moving ions is the:



(A) metal connecting wire

(B) battery

(C) electrolyte

(D) glass container

Q49. Acid rain is caused mainly by the atmospheric oxides of:

(A) carbon and hydrogen

(B) sulphur and nitrogen

(C) oxygen and helium

(D) sodium and potassium

Q50. Which one of the following is a pair of renewable (non-exhaustible) sources of energy?

(A) coal and petroleum

(B) natural gas and coal

(C) diesel and kerosene

(D) solar energy and wind energy

Detailed Solutions

Q1.

Solution

Concept — Electronic configuration: The electronic configuration lists how many electrons occupy each shell. The total number of electrons is the sum of these numbers.

Step 1 — Read the configuration: The shells contain 2, 8 and 1 electrons.

Step 2 — Add them up: $2 + 8 + 1 = 11$.

Step 3 — Identify the atom: An atom with 11 electrons is sodium.

Why other options are wrong:

- 1 counts only the outermost shell.
- 8 counts only the middle shell.
- 3 adds the number of shells, not the electrons.

Final Answer: Total electrons $= 11 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q1

Q2.

Solution

Concept — Chemical symbols: Every element has an internationally agreed symbol, often the first one or two letters of its name (sometimes from its Latin name).

Step 1 — Recall the symbol of zinc: The symbol of zinc is Zn (first two letters of the name).

Step 2 — Confirm: The capital Z with a small n is the accepted symbol.

Why other options are wrong:

- Zr is the symbol of zirconium, a different element.
- Zi and Z alone are not valid element symbols.

Final Answer: The symbol of zinc is Zn $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q2

Q3.

Solution

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

Step 1 — Write the atoms in SO_2: One sulphur atom and two oxygen atoms.

Step 2 — Add the masses of sulphur: $1 \times 32 = 32$ u.

Step 3 — Add the masses of oxygen: $2 \times 16 = 32$ u.

Step 4 — Find the total: $32 + 32 = 64$ u.

Why other options are wrong:

- 48 u counts only one oxygen.
- 32 u counts only the sulphur or only the oxygen.
- 80 u uses too many oxygen atoms.

Final Answer: Molecular mass of $SO_2 = 64$ u $\Rightarrow$ D

Answer: (D) Go Back to Q3

Q4.

Solution

Concept — Electronic configuration: Electrons fill the shells in order, the K shell taking up to 2 and the L shell up to 8. Nitrogen has 7 electrons.

Step 1 — Fill the K shell: 2 electrons. Remaining $= 7 - 2 = 5$.

Step 2 — Fill the L shell: the last 5 electrons go into the L shell.

Step 3 — Write the configuration: $2, 5$, which matches the figure.

Why other options are wrong:

- $2, 8$ would need 10 electrons.
- 7 ignores how electrons are arranged in shells.
- $2, 3, 2$ is not a correct filling order.

Final Answer: Nitrogen is $2, 5 \Rightarrow$ B

Answer: (B) Go Back to Q4

Q5.

Solution

Concept — Formation of ions: An ion is formed when a neutral atom gains or loses electrons. Losing electrons leaves extra positive charge, while gaining electrons gives extra negative charge.

Step 1 — Recall what a cation is: A cation carries a positive charge.

Step 2 — Decide the cause: To become positive, an atom must lose one or more (negatively charged) electrons.

Why other options are wrong:

- Gaining electrons forms a negative ion (anion).
- Protons stay fixed in the nucleus; they are not lost in ordinary chemistry.
- Gaining neutrons changes the mass, not the charge.

Final Answer: A cation forms by loss 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.

Step 1 — Find the K shell capacity ($n = 1$): $2 \times (1)^2 = 2$.

Step 2 — Find the L shell capacity ($n = 2$): $2 \times (2)^2 = 8$.

Step 3 — State the pair: K holds 2 and L holds 8, as the diagram shows.

Why other options are wrong:

- 8 and 18 are the L and M capacities, not K and L.
- 2 and 18 skips the correct L value.
- 8 and 2 swaps the two values.

Final Answer: $\text{K} = 2$, $\text{L} = 8 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q6

Q7.

Solution

Concept — Mass number relation: The mass number (A) equals the number of protons plus the number of neutrons, so neutrons $= A-$ protons.

