ICSE CHEMISTRY (SCIENCE PAPER – 2)

CLASS X

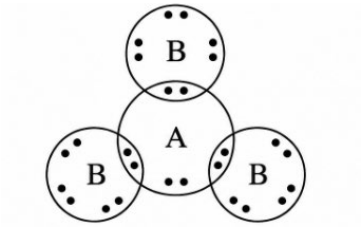
MODEL QUESTION PAPER

Maximum Marks: 80
Time allowed: Two hours
1. Answers to this Paper must be written on the paper provided separately.
*2. You will **not** be allowed to write during first **15** minutes.*
3. This time is to be spent in reading the question paper.
4. The time given at the head of this Paper is the time allowed for writing the answers.
***5. Section A is compulsory**. Attempt **any four** questions from **Section B**.*
6. The intended marks for questions or parts of questions are given in brackets [ ].

SECTION A (40 Marks)

Choose the correct answer. Write the option only. [15]

(i) The diagram given below shows the bonding in a covalent molecule AB_3.



Which option represents the correct electronic configurations of atoms A and B before they combine to form the molecule?

Option	Atom A	Atom B
(a)	2, 5	2, 7
(b)	2, 6	2, 7
(c)	2, 5	2, 6
(d)	2, 4	2, 7

(ii) On adding NaOH dropwise to salt solution P, a white precipitate forms and dissolves in excess. On adding NH_4OH to a fresh portion, a white precipitate remains insoluble in excess. P most likely contains:

(a) Cu^{2+}

(b) Fe^{2+}

(c) Zn^{2+}

(d) Pb^{2+}

(iii) A mixture of 40 cm^3 ethene and 70 cm^3 hydrogen is passed over heated nickel. Assuming complete conversion and identical conditions, what volume of gaseous mixture remains?

(a) 40 cm^3

(b) 70 cm^3

(c) 80 cm^3

(d) 110 cm^3

(iv) Which pair consists of species containing a co-ordinate bond?

(a) NH_4^+ and H_3O^+

(b) HCl and CH_4

(c) NaCl and CaO

(d) O_2 and N_2

(v) A substance conducts electricity in molten state but not in solid state. The best explanation is:

(a) electrons are mobile only in molten form

(b) ions are free to migrate only in molten form

(c) its molecules ionise only on cooling

(d) covalent bonds break into electrons

(vi) During the electrolysis of aqueous $CuSO_4$ using platinum electrodes, the correct pair of products is:

(a) cathode: Cu; anode: O_2

(b) cathode: H_2; anode: Cu

(c) cathode: Cu; anode: Cu^{2+}

(d) cathode: O_2; anode: H_2

(vii) Assertion (A): Zinc oxide dissolves in both dilute HCl and hot concentrated NaOH.

Reason (R): Zinc oxide is amphoteric.

(a) Both are true; R correctly explains A.

(b) Both are true; R does not explain A.

(c) A is true; R is false.

(d) A is false; R is true.

(viii) Which reaction chiefly demonstrates the non-volatile nature of concentrated H_2SO_4?

(a) $C + 2H_2SO_4 \rightarrow CO_2 + 2SO_2 + 2H_2O$

(b) $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

(c) $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$

(d) $CuSO_4 \cdot 5H_2O \rightarrow CuSO_4 + 5H_2O$

(ix) Which procedure can prepare pure dry lead(II) sulphate most directly?

(a) React Pb metal with dilute H_2SO_4 and evaporate.

(b) Mix $Pb(NO_3)_2$(aq) and Na_2SO_4(aq); filter, wash and dry.

(c) Neutralise PbO with dilute HCl and crystallise.

(d) Mix Na_2SO_4(aq) and NaCl(aq); filter.

(x) An organic compound has empirical formula CH_2 and vapour density 28. Its molecular formula is:

(a) C_2H_4

(b) C_3H_6

(c) C_4H_8

(d) C_5H_{10}

(xi) Which change increases the yield of ammonia at equilibrium in the Haber process, other conditions unchanged?

(a) decreasing pressure

(b) increasing pressure

(c) removing nitrogen

(d) increasing temperature indefinitely

(xii) Hot concentrated nitric acid acts as an oxidising agent with copper. The brown gaseous product is:

(a) NO

(b) NH_3

(c) NO_2

(d) N_2O

(xiii) Consider $C_2H_4 \rightarrow C_2H_5Br \rightarrow C_2H_5OH$. The reagents in order are:

(a) Br_2; aqueous NaOH

(b) HBr; aqueous NaOH

(c) H_2; alcoholic KOH

(d) HCl; concentrated H_2SO_4

(xiv) Assertion (A): In the extraction of aluminium, the carbon anodes require replacement.
Reason (R): Oxygen formed at the anodes reacts with carbon to produce oxides of carbon.

