ICSE Class 10 Chemistry Question Paper Solution 2018

CHEMISTRY (PAPER-2)

SECTION I (40 Marks)

Attempt all questions from this Section

Question 1

(a) Choose the correct answer from the options given below: [5]

(i) The salt solution which does not react with *ammonium hydroxide* is:

A. Calcium Nitrate

B. Zinc Nitrate

C. Lead Nitrate

D. Copper Nitrate

(ii) The organic compound which undergoes *substitution reaction* is:

A. C_2H_2

B. C_2H_4

C. $C_{10}H_{18}$

D. C_2H_6

(iii) The *electrolysis of acidified water* is an example of:

A. Reduction

B. Oxidation

C. Redox reaction

D. Synthesis

(iv) The *IUPAC* name of dimethyl ether is:

A. Ethoxy methane

B. Methoxy methane

C. Methoxy ethane

D. Ethoxy ethane

(v) The catalyst used in the *Contact Process* is:

A. Copper

B. Iron

C. Vanadium pentoxide

D. Manganese dioxide

(b) Give **one word** or a **phrase** for the following statements: [5]

(i) The energy released when an electron is added to a neutral gaseous isolated atom to form a negatively charged ion.

(ii) Process of formation of ions from molecules which are not in ionic state.

(iii) The tendency of an element to form chains of identical atoms.

(iv) The property by which certain hydrated salts, when left exposed to atmosphere, lose their water of crystallization and crumble into powder.

(v) The process by which sulphide ore is concentrated.

(c) Write a *balanced chemical equation* for each of the following: [5]

(i) Action of concentrated sulphuric acid on carbon.

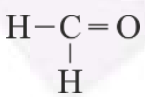
(ii) Reaction of sodium hydroxide solution with iron (III) chloride solution.

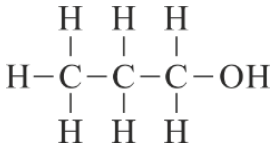
(iii) Action of heat on aluminum hydroxide.

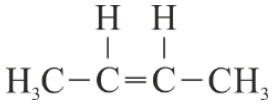
(iv) Reaction of zinc with potassium hydroxide solution.

(v) Action of dilute hydrochloric acid on magnesium sulphite.

(d) (i) Give the IUPAC name for each of the following: [5]

1. 

2. 

3. 

(ii) Write the structural formula of the two isomers of butane.

(e) State one *relevant observation* for each of the following: [5]

(i) Lead nitrate solution is treated with sodium hydroxide solution drop wise till it is in excess.

(ii) At the anode, when molten lead bromide is electrolyzed using graphite electrodes.

(iii) Lead nitrate solution is mixed with dilute hydrochloric acid and heated.

(iv) Anhydrous calcium chloride is exposed to air for some time.

(v) Barium chloride solution is slowly added to sodium sulphate solution.

(f) Give *a reason* for each of the following: [5]

(i) Ionic compounds have a high melting point.

(ii) Inert gases do not form ions.

(iii) Ionisation potential increases across a period, from left to right.

(iv) Alkali metals are good reducing agents.

(v) Conductivity of dilute hydrochloric acid is greater than that of acetic acid.

(g) **Name the gas** that is produced in each of the following cases [5]

(i) Sulphur is oxidized by concentrated nitric acid.

(ii) Action of dilute hydrochloric acid on sodium sulphide.

(iii) Action of cold and dilute nitric acid on copper.

(iv) At the anode during the electrolysis of acidified water.

(v) Reaction of ethanol and sodium.

(h) Fill up the blanks with the correct choice given in brackets. [5]

(i) Ionic or electrovalent compounds do not conduct electricity in their _____ state. (fused / solid)

(ii) Electrolysis of aqueous sodium chloride solution will form _____ at the cathode. (hydrogen gas / sodium metal)

(iii) Dry hydrogen chloride gas can be collected by _____ displacement of air. (downward / upward)

(iv) The most common ore of iron is _____. (calamine / haematite)

(v) The salt prepared by the method of direct combination is _____. (iron (II) chloride / iron (III) chloride

Comments of Examiners

(a) (i) Some candidates chose the salt *copper nitrate* while others selected *lead nitrate* instead of *calcium nitrate*.

(ii) Many candidates made random choices indicating they did not associate the fact that alkanes show substitution reactions or did not apply the general formula to select the correct alkane.

(iii) A few candidates either wrote *oxidation* or *reduction* instead of *redox reaction*.

(iv) Many candidates were unsure of the correct name and gave varied names.

(v) Most candidates selected the correct option of *vanadium pentoxide*. However, a few chose *iron* which was incorrect.