Step 1 — List the data: mass number $A = 14$, protons $= 6$.

Step 2 — Subtract: neutrons $= 14 - 6$.

Step 3 — Compute: neutrons $= 8$.

Why other options are wrong:

- 6 is the number of protons, not neutrons.
- 14 is the mass number.
- 20 would be protons plus mass number, which has no meaning here.

Final Answer: Number of neutrons $= 8 \Rightarrow$ B

Answer: (B) Go Back to Q7

Q8.

Solution

Concept — Discovery of the nucleus: Ernest Rutherford fired alpha particles at a thin gold foil. Most passed straight through, but a few bounced back, showing that the positive charge and mass are concentrated in a tiny central nucleus.

Step 1 — Match the experiment: The alpha-particle scattering experiment is Rutherford's.

Step 2 — Confirm the conclusion: It proved the existence of a small, dense, positive nucleus.

Why other options are wrong:

- Thomson's cathode ray work discovered the electron.
- Chadwick discovered the neutron.
- Dalton's theory only described atoms as indivisible spheres.

Final Answer: Rutherford's scattering experiment found the nucleus $\Rightarrow$ D

Answer: (D) Go Back to Q8

Q9.

Solution

Concept — Mixtures and solutions: When two or more substances are mixed without any fixed ratio and without a chemical reaction, the result is a mixture. A solution is a homogeneous mixture.

Step 1 — Examine sugar in water: Sugar simply dissolves; no new substance is formed and the ratio is not fixed.

Step 2 — Classify it: It is a homogeneous mixture, that is, a solution.

Why other options are wrong:

- A compound needs a chemical reaction and a fixed ratio.
- A pure element has only one kind of atom.
- A suspension has undissolved particles; here the sugar fully dissolves.

Final Answer: Sugar in water is a mixture (solution) $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q9

Q10.

Solution

Concept — Newlands' law of octaves: John Newlands arranged elements in order of increasing atomic mass and noticed that every eighth element had properties similar to the first, just like the eighth note in a musical octave.

Step 1 — Recall the comparison: He compared the pattern to the notes of a musical octave.

Step 2 — Confirm: Hence the name "law of octaves".

Why other options are wrong:

- Ladders, wheels and onions were not the analogies used.

Final Answer: Newlands compared elements to musical notes $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q10

Q11.

Solution

Concept — Naming of groups: Certain groups of the periodic table have special family names. Group 1 (except hydrogen) are the alkali metals and Group 2 are the alkaline earth metals.

Step 1 — Read the figure: The highlighted second vertical column is Group 2.

Step 2 — Name the family: Group 2 elements are the alkaline earth metals (such as calcium and magnesium).

Why other options are wrong:

- Alkali metals are Group 1.
- Halogens are Group 17.
- Noble gases are Group 18.

Final Answer: Group 2 contains the alkaline earth metals $\Rightarrow$ C

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — Trends down a group: As we move down a group, each successive element has one more electron shell than the one above it.

Step 1 — Compare the two atoms shown: The lower one has an extra shell.

Step 2 — State the trend: So the number of shells increases down a group.

Why other options are wrong:

- The number of shells does not decrease or stay the same down a group.
- It does not first increase then decrease.

Final Answer: The number of shells increases down a group $\Rightarrow$ A

Answer: (A) Go Back to Q12

Q13.

Solution

Concept — Metallic character: Metallic character depends on how easily an atom loses electrons. Down a group the outermost electrons are farther from the nucleus and are held less tightly, so they are lost more easily.

Step 1 — Note the change down a group: The atomic size increases and the hold on outer electrons weakens.

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

Why other options are wrong:

- It does not decrease or stay constant down a group.
- It never becomes zero for these elements.

Final Answer: Metallic character increases down a group $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q13

Q14.

Solution

Concept — Halogens and the octet: Group 17 elements (halogens) have 7 electrons in their outermost shell. To complete the octet of 8, they need just one more electron.

Step 1 — Count the outer electrons: A halogen has 7 valence electrons.

Step 2 — Find the shortfall: $8 - 7 = 1$ electron is needed.

Why other options are wrong:

- 2 and 3 are too many to reach the octet.
- 7 is the number already present, not the number needed.