(a) Both are true; R correctly explains A.

(b) Both are true; R does not explain A.

(c) A is true; R is false.

(d) A is false; R is true.

(xv) A gaseous hydrocarbon burns according to $C_xH_Y + 5O_2 \rightarrow 3CO_2 + 4H_2O$. Its molecular formula is:

(a) C_3H_6

(b) C_3H_8

(c) C_4H_8

(d) C_4H_{10}

Question 2

(i) A student adds sodium hydroxide solution dropwise and then in excess to solutions A and B. A gives a dirty-green precipitate which turns brown on standing; B gives a white precipitate soluble in excess. Answer the following: [5]

(a) Identify the cation in A.

(b) Name the initial precipitate in A.

(c) Explain the colour change on standing.

(d) Give one possible cation in B.

(e) Write the ionic equation for formation of the white precipitate in B (using your chosen cation).

(ii) Write balanced chemical equations (including appropriate conditions where relevant) for each conversion: [5]

(a) Sodium propanoate to ethane.

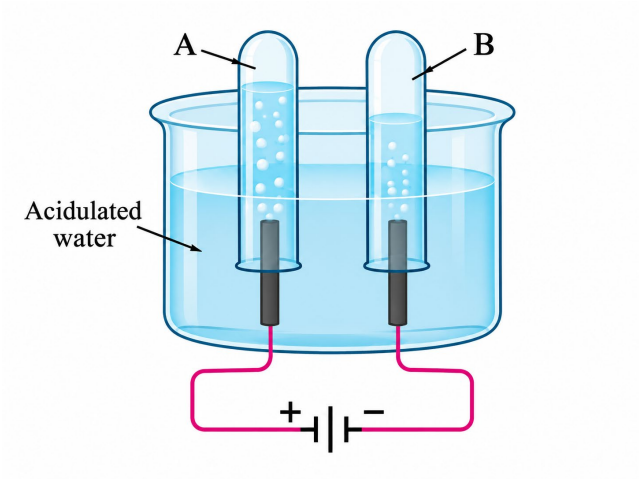
(b) Ethene to ethane.

(c) Ammonia to nitric oxide.

(d) Sulphur dioxide to sulphur trioxide.

(e) Ethanol to ethene.

(iii) The diagram given below shows the electrolysis of acidulated water. [5]



With reference to the diagram, answer the following questions:

(a) Write an equation for the reaction that takes place at A.

(b) Give a test to confirm the product formed at a.

(c) Which gas is liberated at A?

(d) Why is water acidified for electrolysis?

(e) What is the ratio by volume of the gases liberated at A and B?

(iv) Match each description (a–e) with one of the numbered terms: [5]

(a) Heating a sulphide ore strongly in excess air.

(b) Electrolytic purification of impure copper.

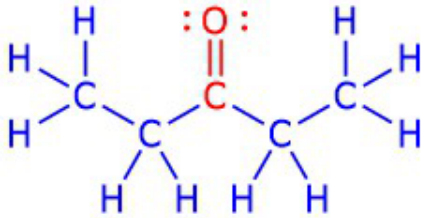
(c) Separation of a sulphide ore using oil and air bubbles.

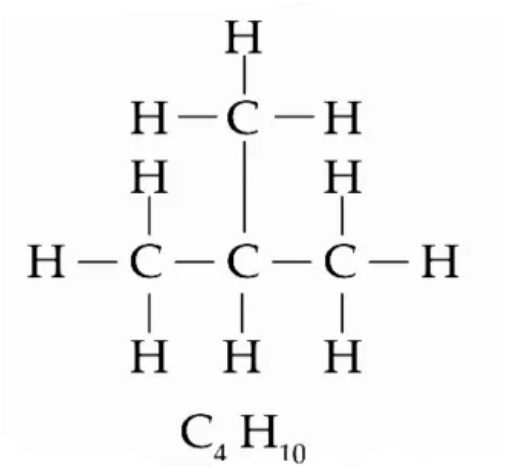
(d) Reaction of an acid with an insoluble metal oxide to make a soluble salt.

(e) Addition of acidified water to concentrated sulphur trioxide-containing acid to make sulphuric acid.

Terms: 1. Froth flotation 2. Roasting 3. Electrorefining 4. Neutralisation 5. Dilution of oleum

(v) (a) Write the IUPAC names of the given compound.





(b) Draw displayed or clear condensed structural formulae of pent-2-yne, 2-methylbutane and ethyl ethanoate. [5]

SECTION B (40 Marks)

(Attempt any four questions from this Section.)

Question 3

(i) An element X (atomic number 12) combines with Y (atomic number 17). Write the formula of the compound and explain, using electron transfer, why its molten form conducts electricity.