(b) (i) Instead of *electron affinity*, many candidates wrote *electronegativity* or *ionization potential.*

(ii) Many candidates wrote *dissociation* instead of *ionization*.

(iii) Some candidates wrote *self-linking* instead of *Catenation*.

(iv) Majority of the candidates answered correctly. However, a few candidates got confused between *efflorescence* and *deliquescence*. Spelling errors were also noticed in some answers. Some referred to it as *effervescence*.

(v) Many candidates wrote *roasting* or *calcination* instead of *froth floatation*.

(c) (i) Many candidates erred by writing H_2SO_3 or H_2CO_3 among the products. Some left the equation unbalanced. A few wrote Cu instead of C.

(ii) Some candidates wrote the equation with $FeCl_2$ instead of $FeCl_3$.

(iii) Some candidates incorrectly wrote the products as Al and H_2O.

(iv) Some candidates wrote incorrect formula of potassium zincate and many wrote one of the products as $Zn(OH)_2$ or ZnO or K_2O.

(v) Many candidates got confused between magnesium sulphite, sulphide and sulphate. Some others erred by writing one of the products as H_2SO_3 instead of $H_2O + SO_2$.

(d) (i) Some candidates wrote trivial or common names.

(1) *methanone* instead of *methanal*.

Suggestions for teachers

- Encourage students to read the question carefully and state complete answers.
- Familiarize students with the help of practical work that NH_4OH forms precipitate with Pb^{2+}, Zn^{2+}, Cu^{2+} Fe^{2+}, Fe^{3+} but not with Ca^{2+}.
- Ask students to learn hydrocarbons (alkanes, alkenes and alkynes) their general formulae, methods of preparation and main properties thoroughly.
- Stress upon revising the concepts based on oxidation and reduction frequently.
- Train students in naming of compounds, both the trivial names (where possible) and IUPAC names.
- Instruct students to learn industrial processes like Haber's, Ostwald's and Contact with conditions, reactions and precautions (if any) in detail.
- Advise students to learn the differentiation between terms such as: ionization potential and electron affinity; electron affinity and electronegativity; dissociation and ionization; ionic compounds and covalent compounds; self-linking and catenation; efflorescence and deliquescence; efflorescence and effervescence; roasting and calcination; roasting and froth floatation; calcination and froth floatation
- Teach various methods of concentration of ores with the help of diagrams/charts etc, for better retention of the content.
- Test regularly or conduct quizzes on topics that require memorization for better retention.

(2) Name ended by 'al' instead of 'ol' while some incorrectly wrote prop-l-ol.

(3) *1,2-dimethlyethene* instead of *2-butene or but-2-ene*. Some wrote simply *butane or butan-2-ene*.

(ii) Many candidates did not understand the difference between straight and branched chains clearly. Some showed the Carbon skeleton and missed showing the complete structural formula.

(e) (i) Many candidates wrote white $Pb(OH)_2$ instead of *white precipitate soluble*. Thus, the answer was left incomplete. For solubility of the precipitate in excess NaOH some wrote:

- Insoluble in excess instead of soluble in excess.
- White solution instead of colourless solution.

(ii) Colour of bromine was written as orange/red by some candidates; some forgot to add the word *vapour* or *gas* with the colour of bromine; A few candidates wrote that grey metal is deposited at the anode. Several candidates wrote equations instead of observations.

(iii) Instead of *white precipitate* many candidates wrote reddish brown fumes of NO_2. Some wrote the equation without stating the colour of the precipitate. A few candidates expressed the answer by leaving out the effect of heating on the solubility of $PbCl_2$.

(iv) Instead of writing that $CaCl_2$ turns into colourless solution, candidates wrote that it turns hydrated. Some candidates stated that it turns powdery having got confused with efflorescent substances.

(v) Most candidates answered correctly. However, a few candidates identified the product $BaSO_4$ but missed out the word *precipitate* or the colour *white*

(f) (i) *Intermolecular force of attraction* instead of *strong electrostatic force of attraction* between ions was stated to be responsible for the high melting point in ionic compounds.