Final Answer: A halogen needs 1 electron $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q14

Q15.

Solution

Concept — Combustion: Combustion is a rapid reaction of a substance with oxygen that releases heat and light. Because the fuel combines with oxygen, it is also an oxidation reaction.

Step 1 — Examine the reaction: The gas combines with oxygen in air and gives out heat.

Step 2 — Classify it: Combining with oxygen with release of heat is a combustion (oxidation) reaction.

Why other options are wrong:

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

Final Answer: Burning of LPG is a combustion reaction $\Rightarrow$ A

Answer: (A) Go Back to Q15

Q16.

Solution

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

Step 1 — Examine the change: On heating, ferrous sulphate breaks down into ferric oxide and the gases sulphur dioxide and sulphur trioxide (the smell of burning sulphur).

Step 2 — Name the type: One compound splitting into several products is a decomposition reaction.

Why other options are wrong:

- Combination joins substances into one.
- Displacement replaces one element with another.
- Neutralisation is an acid–base reaction.

Final Answer: Heating ferrous sulphate is a decomposition $\Rightarrow$ C

Answer: (C) Go Back to Q16

Q17.

Solution

Concept — Double displacement (precipitation): When two compounds in solution exchange their ions and one of the products is an insoluble solid (a precipitate), the reaction is a double displacement (precipitation) reaction.

Step 1 — Write the change: Lead nitrate and potassium iodide exchange ions to give lead iodide and potassium nitrate.

Step 2 — Spot the precipitate: Lead iodide is the insoluble yellow solid shown settling in the tube.

Step 3 — Name the type: An ion exchange forming a precipitate is double displacement.

Why other options are wrong:

- Combination and decomposition involve only one product or one reactant.
- Displacement involves a single element replacing another, not an ion exchange.

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

Answer: (D) Go Back to Q17

Q18.

Solution

Concept — Reactivity of halogens: Among the halogens, reactivity decreases down the group. A more reactive halogen can displace a less reactive halogen from its salt solution.

Step 1 — Compare chlorine and bromine: Chlorine is above bromine, so chlorine is more reactive.

Step 2 — Interpret the result: The more reactive chlorine displaces the less reactive bromine from sodium bromide.

Why other options are wrong:

- Bromine is less reactive than chlorine, not more.
- They are not equally reactive.
- Bromine cannot displace chlorine.

Final Answer: A more reactive halogen displaces a less reactive one $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q18

Q19.

Solution

Concept — Oxidation in terms of hydrogen: Oxidation can be described as the addition of oxygen or the removal of hydrogen. So, in terms of hydrogen, oxidation is the loss of hydrogen.

Step 1 — Recall the hydrogen rule: Loss of hydrogen = oxidation; gain of hydrogen = reduction.

Step 2 — Match the definition: Oxidation is the loss of hydrogen.

Why other options are wrong:

- Gain of hydrogen is reduction.
- Loss of oxygen is also reduction.
- Gain of electrons is reduction (in the electron view).

Final Answer: Oxidation is the loss of hydrogen $\Rightarrow$ A

Answer: (A) Go Back to Q19

Q20.

Solution

Concept — Endothermic reaction: A reaction that absorbs heat energy from the surroundings is called endothermic; the surroundings often feel cooler.

Step 1 — Match the definition: Heat absorbed from surroundings = endothermic.

Step 2 — Contrast: An exothermic reaction, on the other hand, gives out heat.

Why other options are wrong:

- Exothermic releases heat, the opposite of what is asked.
- Combustion and oxidation are reaction types, not the heat-absorbing description.

Final Answer: Absorbing heat makes it endothermic $\Rightarrow$ C

Answer: (C) Go Back to Q20

Q21.

Solution

Concept — Acids in foods: Different foods owe their sour taste to different acids. Curd and yoghurt turn sour because of lactic acid produced by bacteria from milk sugar.

Step 1 — Identify the source: Curd (yoghurt) $\rightarrow$ lactic acid.

Step 2 — Confirm: The bacterial fermentation of milk gives lactic acid.

Why other options are wrong:

- Citric acid is found in lemons and oranges.
- Acetic acid is found in vinegar.
- Tartaric acid is found in tamarind.

