



ICSE Class 10 Chemistry Question Paper Solution 2019

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) An *electrolyte* which completely dissociates into ions is:
- A. Alcohol
 - B. Carbonic acid
 - C. Sucrose
 - D. Sodium hydroxide
- (ii) The most *electronegative element* from the following elements is:
- A. Magnesium
 - B. Chlorine
 - C. Aluminium
 - D. Sulphur
- (iii) The reason for using *Aluminium* in the alloy duralumin is:
- A. Aluminium is brittle.
 - B. Aluminium gives strength.
 - C. Aluminium brings lightness.
 - D. Aluminium lowers melting point.
- (iv) The *drying agent* used to *dry HCl* gas is:
- A. Conc. H_2SO_4
 - B. ZnO
 - C. Al_2O_3
 - D. CaO
- (v) A hydrocarbon which is a *greenhouse gas* is:
- A. Acetylene
 - B. Ethylene
 - C. Ethane
 - D. Methane

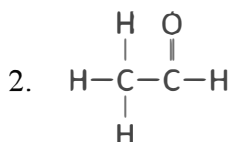
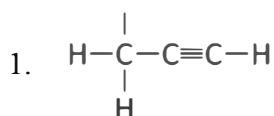


- (b) Fill in the blanks with the choices given in brackets: [5]
- (i) Conversion of *ethanol to ethene* by the action of *concentrated sulphuric acid* is an example of _____. (dehydration / dehydrogenation / dehydrohalogenation)
 - (ii) When *sodium chloride* is heated with *concentrated sulphuric acid below 200°C*, one of the products formed is _____. (sodium hydrogen sulphate / sodium sulphate / chlorine)
 - (iii) *Ammonia* reacts with *excess chlorine* to form _____. (nitrogen / nitrogen trichloride / ammonium chloride)
 - (iv) *Substitution reactions* are characteristic reactions of _____. (alkynes / alkenes / alkanes)
 - (v) In Period 3, the *most metallic* element is _____. (sodium / magnesium / aluminium)
- (c) Write a balanced chemical equation for each of the following reactions: [5]
- (i) Reduction of copper (II) oxide by hydrogen.
 - (ii) Action of dilute sulphuric acid on sodium hydroxide.
 - (iii) Action of dilute sulphuric acid on zinc sulphide.
 - (iv) Ammonium hydroxide is added to ferrous sulphate solution.
 - (v) Chlorine gas is reacted with ethene.
- (d) State one observation for each of the following: [5]
- (i) Concentrated nitric acid is reacted with sulphur.
 - (ii) Ammonia gas is passed over heated copper (II) oxide.
 - (iii) Copper sulphate solution is electrolysed using copper electrodes.
 - (iv) A small piece of zinc is added to dilute hydrochloric acid.
 - (v) Lead nitrate is heated strongly in a test tube.
- (e) (i) Calculate: [5]
1. The number of moles in 12g of oxygen gas. [O = 16]
 2. The weight of 10^{22} atoms of carbon.
[C = 12, Avogadro's No. = 6×10^{23}]



(ii) Molecular formula of a compound is $C_6H_{18}O_3$. Find its empirical formula.

(f) (i) Give the IUPAC name of the following organic compounds: [5]



(ii) What is the special feature of the structure of ethyne?

(iii) Name the saturated hydrocarbon containing two carbon atoms.

(iv) Give the structural formula of Acetic acid.

(g) Give the appropriate term defined by the statements given below: [5]

(i) The formula that represents the simplest ratio of the various elements present in one molecule of the compound.

(ii) The substance that releases hydronium ion as the only positive ion when dissolved in water.

(iii) The tendency of an atom to attract electrons towards itself when combined in a covalent compound.

(iv) The process by which certain ores, specially carbonates, are converted to oxides in the absence of air.

(v) The covalent bond in which the electrons are shared equally between the combining atoms.