(ii) Some candidates wrote that inert gases are stable without mentioning *electronic configuration / 8 electrons in the valence shell.*

- Advise students to learn the chemical reactions with necessary conditions and their balanced chemical equations assiduously and practise by writing again and again.
- Draw the attention of students to the difference in the symbols of radicals especially when the names sound similar.
- Ensure students grasp the fact that alcohols end in 'ol' and aldehydes end in 'al' that the 'e' of an alkane is replaced by 'ol' or 'al'
- Instruct students that numbering of chain is essential to assign the number to the functional group.
- Clarify straight and branched chains with sufficient examples and by giving repeated practice.
- Insist upon students recording the observation on their own during practical and then ask them to compare their observations with the observations expected. Discuss the reason for the difference (if any) in their observations.
- Demonstrate the *what happens when* type of possible cases to students to enable them to write relevant observation/s with confidence.
- Give practice in answering reasoning questions in different units. Explain the possible reasoning questions in the class at the time of discussing a topic.
- Train students to write answers to the point. While writing a chemical equation, gas should be highlighted with an upward arrow and precipitation with a downward arrow.
- Instruct students to be specific as per the requirement of the question in writing the correct gas or precipitate instead of giving multiple answers or all products.
- Guide students to learn the chemical names correctly especially the various oxides of nitrogen, etc.

(iii) Many candidates could not explain the reason for increase in ionisation potential across a period, from left to right.

(iv) Many candidates did not write the correct reason to explain *alkali metals are good reducing agents*.

(v) Most candidates wrote about the conductivity of dilute HCl or acetic acid but could not compare the conductivity of both the acids.

- Ask students to first name the electrode and then give the equation or product while answering questions on reaction at electrode.
- Ask students to read the given statements and choices supplied carefully.

(g) (i) Instead of NO_2 some candidates wrote SO_2, H_2S or N_2 while some others wrote NO_2 and SO_2.

(ii) Most of the candidates answered this sub-part correctly.

(iii) While most candidates were able to give correct answer, but a few could not name the gas correctly called it *nitrogen oxide* instead of *nitric oxide* or gave the incorrect answer NO_2.

(iv) While writing the name of the gas produced at the anode during the electrolysis of acidified water many candidates overlooked the term anode and wrote hydrogen and oxygen.

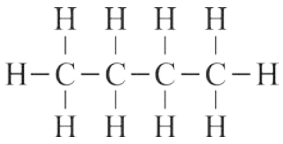
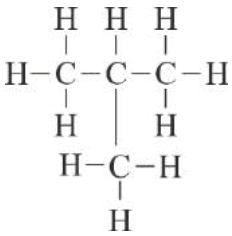
(v) Several candidates wrote ethane/ethene is evolved with the reaction of ethanol and sodium which was an incorrect answer.

(h) This question was attempted well by most candidates, but a few candidates made errors in sub-parts(i), (ii) and (v).

MARKING SCHEME

Question 1

(a)	(i)	A or calcium nitrate
	(ii)	D or C_2H_6
	(iii)	C or redox reaction
	(iv)	B or methoxy methane
	(v)	C or Vanadium pentoxide
(b)	(i)	Electron affinity/electron gain enthalpy
	(ii)	Ionisation
	(iii)	Catenation
	(iv)	Efflorescence/efflorescent
	(v)	Froth floatation method
(c)	(i)	$C + 2H_2SO_4 \rightarrow CO_2 + 2SO_2 + 2H_2O$
	(ii)	$FeCl_3 + 3NaOH \rightarrow Fe(OH)_3 + 3NaCl$
	(iii)	$2Al(OH)_3 \rightarrow Al_2O_3 + 3H_2O$
	(iv)	$Zn + 2KOH \rightarrow K_2ZnO_2 + H_2$
	(v)	$MgSO_3 + 2HCl \rightarrow MgCl_2 + SO_2 + H_2O$

(d)	(i) 1. Methanal or methan-1-al 2. 1Propanol or Propane – 1 – OL 3. 2Butene or but – 2 – ene
	(ii) 1.  OR CH_3-CH_2-CH_2-CH_3 2.  OR $H_3C - CH(CH_3) - CH_3$
(e)	(i) White precipitate soluble in excess of sodium hydroxide solution. (ii) Reddish brown vapour at the anode. (iii) A white precipitate is formed which dissolves on heating or initially white precipitate is formed but on heating colourless solution is observed. (iv) Colourless solution or solid $CaCl_2$ turns into solution. (v) A white precipitate is formed. *(correct relevant observations accepted)*
(f)	(i) Oppositely charged ions are held by strong force of attraction or energy is required to separate the ions/ particles held by strong electrostatic force of attraction (ii) Inert gases have stable electronic configuration or have 8 electrons in the valence shell (last shell) / do not lose or gain electrons to form ions/complete outermost or valence shell. (iii) Nuclear charge increases / nucleus exerts greater force of attraction on the valence electrons of same shell or atomic size decreases / the force of attraction on the valence electrons are more i.e., increases. (iv) Alkali metals have low ionization potential / have one electron in their valence shell /and hence they easily lose or donate electron. (v) Dilute hydrochloric acid undergoes complete ionization/ dissociation whereas acetic acid undergoes incomplete or partial ionization or dilute HCl has higher concentration of ions than acetic acid./Dilute hydrochloric acid is a stronger acid than acetic acid/ Dilute hydrochloric acid is a strong electrolyte and acetic acid is a weak electrolyte/ Dilute hydrochloric -only ions, acetic acid- ions and molecules/ Dilute hydrochloric acid has higher degree of dissociation than acetic acid.