Final Answer: Curd is sour due to lactic acid $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q21

Q22.

Solution

Concept — Methyl orange indicator: Methyl orange is red in acidic solution and yellow in basic (alkaline) solution.

Step 1 — Apply to a base: In a basic solution, methyl orange turns yellow.

Step 2 — Confirm: It would be red in an acid, so yellow signals a base.

Why other options are wrong:

- Red is its colour in acid, not base.
- Pink is the basic colour of phenolphthalein, not methyl orange.
- Methyl orange does not become colourless.

Final Answer: Methyl orange turns yellow in a base $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q22

Q23.

Solution

Concept — Acid with hydrogencarbonate: When an acid reacts with a metal hydrogencarbonate, the products are a salt, water and carbon dioxide gas.

Step 1 — Write the general reaction: acid + metal hydrogencarbonate → salt + water + CO_2.

Step 2 — Identify the gas: The gas released is carbon dioxide, which turns lime water milky.

Why other options are wrong:

- Hydrogen is released when acids react with active metals, not carbonates.
- Oxygen and sulphur dioxide are not produced here.

Final Answer: The gas released is carbon dioxide ⇒ $\boxed{A}$

Answer: (A) Go Back to Q23

Q24.

Solution

Concept — Uses of baking soda: Sodium hydrogencarbonate ($NaHCO_3$), or baking soda, is a mild, edible base. It releases carbon dioxide on heating, which makes cakes rise, and it neutralises excess acid in the stomach.

Step 1 — Recall its nature: It is a mild base, safe in small amounts.

Step 2 — Match the use: It is used in baking and as a mild antacid.

Why other options are wrong:

- It is not a strong bleach.
- It does not soften (it is washing soda that helps with hard water).
- It is not a battery acid.

Final Answer: Baking soda is used in baking and as a mild antacid ⇒ $\boxed{C}$

Answer: (C) Go Back to Q24

Q25.

Solution

Concept — Safe dilution of acids: Diluting a concentrated acid releases a large amount of heat. To avoid splashing and dangerous heating, the acid must always be added slowly to water, with stirring, never the other way round.

Step 1 — Recall the safety rule: Always add acid to water, not water to acid.

Step 2 — Add the precaution: Do it slowly and with constant stirring to spread the heat.

Why other options are wrong:

- Adding water to acid can make it boil and splash dangerously.
- Mixing all at once releases too much heat suddenly.
- Heating the acid first is unsafe and unnecessary.

Final Answer: Add acid slowly to water with stirring $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q25

Q26.

Solution

Concept — pH of strong acids: The pH scale runs from 0 to 14. A strongly acidic solution has a very low pH, close to 0 or 1.

Step 1 — Place dilute HCl: Dilute hydrochloric acid is a strong acid with a high H^+ concentration.

Step 2 — Read the scale: On the figure, the arrow at the acidic (red) end points to about pH 1.

Why other options are wrong:

- 7 is neutral.
- 10 and 14 are basic values.

Final Answer: Dilute HCl has pH about 1 $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q26

Q27.

Solution

Concept — Physical state of metals: Almost all metals are solids at room temperature. Mercury is the well-known exception, being a liquid metal.

Step 1 — Test the options: Sodium, zinc and iron are all solids at room temperature.

Step 2 — Identify the liquid metal: Mercury is the metal that is liquid at room temperature.

Why other options are wrong:

- Sodium is a soft solid metal.
- Zinc and iron are hard solid metals.

Final Answer: Mercury is the liquid metal $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q27

Q28.

Solution

Concept — Lustre of non-metals: Non-metals are usually dull (non-lustrous). Iodine is the notable exception, being a shiny, lustrous non-metal.

Step 1 — Test the options: Sulphur, carbon (coal) and phosphorus are all dull.

Step 2 — Identify the lustrous one: Iodine has a shiny, metallic-looking lustre.

Why other options are wrong:

- Sulphur is a dull yellow solid.
- Carbon (coal) and phosphorus are non-lustrous.

Final Answer: Iodine is the lustrous non-metal $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q28

Q29.

Solution

Concept — Extraction of reactive metals: Metals at the top of the reactivity series (such as sodium and potassium) hold their compounds very strongly. They cannot be reduced by carbon, so they are extracted by the electrolysis of their molten compounds.