(h) Arrange the following according to the instructions given in brackets: [5]

(i) K, Pb, Ca, Zn. (In the increasing order of the reactivity)

(ii) Mg^{2+} , Cu^{2+} , Na^{1+} , H^{1+} (In the order of preferential discharge at the cathode)

(iii) Li, K, Na, H (In the decreasing order of their ionization potential)

(iv) F, B, N, O (In the increasing order of electron affinity)

(v) Ethane, methane, ethene, ethyne. (In the increasing order of the molecular weight) [H = 1, C = 12]

**MARKING SCHEME****Question 1**

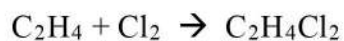
- (a)
- (i) D or Sodium Hydroxide or NaOH
 - (ii) B or Chlorine or Cl₂
 - (iii) C or Aluminium brings lightness
 - (iv) A or Concentrated H₂SO₄
 - (v) D or Methane or CH₄

- (b)
- (i) Dehydration
 - (ii) Sodium hydrogen sulphate or NaHSO₄
 - (iii) Nitrogen trichloride or NCl₃
 - (iv) Alkanes
 - (v) Sodium

- (c)
- (i) $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$
 - (ii) $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$
 - (iii) $\text{ZnS} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2\text{S} \uparrow$
 - (iv) $\text{FeSO}_4 + 2\text{NH}_4\text{OH} \rightarrow (\text{NH}_4)_2\text{SO}_4 + \text{Fe}(\text{OH})_2$
 - (v) $\text{H}_2\text{C} = \text{CH}_2 + \text{Cl}_2 \rightarrow \text{H}_2\text{C} - \text{CH}_2$



Or





(d)	<p>(i) Reddish brown or brown gas of nitrogen dioxide is formed.</p> <p>(ii) The black copper (II) oxide turns into a pink or reddish-brown substance.</p> <p>(iii) The colour of the electrolyte remains blue / anode diminishes in size or becomes thinner / cathode becomes thicker.</p> <p>(iv) Brisk effervescence / A gas given out extinguishes burning splinter and itself burns with pop sound.</p> <p>(v) A decrepitating sound is heard / A reddish brown gas is given out / A yellow residue is left behind.</p>
(e)	<p>(i) 1. Number of moles in 12 g of oxygen gas = $\frac{12}{32} = 0.375$ moles</p> <p>2. Weight of 10^{22} atoms of C = $\frac{12 \times 10^{22}}{6 \times 10^{23}} = 0.2$ g</p> <p>(ii) Its empirical formula is C_2H_6O</p>
(f)	<p>(i) 1. Propyne</p> <p>2. Ethanal</p> <p>(ii) Triple bond between 2 carbon atoms / $H - C \equiv C - H$</p> <p>(iii) Ethane</p> <p>(iv) $\begin{array}{c} H & O \\ & \\ H - C & - C - OH \\ \\ H \end{array}$</p>
(g)	<p>(i) Empirical formula</p> <p>(ii) Acid</p> <p>(iii) Electronegativity</p> <p>(iv) Calcination</p> <p>(v) Non-polar covalent bond</p>
(h)	<p>(i) Pb, Zn, Ca, K</p> <p>(ii) Cu^{2+}, H^{1+}, Mg^{2+}, Na^{1+}</p> <p>(iii) H, Li, Na, K</p> <p>(iv) B, N, O, F</p> <p>(v) Methane, ethyne, ethene, ethane</p>



Comments of Examiners

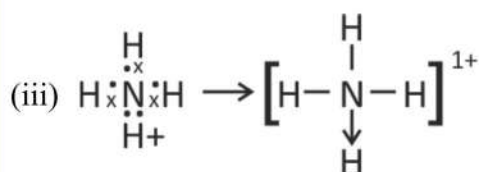
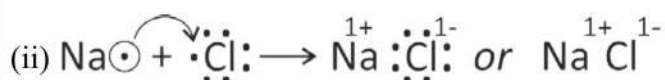
- (a) While a number of candidates drew the electron dot structures asked for correctly, others committed the following errors:
- Candidates drew the orbital structure or showed electron pairs along with the bonds. Some forgot the lone pair of electrons of N.
 - Electrons of sodium were not differently represented from chlorine; transfer of electron and ion formation was not shown. A few candidates drew the orbital diagram instead of the electron dot diagram.
 - Coordinate bond was not shown by some candidates. Overall positive charge was not shown on the ion in a few cases. Some drew the structure of *ammonia* instead of *ammonium*.
- (b) Most candidates answered the pH value related questions correctly. However, some candidates failed to associate the nature of the substance with the correct pH value. Some attached names to the solutions instead of using the symbols A, B and C.
- (c) Some candidates identified the elements instead of using the given letters of alphabets. In a few cases, the position of metals and non-metals was not clear. Despite the clear instructions not to repeat elements some candidates repeated certain elements.