(g)	(i) Nitrogen dioxide or NO_2 (ii) Hydrogen sulphide or H_2S (iii) Nitric oxide / nitrogen monoxide or NO (iv) Oxygen or O_2 (v) Hydrogen or H_2
(h)	(i) solid (ii) hydrogen (gas) (iii) upward (iv) Haematite (v) iron III chloride

SECTION II (40 Marks)

*Attempt **any four** questions from this Section*

Question 2

(a) (i) What do you understand by a lone pair of electrons? [3]

(ii) Draw the electron dot diagram of Hydronium ion. (H=1; O=8)

(b) *In Period 3 of the Periodic Table, element **B** is placed to the left of element **A**.* [3]

On the basis of this information, choose the correct word from the brackets to complete the following statements:

(i) The element **B** would have *(lower / higher)* metallic character than **A**.

(ii) The element **A** would probably have *(lesser / higher)* electron affinity than **B**.

(iii) The element **A** would have *(greater / smaller)* atomic size than **B**.

(c) Copy and complete the following table which refers to the conversion of ions to neutral particles. [4]

Conversion	Ionic Equation	Oxidation / Reduction
Chloride ion to chlorine molecule	(i) _____	(ii) _____
Lead (II) ion to lead	(iii)_____	(iv) _____

Comments of Examiners

(a)(i) Many candidates could not define *a lone pair of electrons* completely. They missed out the key words in the definition like *pair of electrons* or *not shared/unshared* or *covalent molecule.*

(ii) Observations in the electron dot diagram of hydronium ion drawn by some candidates were as follows:

- the lone pair or the charge was missing.
- same kind of dots were used for electrons of both O and H
- the coordinate bond was not indicated by an arrow.

(b) Majority of the candidates attempted sub-parts (i), (ii) and (iii) of this question well barring a few exceptions who could not choose the correct word from the brackets to complete the given statements.

(c) Common errors observed in this question were:

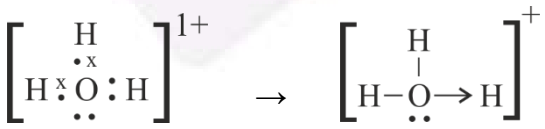
- in ionic equations such as of Cl_2 formation,
  equation $Cl^- + e^- \rightarrow Cl$ was given and the next equation was missed out.
- $Pb^{2+} - 2e \rightarrow Pb$.
  the term oxidation/reduction was incorrectly associated with the ionic equations.

Suggestions for teachers

- Stress upon using the necessary key words and insist on underlining them at the time of regular practice in class.
- Train students to draw both dot structure and bond structure separately.
- Instruct students about the periodic properties of elements in the Periodic table and variations of properties in detail. Use charts displayed with pictorial representation of the trends to enhance understanding and retention.
- Give regular exercises in application of the knowledge of trends of the following periodic properties in groups and periods: atomic size, metallic character, electron affinity, etc.
- Illustrate the concept of oxidation and reduction based on loss and gain of electrons in detail.

MARKING SCHEME

Question 2

(a)	(i) The pair of electrons which is not yet shared with other atoms in a covalent molecule is known as lone pair of electrons. (ii) 
(b)	(i) higher (ii) higher (iii) smaller
(c)	(i) $2Cl^{1-} - 2e \rightarrow Cl_2$ or $Cl^- - e \rightarrow Cl$ (or $Cl^- \rightarrow Cl + e^-$) and $Cl + Cl \rightarrow Cl_2$ or $2Cl \rightarrow Cl_2$ (ii) Oxidation (iii) $Pb^{2+} + 2e \rightarrow Pb$ (iv) Reduction

Question 3

(a) (i) Write the balanced chemical equation to prepare ammonia gas in the laboratory by using an alkali. [3]

(ii) State why concentrated sulphuric acid is not used for drying ammonia gas.

(iii) Why is ammonia gas not collected over water?

(b) (i) Name the acid used for the preparation of hydrogen chloride gas in the laboratory. Why is this particular acid preferred to other acids? [3]

(ii) Write the balanced chemical equation for the laboratory preparation of hydrogen chloride gas.