[2]

(ii) A dry sample of HCl gas does not turn dry blue litmus red, whereas its aqueous solution does. Explain both observations. [2]

(iii) A salt solution gives a pale-blue precipitate with a little NH_4OH; the precipitate dissolves in excess reagent to form a deep-blue solution. Identify the cation, name the precipitate and explain the observation in excess reagent. [3]

(iv) A 5.6 L sample of nitrogen gas at STP reacts with sufficient hydrogen to form ammonia. Calculate (a) the volume of hydrogen needed at STP; (b) mass of ammonia formed; (c) number of ammonia molecules formed. [N = 14, H = 1; $N_a = 6.02 \times 10^{23}\ mol^{-1}$] [3]

Question 4

(i) State two differences between electrolysis of aqueous copper(II) sulphate using copper electrodes and using platinum electrodes, considering the anode product and the colour of the electrolyte over time. [2]

(ii) Give one reason each: (a) anode blocks are consumed in the Hall–Héroult process; (b) cryolite is added to alumina. [2]

(iii) A mixture of 24 cm^3 methane and 60 cm^3 oxygen is ignited. After cooling to room temperature, calculate the volume of each gaseous product and the total gaseous volume remaining, assuming complete combustion and the same temperature and pressure. [3]

(iv) Write the balanced equations for (a) roasting zinc blende; (b) reduction of zinc oxide by carbon; (c) reaction of zinc oxide with hot concentrated sodium hydroxide solution. [3]

Question 5

(i) An organic compound A (C_2H_6O) reacts with sodium, releasing a gas. On heating A with ethanoic acid and concentrated H_2SO_4, a sweet-smelling compound forms. Identify A and write the formula of the sweet-smelling product. [2]

(ii) Explain why aqueous ammonia forms a white precipitate with Zn^{2+} ions that dissolves in excess ammonia, whereas lead(II) hydroxide does not dissolve in excess ammonia. [2]

(iii) An organic compound contains 40.0% carbon, 6.67% hydrogen and 53.33% oxygen. Its vapour density is 30. Determine its empirical formula and molecular formula. [C = 12, H = 1, O = 16] [3]

(iv) Give balanced chemical equations and state a key condition for: (a) converting ethanol into ethene; (b) converting ethene into 1,2-dibromoethane; (c) converting 1,2-dibromoethane into ethyne. [3]

Question 6

(i) During preparation of HCl gas, a student collects it over water and finds very little gas. Identify the error and state a suitable method of collection. [2]

(ii) Distinguish zinc nitrate solution from lead nitrate solution by using excess sodium hydroxide and excess ammonium hydroxide in separate portions. State the observations for the two reagents. [2]

(iii) In the Contact Process, explain the roles of (a) vanadium(V) oxide, (b) concentrated sulphuric acid in absorbing SO_3 and (c) controlled addition of water to oleum. [3]

(iv) A 13 g sample of zinc reacts with excess dilute HCl. Calculate (a) moles of zinc consumed, (b) volume of hydrogen at STP and (c) mass of $ZnCl_2$ formed. [Zn = 65, H = 1, Cl = 35.5] [3]

Question 7

(i) A sample of a soluble salt produces a gas when warmed with NaOH; the gas turns moist red litmus blue. Identify the cation and write the ionic equation for gas formation. [2]

(ii) Explain why concentrated nitric acid is stored in a dark bottle. Write the balanced equation for the change responsible. [2]

(iii) Element P is in Group 1, Period 3 and Q is in Group 17, Period 3. (a) Give their electronic configurations. (b) State the formula of their compound. (c) Compare the atomic radii of P and Q with a reason. [3]

(iv) Write balanced equations for (a) copper reacting with concentrated HNO_3; (b) carbon reacting with concentrated H_2SO_4; (c) ammonia reducing hot copper(II) oxide. [3]

Question 8

(i) A student claims that boiling an aqueous solution of copper(II) sulphate with copper electrodes will make the blue colour disappear during electrolysis. Evaluate the claim and explain. [2]

(ii) Draw electron-dot diagrams showing (a) the triple bond and lone pairs in N_2, and (b) the formation of the ammonium ion, marking the co-ordinate bond. [2]

(iii) For each of the following identify the preferred salt preparation method and provide a balanced equation: (a) sodium sulphate from sodium hydroxide; (b) lead(II) chloride from two soluble salts; (c) copper(II) sulphate from copper(II) oxide. [3]

(iv) A hydrocarbon X gives two moles of CO_2 and one mole of H_2O per mole of X on complete combustion. Its relative molecular mass is 26. Identify X; write the balanced combustion equation; explain how bromine solution distinguishes X from ethane. [C = 12, H = 1] [3]