Suggestions for teachers

- Clarify the difference between electron dot and orbital diagram and explain that after bonding, each atom must have an octet structure. Compare dot structure with structural formula for shared pairs. Emphasise that lone pair must not be missed out.
- Ask students to differentiate between electrons of unlike atoms. Lay emphasis on writing the positive charge on the ion.
- Show the association between pH scale and the nature of substances clearly to the students. Explain clearly the properties of acids and alkalis.
- Instruct students to read the questions carefully and answer as per instructions given. Guided practice will assist students in performing better.

MARKING SCHEME

Question 2



(b) (i) C / pH 7

(ii) B / pH 2

(iii) A / pH 12



- (c) (i) B
(ii) A
(iii) E
(iv) F

Question 3

(a) Name the particles present in: [3]

- (i) Strong electrolyte
(ii) Non- electrolyte
(iii) Weak electrolyte

(b) Distinguish between the following pairs of compounds using the reagent given in the bracket. [3]

- (i) Manganese dioxide and copper (II) oxide. (using concentrated HCl)
(ii) Ferrous sulphate solution and ferric sulphate solution. (using sodium hydroxide solution)
(iii) Dilute hydrochloric acid and dilute sulphuric acid. (using lead nitrate solution)

(c) Choose the method of preparation of the following salts, from the methods given in the list: [4]

[List: A. Neutralization B. Precipitation
C. Direct combination D. Substitution]

- (i) Lead chloride
(ii) Iron (II) sulphate
(iii) Sodium nitrate
(iv) Iron (III) chloride



Comments of Examiners

- (a) Majority of the candidates named the particles present in Strong electrolyte, Non-electrolyte and Weak electrolyte correctly. However, some candidates listed examples instead of stating the presence of ions or molecules depending on the type of electrolyte.
- (b) (i) Some of the candidates gave the equation instead of writing the observation to distinguish between the given pairs of compounds. With the reagent given, the result of adding it to one substance was specified by several candidates but not for the other substance.
- (ii) Some candidates interchanged the colours of the two ions, ferrous and ferric.
- (iii) White precipitate was mentioned by several candidates but the effect of heat on both was not mentioned.
- (c) (i) Several candidates incorrectly chose *neutralization* instead of *precipitation*.
- (ii) Some candidates erred by writing *precipitation* instead of *substitution*.
- (iii) This subpart of the question was attempted correctly by most candidates.
- (iv) Most candidates attempted this subpart correctly.

Suggestions for teachers

- Discuss in detail the types of electrolytes on the basis of dissociation /ionization whether complete/partial or no dissociation/ionization.
- Ask students to specify the effect of the reagent on both the substances when a single test is used.
- Supplement theory adequately with practical work, which may be done by the students themselves or through demonstration. Instruct students to record observations.
- Never disregard the importance of practical work.

MARKING SCHEME

Question 3

- | | |
|-----|--|
| (a) | (i) Only ions
(ii) Only molecules
(iii) Both molecules and ions |
| (b) | (i) On adding concentrated hydrochloric acid if a greenish yellow gas is evolved it is Manganese dioxide.
If no gas is evolved it is CuO.
(ii) On adding sodium hydroxide solution if a dirty green precipitate is formed it is ferrous sulphate solution.
If a reddish-brown precipitate is formed, it is Ferric sulphate solution.
(iii) On adding lead nitrate solution, if white precipitate is formed which dissolves on heating, then it is dilute HCl.
If white precipitate formed does not dissolve on heating, it is dilute H ₂ SO ₄ . |
| (c) | (i) B or Precipitation
(ii) D or Substitution
(iii) A or Neutralization
(iv) C or Direct combination |