(c) For the preparation of hydrochloric acid in the laboratory: [2]

(i) Why is direct absorption of hydrogen chloride gas in water not feasible?

(ii) What arrangement is done to dissolve hydrogen chloride gas in water?

(d) For the electro-refining of copper: [2]

(i) What is the cathode made up of?

(ii) Write the reaction that takes place at the anode.

Comments of Examiners

(a) (i) Many candidates wrote the required balanced chemical equation to prepare ammonia gas in the laboratory using an alkali correctly but some wrote methods of preparation of NH_3 gas using NaOH or using $(NH_4)_2SO_4$ instead of NH_4Cl. Some showed the formation of NH_4OH instead of NH_3. Most candidates answered sub parts (ii) and (iii) of this question correctly.

(b) (i) Many candidates did not specify whether sulphuric acid used for the preparation of hydrogen chloride gas in the laboratory should be concentrated or dilute. In response to the preference of this acid over other acids, some wrote that it does not react with HCl gas.

(ii) Some candidates did not mention the necessary condition of temperature i.e., below 200 ^oC to ensure Na_2SO_4 is not formed which has a tendency to get fused with the glass and ended up writing the equation which was not required as per the question asked :

$2NaCl + H_2SO_4 \rightarrow Na_2SO_4 + 2HCl$

(c)(i) Many candidates gave inadequate explanation without mentioning the effect *back suction*.

(ii) Most candidates answered correctly. However, a few candidates wrote *thistle funnel* instead of *inverted funnel* arrangement.

(d) (i) Majority of the candidates wrote that the cathode is made up of copper. A few candidates missed out associating the word *pure* with it or wrote *impure copper*.

(ii) Some candidates wrote incorrect reactions such as:

$Cu + 2e^- \rightarrow Cu^{2+}$ Or $Cu^{2+} - 2e^- \rightarrow Cu$

Suggestions for teachers

- Insist upon students sticking to the choice of appropriate reactants for laboratory preparations.
- Explain thoroughly the study of compounds with laboratory preparation of hydrogen chloride gas, ammonia, etc., and their physical and chemical properties. Besides this, also discuss all possible reasoning questions related to their physical and chemical properties at length.
- Instruct students to read the question carefully and answer to the point as per the requirement of the question.
- Clarify the technical terms used in the question.
- Train students to write *dilute* or *concentrated* whenever reference is made to any acid.
- Habituate students to write chemical equations with necessary conditions
- Show a presentation on back suction will give clarity to students.
- Discuss electrorefining and also give practice in writing reactions taking place at cathode and anode.

MARKING SCHEME

Question 3

(a)	(i) $2NH_4Cl + Ca(OH)_2 \xrightarrow{\Delta} CaCl_2 + 2H_2O + 2NH_3$ (ii) Concentrated sulphuric acid reacts with ammonia / form ammonium sulphate or NH_3 being basic combines with concentrated H_2SO_4 /correct chemical equation. (iii) NH_3 is highly soluble in water or dissolves in water.
(b)	(i) Concentrate sulphuric acid. It is nonvolatile / has high boiling point / displaces the volatile hydrogen chloride from the salt sodium chloride. (ii) $NaCl + H_2SO_4 \xrightarrow{\angle 200^\circ C} NaHSO_4 + HCl$ (conc.)
(c)	(i) Back suction occurs (or the description of back suction) / HCl gas dissolves in water at a faster rate than it is produced.

	(ii)	Inverted funnel arrangement/ the rim of the funnel just touches the surface of water taken in the trough or correct diagram.
(d)	(i)	Pure copper
	(ii)	$Cu - 2e \rightarrow Cu^{2+}$ / $Cu \rightarrow Cu^{2+} + 2e^-$

Question 4

(a) The percentage composition of a gas is: [2]

Nitrogen 82.35%, Hydrogen 17.64%.

Find the empirical formula of the gas. [N = 14, H = 1]

(b) Aluminum carbide reacts with water according to the following equation: [4]

$Al_4C_3 + 12H_2O \rightarrow 4Al(OH)_3 + 3CH_4$

(i) What mass of aluminum hydroxide is formed from 12 g of aluminum carbide?

(ii) What volume of methane at s.t.p. is obtained from 12 g of aluminum carbide?

[Relative molecular weight of Al_4C_3 = 144; $Al(OH)_3$ = 78]

(c) (i) If 150 cc of gas A contains X molecules, how many molecules of gas B will be present in 75 cc of B? [2]

The gases A and B are under the same conditions of temperature and pressure.

(ii) Name the law on which the above problem is based.