Step 1 — Read the series: Sodium and potassium sit at the top, meaning they are very reactive.

Step 2 — Choose the method: Such reactive metals are obtained by electrolysis of their molten salts.

Why other options are wrong:

- Heating with carbon works only for moderately reactive metals.
- Simply heating in air does not extract these metals.
- Iron cannot displace metals that are more reactive than itself.

Final Answer: They are extracted by electrolysis $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q29

Q30.

Solution

Concept — Displacement and reactivity: In a displacement reaction, only a more reactive metal can displace a less reactive metal from its salt solution. A less reactive metal cannot do so.

Step 1 — Compare the metals: Zinc is more reactive than copper.

Step 2 — Apply the rule: Since copper is less reactive than zinc, copper cannot displace zinc from zinc sulphate.

Why other options are wrong:

- Copper is less reactive than zinc, not more.
- Zinc sulphate is soluble in water.
- Copper is a metal, not a non-metal.

Final Answer: A less reactive metal cannot displace a more reactive one $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q30

Q31.

Solution

Concept — Alloys and their composition: An alloy is a mixture of a metal with one or more other elements. Brass is an alloy made of copper and zinc.

Step 1 — Recall the composition of brass: Brass $=$ copper $+$ zinc.

Step 2 — Confirm: This makes it stronger and more useful than pure copper for utensils.

Why other options are wrong:

- Copper and tin make bronze.
- Iron and carbon make steel.
- Lead and tin make solder.

Final Answer: Brass is an alloy of copper and zinc $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q31

Q32.

Solution

Concept — Forms of iron: The different commercial forms of iron differ mainly in their carbon content. Wrought iron has the least carbon (about 0.1%) and is therefore the purest form.

Step 1 — Compare carbon content: Pig iron and cast iron have the most carbon; steel has a moderate amount; wrought iron has the least.

Step 2 — Identify the purest: Wrought iron is the purest form of iron.

Why other options are wrong:

- Cast iron and pig iron are high in carbon.
- Steel contains more carbon than wrought iron.

Final Answer: Wrought iron is the purest form $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q32

Q33.

Solution

Concept — Ionic bonding: An ionic bond forms when a metal loses electrons (forming a positive ion) and a non-metal gains them (forming a negative ion). So it forms between a metal and a non-metal.

Step 1 — Recall who gives and who takes: Metals lose electrons; non-metals gain electrons.

Step 2 — Identify the pairing: An ionic bond forms between a metal and a non-metal.

Why other options are wrong:

- Two non-metals form covalent bonds.
- Two metals form metallic bonds.
- Noble gases do not normally bond.

Final Answer: An ionic bond forms between a metal and a non-metal $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q33

Q34.

Solution

Concept — Covalent bond in HCl: In hydrogen chloride, the hydrogen atom and the chlorine atom share one pair of electrons. Each shared pair is one covalent bond.

Step 1 — Read the figure: There is exactly one shared pair of electrons between H and Cl.

Step 2 — Count the bonds: One shared pair means one covalent bond.

Why other options are wrong:

- 2 or 3 would need two or three shared pairs.
- 0 is wrong because the atoms are clearly bonded.

Final Answer: HCl has 1 covalent bond $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q34

Q35.

Solution

Concept — Properties of ionic solids: Ionic compounds have strong electrostatic forces between their ions arranged in a rigid lattice. This makes them hard, but also brittle, since a slight shift brings like charges together and the crystal cracks.

Step 1 — Recall the structure: A strong, rigid ionic lattice.

Step 2 — State the property: Ionic solids are hard and brittle.

Why other options are wrong:

- They are not soft and waxy.
- They are solids with high melting points, not liquids or gases.

Final Answer: Ionic solids are hard and brittle $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q35

Q36.

Solution

Concept — Achieving a stable octet: An atom becomes stable by reaching a noble-gas configuration. Calcium has 2 electrons in its outermost shell, so it is easiest for it to lose those 2 electrons.

Step 1 — Read the configuration: Calcium is $2, 8, 8, 2$, with 2 valence electrons.

Step 2 — Decide the easiest route: Losing 2 electrons leaves the stable $2, 8, 8$ arrangement.