Question 4

- (a) Complete the following equations: [3]
- (i) $S + \text{conc. HNO}_3 \rightarrow$
 - (ii) $C + \text{conc. H}_2\text{SO}_4 \rightarrow$
 - (iii) $\text{Cu} + \text{dil. HNO}_3 \rightarrow$
- (b) Write a balanced chemical equation for the preparation of: [3]
- (i) Ethene from bromoethane
 - (ii) Ethyne using calcium carbide
 - (iii) Methane from sodium acetate.
- (c) Name the following organic compounds: [4]
- (i) The compound with 3 carbon atoms whose functional group is a carboxyl.
 - (ii) The first homologue whose general formula is C_nH_{2n} .
 - (iii) The compound that reacts with acetic acid to form ethyl ethanoate.
 - (iv) The compound formed by complete chlorination of ethyne



Comments of Examiners

- (a) (i) A large number of candidates made errors in balancing of the equation and/or writing the products. Many candidates wrote SO_2 as a product instead of H_2SO_4 .
- (ii) Although CO_2 was the product, several candidates wrote H_2CO_3 .
- (iii) Many candidates wrote NO_2 as a product instead of NO .
- (b) (i) In writing a balanced chemical equation for the preparation of Ethene from bromoethane, the formula for bromoethane was written as C_2H_6Br in place of C_2H_5Br by some candidates.
Several candidates used chloroethane instead of bromoethane.
- (ii) In writing a balanced chemical equation for the preparation of Ethyne using calcium carbide, some candidates wrote the product as CaO instead of $Ca(OH)_2$.
- (iii) The formula of *sodium acetate* was written incorrectly by some candidates.
- (c) (i) Some candidates incorrectly drew the structural formula when the name of the organic compound was asked.
- (ii) Several candidates gave incorrect answers like, alkene, ethyne or acetylene.
- (iii) For the compound that reacts with acetic acid to form ethyl ethanoate, reactants listed by many candidates were incorrect.
- (iv) Most candidates answered this subpart correctly. However, some candidates wrote incorrect numbering of the C atoms having the chlorine atoms.

Suggestions for teachers

- Give adequate practice in writing of balanced chemical equations with necessary conditions. Use of structural formulae for organic compounds will help students to write equations correctly.
- Ask students to prepare a chart on various homologous series with the first member listed along with other properties.
- Ensure that students know the common names along with the IUPAC names, wherever possible.

MARKING SCHEME

Question 4

- | | |
|-----|--|
| (a) | (i) $S + 6HNO_3 \rightarrow H_2SO_4 + 6NO_2 + 2H_2O$
(ii) $C + 2H_2SO_4 \rightarrow CO_2 + 2SO_2 + 2H_2O$
(iii) $3Cu + 8HNO_3 \rightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$ |
| (b) | (i) $C_2H_5Br + KOH \rightarrow C_2H_4 + KBr + H_2O$
(alc.)
(ii) $CaC_2 + 2H_2O \rightarrow C_2H_2 + Ca(OH)_2$
(iii) $CH_3COONa + NaOH \rightarrow CH_4 + Na_2CO_3$ |
| (c) | (i) Propanoic acid
(ii) Ethene or ethylene
(iii) Ethanol or ethyl alcohol
(iv) 1, 1, 2, 2 – tetra chloro ethane |



Question 5

- (a) Give the chemical formula of: [3]
- Bauxite
 - Cryolite
 - Sodium aluminate
- (b) Answer the following questions based on the extraction of aluminium from alumina by **Hall-Heroult's Process**.: [3]
- What is the function of cryolite used along with alumina as the electrolyte?
 - Why is powdered coke sprinkled on top of the electrolyte?
 - Name the electrode, from which aluminium is collected.
- (c) Match the alloys given in column I to the uses given in column II: [4]

COLUMN I	COLUMN II
(i) Duralumin	A. Electrical fuse
(ii) Solder	B. Surgical instruments
(iii) Brass	C. Aircraft body
(iv) Stainless Steel	D. Decorative articles

Comments of Examiners

- (a) In writing the chemical formula of bauxite, many candidates either wrote incorrect number of water molecules or did not write them at all. In subparts(ii) and (iii), some candidates wrote incorrect formulae.
- (b) Most candidates answered this question correctly.
- (c) Some candidates mismatched Column I and Column II, as they were not sure of the uses of alloys.