(d) Name the main component of the following alloys: [2]

(i) Brass

(ii) Duralumin

Comments of Examiners

(a) Some candidates calculated the number of atoms by dividing atomic weight by the individual percentage. Therefore, empirical formula went incorrect. In the last step, some candidates stated the empirical formula as N_3H instead of NH_3.

(b) (i) Many candidates ignored the stoichiometric coefficients and did not consider 4 moles of $Al(OH)_3$.

Suggestions for teachers

- Train students to work out numericals step by step and give enough practice in solving them. *Explain Mole concept and Stoichiometry in detail*

(ii) A few candidates ignored the fact that 3 moles of CH_4 were released with every mole of Al_4C_3.

(c) (i) Most candidates answered correctly. However, a few candidates wrote number of molecules of gas B as 2x instead of x/2.

(ii) Many candidates named the law as Gay Lussac's law which was incorrect.

(d) In sub-parts (i) and (ii), most candidates listed all the components of the alloys *Brass* and *Duralumin* instead of giving the *main components* as asked in the question.

- Familiarize students with the equivalent correspondence between number of moles, molar mass and molar volume.
- Give adequate practice to students in solving numerical problems based on Mole and Stoichiometry.
- Ensure that students understand Gay Lussac's law of combining volumes, Avogadro's law, their statements, explanation and numerical problems based on them.
- Train students to read the question carefully and answer only whatever is asked in the question.

MARKING SCHEME

Question 4

(a)

	% Composition	Atomic Mass	No. of atoms	Simplest formula
N	82.35	14	82.35/14=5.88	5.88/5.88=1
H	17.64	1	17.64/1=17.64	17.64/5.88=3

Empirical Formula N_1H_3

(b) $Al_4C_3 + 12H_2O \rightarrow 4Al(OH)_3 + 3CH_4$

144 4 x 78 = 312

1. 144 g $Al_4C_3 \rightarrow$ 312 g of $Al(OH)_3$

   Mass of $Al(OH)_2 = \frac{312}{144} \times 12 = 26$ g

2. 144 g $Al_4C_3 \rightarrow$ 3 x 22.4l of CH_4

   Volume of $CH_4 = \frac{3\times22.4}{144} \times 12 = 5.6$l CH_4

(c) (i) No. of molecules of B = $\frac{75\times x}{150} = \frac{x}{2}$

(ii) Avogadro's law

(d) (i) Copper

(ii) Aluminum

Question 5

(a) Complete the following table which relates to the homologous series of hydrocarbons. [6]

General formula	IUPAC name of the homologous series	Characteristic bond type	IUPAC name of the first member of the series
C_nH_{2n-2}	(A) _____	(B)_____	(C)_____
C_nH_{2n+2}	(D)_____	(E)_____	(F)_____

(b) (i) Name the most common ore of the metal aluminum from which the metal is extracted. Write the chemical formula of the ore. [4]

(ii) Name the process by which impure ore of aluminum gets purified by using concentrated solution of an alkali.

(iii) Write the equation for the formation of aluminum at the cathode during the electrolysis of alumina.

Comments of Examiners

(a) Some candidates made the following mistakes in completing the table which relates to the homologous series of hydrocarbons:
- Name of compound was written in place of homologous series;
- The characteristic bond was referred to as unstaturated/saturated instead of triple covalent bond and single covalent bond respectively;
- The IUPAC name of the first member of the alkynes was given as methyne.

(b) Most candidates wrote the name of the common ore of aluminum from which the metal is extracted as *alumina* or *cryolite* instead of *Bauxite*. Some candidates gave chemical formula of Bauxite as $Al_2O_3.5H_2O$ wherein the number of water molecules was incorrect.

(i) A few candidates named the process by which impure ore of aluminum gets purified by using concentrated solution of an alkali as *Hall's process* or *Hoope's Process* in place of *Baeyer's process*.

Suggestions for teachers

- Develop an understanding of the general formula of hydrocarbons. Train students to apply general formula to various component and point out the formation of a homologues series with its special features like successive members differing by CH_2 and so on.
- Write the name or formula of any organic compound using the IUPAC system of nomenclature.
- Give enough practice to students in writing the name of compounds and their structures.
- Clarify electrolysis and its applications in detail with examples. Instruct students to commit to memory the names and formulae of important ores of metals (listed in the syllabus) and the processes for extraction of metals from ores

(ii) Most candidates wrote the correct equation for the formation of aluminum at the cathode during the electrolysis of alumina. However, a few got confused and wrote equations like:

$Al - 3e^- \longrightarrow Al^{3+}$

Or $Al + 3e^- \longrightarrow Al^{3+}$

Or $2Al^{3+} + 6e^- \longrightarrow Al$

- Advise students to ensure that instructions are read carefully.