Why other options are wrong:

- Gaining 2 would mean adding 6 more to fill the shell, which is harder.
- Sharing is typical of covalent bonding, not a metal like calcium.
- Losing 8 electrons is not possible from the outer shell here.

Final Answer: Calcium loses 2 electrons $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q36

Q37.

Solution

Concept — Catenation: Catenation is the property of an element to form bonds with other atoms of the same element, making long chains, branches and rings. Carbon shows this property to the greatest extent.

Step 1 — Match the description: Forming long carbon-carbon chains and rings is catenation.

Step 2 — Confirm: This is why carbon forms millions of compounds.

Why other options are wrong:

- Isomerism is having the same formula but different structures.
- Hydrogenation adds hydrogen; oxidation adds oxygen.

Final Answer: The chain-forming ability is catenation $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q37

Q38.

Solution

Concept — Halo functional group: When a halogen atom such as chlorine or bromine replaces a hydrogen on a carbon chain, the compound is a haloalkane and the halogen is its functional group.

Step 1 — Identify the group: A $-$Cl or $-$Br attached to carbon is the halo group.

Step 2 — Name the compound: Such a compound is a haloalkane.

Why other options are wrong:

- Alcohols carry $-$OH.
- Carboxylic acids carry $-$COOH.
- Ketones carry the $>$C=O group.

Final Answer: A halogen on a carbon chain gives a haloalkane $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q38

Q39.

Solution

Concept — Formula of alkenes: Alkenes have the general formula C_nH_{2n}. Butene has 4 carbon atoms, so $n = 4$.

Step 1 — Substitute $n = 4$: hydrogen atoms $= 2 \times 4 = 8$.

Step 2 — Write the formula: C_4H_8, which matches the C=C skeleton shown.

Why other options are wrong:

- C_4H_{10} is butane (an alkane).
- C_3H_6 is propene (only 3 carbons).
- C_4H_6 does not fit the alkene formula.

Final Answer: Butene is $C_4H_8 \Rightarrow$ A

Answer: (A) Go Back to Q39

Q40.

Solution

Concept — Dehydration: Dehydration is the removal of a molecule of water from a compound. When ethanol is heated with excess hot concentrated sulphuric acid, a water molecule is removed and ethene is formed.

Step 1 — Note what is removed: A molecule of water leaves the ethanol.

Step 2 — Name the process: Removal of water is dehydration.

Why other options are wrong:

- Hydrogenation adds hydrogen.
- Hydration adds water; hydrolysis splits a molecule using water.

Final Answer: Removing water from ethanol is dehydration $\Rightarrow$ C

Answer: (C) Go Back to Q40

Q41.

Solution

Concept — Chemistry of soaps: Soaps are the sodium or potassium salts of long-chain fatty acids (carboxylic acids). They are made by treating fats or oils with an alkali (saponification).

Step 1 — Recall the definition: Soap = sodium/potassium salt of a long-chain fatty acid.

Step 2 — Confirm: For example, sodium stearate is a common soap.

Why other options are wrong:

- Esters of glycerol are fats and oils, not soaps.
- Soaps are salts, not alcohols or mineral acids.

Final Answer: Soaps are salts of long-chain fatty acids $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q41

Q42.

Solution

Concept — Alkynes: Hydrocarbons that contain a carbon-carbon triple bond are unsaturated and belong to the alkyne series, with the general formula C_nH_{2n-2}.

Step 1 — Read the figure: Three lines between the carbons show a triple bond.

Step 2 — Name the series: A carbon-carbon triple bond means the alkyne series.

Why other options are wrong:

- Alkanes have only single bonds.
- Alkenes have a double bond.
- The aromatic series is based on benzene rings, not a simple triple bond.

Final Answer: A triple bond means an alkyne $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q42

Q43.

Solution

Concept — Complete combustion: When a hydrocarbon burns in plenty of air (enough oxygen), it is completely oxidised to carbon dioxide and water, releasing a lot of heat.

Step 1 — Write the products: carbon dioxide and water.

Step 2 — Confirm: Enough oxygen ensures complete (clean) combustion with a blue flame.

Why other options are wrong:

- Carbon monoxide and soot form only in incomplete combustion (limited air).
- "Only carbon dioxide" ignores the water produced.