MARKING SCHEME

Question 5

(a)	(A) Alkyne (B) Triple covalent bond/ triple/≡ / C ≡ C/ CH ≡ CH (C) Ethyne (D) Alkane (E) Single covalent bond/ single / – / C – C (F) Methane
(b)	(i) Bauxite $Al_2O_3.2H_2O$ (ii) Baeyer's Process (iii) $Al^{3+} + 3e \rightarrow Al$

Question 6

(a) A compound **X** (having vinegar like smell) when treated with ethanol in the presence of the acid **Z**, gives a compound **Y** which has a fruity smell. [4]

The reaction is:

$C_2H_5OH + X \xrightarrow{Z} Y + H_2O$

(i) Identify **Y** and **Z**.

(ii) Write the structural formula of **X**.

(iii) Name the above reaction.

(b) Ethane burns in oxygen to form CO_2 and H_2O according to the equation: [4]

$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$.

If 1250 cc of oxygen is burnt with 300 cc of ethane.

Calculate:

(i) the volume of CO_2 formed.

(ii) the volume of unused O_2.

(c) Three solutions P, Q and R have pH value of 3.5, 5.2 and 12.2 respectively. Which one of these is a: [2]

(i) Weak acid?

(ii) Strong alkali?

Comments of Examiners

(a)(i) Many candidates identified compound Y as $C_2H_5COOCH_3$ while some identified it as ester.A few candidates did not mention the strength of the acid.

(ii) Some candidates drew an incorrect structure of compound X.

(iii) Majority of candidates named the reaction correctly. However, a few called it *catalysis* which was not correct.

(b) (i) While majority of candidates answered correctly, a few candidates incorrectly used volume of O_2 to calculate the volume of CO_2. Some copied the volume of ethane incorrectly.

(ii) Many candidates did not calculate the volume of unused O_2.

(c) (i) Some candidates wrote solution P having value of pH 3.5 as that of a weak acid.

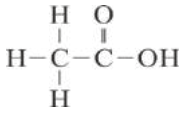
(ii) Most candidates answered correctly.

Suggestions for teachers

- Clarify that the H of acid is replaced by the alkyl group of alcohol and to prevent the backward reaction conc.H_2SO_4 (a strong dehydrating agent) is used to remove the moisture content.
- Train students in naming as well as drawing various kinds of structural formulae.
- Ensure that students know the reaction is called esterification.
- Provide adequate practice to students in numerical problems. Insist on stepwise working.
- Guide students about pH scale to test for acidity, neutrality and alkalinity.

MARKING SCHEME

Question 6

(a)	(i)	Y: Ethyl acetate / Ethyl ethanoate / $CH_3COOC_2H_5$ Z: Concentrated H_2SO_4
	(ii)	
	(iii)	Esterification
(b)	(i)	Volume of CO_2 formed = $\frac{4}{2}$ x 300 = 600 cc
	(ii)	Volume of O_2 used = $\frac{7}{2}$ x 300 = 1050 cc Volume of unused oxygen = 1250 – 1050 = 200 cc

(c)	(i)	Solution Q
	(ii)	Solution R

Question 7

(a) Give a chemical test to distinguish between the following pairs of chemicals: [4]

(i) Lead nitrate solution and Zinc nitrate solution

(ii) Sodium chloride solution and Sodium nitrate solution

(b) Write a balanced equation for the preparation of each of the following salts: [2]

(i) Copper sulphate from Copper carbonate.

(ii) Zinc carbonate from Zinc sulphate.

(c) (i) What is the type of salt formed when the reactants are heated at a suitable temperature for the preparation of Nitric acid? [2]

(ii) State why for the preparation of Nitric acid, the complete apparatus is made up of glass.

(d) Which property of sulphuric acid is shown by the reaction of concentrated sulphuric acid with: [2]

(i) Ethanol?

(ii) Carbon?

Comments of Examiners

(a) (i) Many candidates ignored the solution state of both $Pb(NO_3)_2$ and $Zn(NO_3)_2$ and gave dry heating test for each, which was contrary to the requirement of the question. Some candidates used, the reagent solution NaOH in place of NH_4OH for distinguishing one from the other.

(ii) A few candidates used concentrated H_2SO_4 to distinguish between NaCl and $NaNO_3$ overlooking the fact that both were in solution form and not in solid state.

(b)(i) Instead of reaction with H_2SO_4, a few candidates used Na_2SO_4 solution. Some candidates wrote two equations first using HCl and then using H_2SO_4.

Suggestions for teachers

- Demonstrate chemical tests to distinguish between the pairs of chemicals for better understanding and recall. Simultaneously, explain other technicalities related to use of those chemicals/reagents, etc.
- Guide students to learn the typical reactions of acid in word form also such as

  Carbonate +Acid $\longrightarrow$ Salt +H_2O +CO_2

(ii) Instead of Na_2CO_3 solution or another soluble carbonate solution, a few candidates used H_2CO_3 solution.
Some used two steps to obtain $ZnCO_3$:
- first reaction of $ZnSO_4$ with HCl and
- second reaction of $ZnCl_2$ with Na_2CO_3.

(c)(i) Instead of acid salt, some candidates wrote normal salt.

(ii) Most candidates answered correctly but a few stated that rubber will melt due to heat or cork will break.

(d)(i) Many candidates wrote *drying* instead of *dehydration*.

(ii) Several candidates stated *acidic* property instead of *oxidising* property.

- Discuss most of the reasoning questions (wherever it is possible), with demonstration in the laboratory or in the class through actual observation to develop students' inquisitiveness.
- Explain thoroughly the preparation of nitric acid, equations with conditions, setting up of apparatus, precautions, material suitable for its storage, etc.
- Stress on the essential difference between *drying* and *dehydration* i.e. in the former process only physically combined water/moisture is removed but in dehydration chemically combined H_2O is removed.
- Explain about the behavior of sulphuric acid in its dilute and concentrated forms, and its volatile nature with illustrations.

MARKING SCHEME

Question 7

(a)	(i) By adding ammonium hydroxide in excess. Lead nitrate solution gives a white precipitate while Zinc Nitrate solution gives a colourless solution. (ii) By adding silver nitrate / lead nitrate solution. Sodium chloride gives a white precipitate while sodium nitrate gives no precipitate / colourless solution / remains unchanged. *(alternate correct chemical test)*
(b)	(i) $CuCO_3 + H_2SO_4 \rightarrow CuSO_4 + H_2O + CO_2$ (ii) $ZnSO_4 + Na_2CO_3 \rightarrow ZnCO_3 + Na_2SO_4$ Or $ZnSO_4 + (NH_4)_2CO_3 \rightarrow (NH_4)_2SO_4 + ZnCO_3$
(c)	(i) Acid Salt/ bisulphate/ hydrogen sulphate/ $NaHSO_4$/ $KHSO_4$ (ii) The vapour of nitric acid being highly corrosive/ HNO_3 vapours attack rubber, cork etc./ HNO_3 vapours do not react with glass.
(d)	(i) Dehydrating agent/dehydration (ii) Oxidizing agent/oxidation

Note: For questions having more than one correct answer/solution, alternate correct answers/solutions, apart from those given in the marking scheme, have also been accepted.

GENERAL COMMENTS

Topics found difficult/ confusing by candidates

- Specific tests to identify/distinguish between substances.
- IUPAC names of organic compounds.
- Scientific terms for process/properties.
- Observations of different reactions based on practical chemistry.
- Reasons behind trends in properties across or down the periodic table.
- Ionic equations, especially involving the discharge of ions/formation of ions.
- Selective discharge of ions during electrolysis.
- Definition if lone pair of electrons.
- Scientific reasons for certain observations.

Concepts in which candidates got confused

- Electron affinity and Ionization potential.
- Froth floatation and roasting.
- Method of preparations of salts in the lab.
- Dissociation and Ionization.
- Gases involved in reactions.
- Structural formulae of organic compounds.
- Difference between precipitate and solution.

Suggestions for Candidates

- Read the questions carefully and then answer accordingly what has been asked.
- Avoid selective study.
- Prepare charts to study topics at a glance, such as Industrial processes, comparative study of Homologous series of hydrocarbons, etc.
- Practice numerical problems regularly, solve the numericals stepwise with correct formula and write the answer with correct unit.
- Learn definitions verbatim and highlight key words.
- Learn symbols of elements and their valencies. Practice writing balanced chemical equations with necessary conditions.
- In a chemical equation, write an acid with its strength(dilute/concentration)
- Name organic chemical compounds only using IUPAC nomenclature.
- In laboratory listen to the teacher's instructions carefully, read the experiment thoroughly and then perform it.
- Select only one reagent when distinguishing between substances and state the result with each substance.
- Study the typical reactions of acids as word equations such as
  Metal + Acid ---> Salt + H_2
  OR
  Carbonate + Acid ---> Salt + H_2O + CO_2
- Practice structural formulae of hydrocarbons.
- Solve past years' papers to understand the pattern of the paper.