Final Answer: Complete combustion gives carbon dioxide and water $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q43

Q44.

Solution

Concept — Electrodes and redox: In electrolysis, oxidation (loss of electrons) takes place at the anode, while reduction (gain of electrons) takes place at the cathode.

Step 1 — Recall the rule: Oxidation occurs at the anode.

Step 2 — Confirm: Negative ions move to the anode and lose electrons there.

Why other options are wrong:

- Reduction, not oxidation, occurs at the cathode (the negative electrode).
- A salt bridge is part of a galvanic cell, not the site of oxidation here.

Final Answer: Oxidation occurs at the anode $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q44

Q45.

Solution

Concept — Charles' law graph: Charles' law states that, at constant pressure, the volume of a fixed mass of gas is directly proportional to its absolute temperature, $V \propto T$. A direct proportion gives a straight line through the origin.

Step 1 — Recall the relation: $V = kT$, a straight-line equation passing through $(0, 0)$.

Step 2 — Read the graph: The figure shows a straight line starting from the origin.

Why other options are wrong:

- A downward curve or a hyperbola does not represent a direct proportion.
- A horizontal line would mean volume does not change with temperature.

Final Answer: The V–T graph is a straight line through the origin $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q45

Q46.

Solution

Concept — Conduction in solutions: Electricity is carried through a solution by free-moving ions. Distilled water has almost no ions, so it hardly conducts. Adding common salt provides many ions.

Step 1 — Compare the ions present: Salt water has many free ions; distilled water has very few.

Step 2 — Conclude: Salt water conducts electricity much better than distilled water.

Why other options are wrong:

- Salt water does conduct, so "not at all" is wrong.
- It conducts better, not the same or less than distilled water.

Final Answer: Salt water conducts much better $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q46

Q47.

Solution

Concept — Avogadro's number: One mole of any substance contains a fixed number of particles, equal to 6.022×10^{23}. This is called Avogadro's number.

Step 1 — Recall the definition: The number of particles in one mole is Avogadro's number.

Step 2 — Confirm the value: It is 6.022×10^{23} particles per mole.

Why other options are wrong:

- Mole fraction is a ratio of amounts, not a count of particles.
- Molar mass is the mass of one mole, not the number of particles.
- Atomic number is the number of protons in an atom.

Final Answer: The number of particles in one mole is Avogadro's number $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q47

Q48.

Solution

Concept — Role of the electrolyte: In an electrolytic cell, the electrolyte is the molten or dissolved substance that contains free-moving ions. These ions carry the electric current through the solution.

Step 1 — Read the figure: Cations move to the cathode and anions move to the anode through the solution.

Step 2 — Identify the conductor of ions: The substance providing these free ions is the electrolyte.

Why other options are wrong:

- The metal wire carries electrons, not ions.
- The battery only supplies the energy.
- The glass container holds the cell but does not conduct.

Final Answer: The electrolyte carries current through its ions $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q48

Q49.

Solution

Concept — Acid rain: Burning fossil fuels releases oxides of sulphur (SO_2) and nitrogen (NO_2) into the air. These dissolve in rain water to form sulphuric and nitric acids, producing acid rain.

Step 1 — Identify the gases: The harmful oxides are those of sulphur and nitrogen.

Step 2 — Confirm: They form acids in rain water, lowering its pH.

Why other options are wrong:

- Oxides of carbon and hydrogen are not the main cause.
- Oxygen, helium, sodium and potassium oxides are not responsible.

Final Answer: Acid rain is caused by oxides of sulphur and nitrogen $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q49

Q50.

Solution

Concept — Renewable energy: Renewable (non-exhaustible) sources are those that are naturally replenished and will not run out, such as solar energy, wind energy, and hydro energy.

Step 1 — Test the pairs: Coal, petroleum, natural gas, diesel and kerosene are all non-renewable fossil fuels.

Step 2 — Identify the renewable pair: Solar energy and wind energy are both renewable.

Why other options are wrong:

- Coal and petroleum are exhaustible fossil fuels.
- Natural gas, diesel and kerosene are also non-renewable.

Final Answer: Solar and wind energy are renewable $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q50

Answer Key

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