Suggestions for teachers

- Give regular practice through class tests, games, quizzes to ensure that students learn the details.
- Teach students metallurgy in detail.
- Frequently revise names of common ores of aluminium, iron and zinc.
- Discuss the questions based on the extraction of aluminium from alumina by Hall-Heroult's process in class.

**MARKING SCHEME****Question 5**

(a)	(i) $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ (ii) Na_3AlF_6 (iii) NaAlO_2
(b)	(i) Cryolite reduces the fusion temperature of the mixture / Cryolite increases the mobility of the ions / increases the conductivity of the electrolyte / Acts as solvent for alumina. (ii) Powdered coke protects the graphite rods of the anode from oxidation by oxygen released at the anode / Powdered coke prevents the loss of heat from the electrolyte. (iii) Cathode
(c)	(i) Duralumin: C or Aircraft body. (ii) Solder: A or Electrical fuse (iii) Brass: D or Decorative articles (iv) Stainless Steel: B or surgical instruments

Question 6

(a) Identify the substances underlined: [3]

- (i) The catalyst used to oxidise ammonia.
- (ii) The organic compound which when solidified, forms an ice like mass.
- (iii) The dilute acid which is an oxidizing agent.

(b) Copper sulphate solution reacts with sodium hydroxide solution to form a precipitate of copper hydroxide according to the equation: [3]



(i) What mass of copper hydroxide is precipitated by using 200 gm of sodium hydroxide?

$$[\text{H} = 1, \text{O} = 16, \text{Na} = 23, \text{S} = 32, \text{Cu} = 64]$$

(ii) What is the colour of the precipitate formed?

(c) Find the **empirical formula** and the **molecular formula** of an organic compound from the data given below: [4]

C = 75.92%, H = 6.32% and N = 17.76%

The vapour density of the compound is 39.5.

$$[\text{C} = 12, \text{H} = 1, \text{N} = 14]$$



Comments of Examiners

- (a) (i) Most candidates identified the catalyst used to oxidise ammonia correctly. However, a few candidates mentioned incorrect catalyst such as Fe/ V₂O₅/CaO.
- (ii) Almost all candidates answered correctly.
- (iii) Many candidates listed HCl or H₂SO₄ as an oxidising agent instead of nitric acid.
- (b) (i) Some candidates used Gay Lussac's law instead of mole concept or calculated the molecular mass incorrectly. Some candidates failed to use the stoichiometric coefficients i.e. **2** in the case of NaOH.
- (ii) Most of the candidates attempted this part well.
Some candidates incorrectly wrote the colour of the precipitate as brown or white.
- (c) Many candidates determined the empirical formula correctly but failed in calculating the value of **n** and hence, erred in the molecular formula.

Suggestions for teachers

- Maintain a comparative chart for the various processes consisting of reactants, catalysts, temperature / pressure condition, equation, etc.
- Teach students the fact that only nitric acid in dilute and concentrated form can act as an oxidizing agent.
- Train students to answer the molar relationship using the coefficients in the equation and compute the answer accurately.
- Instruct students to focus on practical work and the noting of results.
- Insist on stepwise working of numerical problems and give adequate practice.

MARKING SCHEME

Question 6

- | | |
|-----|---|
| (a) | (i) Platinum or Pt.
(ii) Acetic acid or ethanoic acid or CH ₃ COOH
(iii) HNO ₃ or nitric acid. |
| (b) | (i) RMW of NaOH = 40, Cu(OH) ₂ = 98
∴ 2 x 40 g precipitate = 98 g
∴ 200 g precipitate = $\frac{98 \times 200}{80} = 245$ g

(ii) Pale blue |



(c)

Element	% composition	Atomic weight	Relative no. of atoms	Simplest Ratio
C	75.92	12	$75.92/12 = 6.32$	$6.32/1.26 = 5$
H	6.32	1	$6.32/1 = 6.32$	$6.32/1.26 = 5$
N	17.76	14	$17.76/14 = 1.26$	$1.26/1.26 = 1$

Empirical formula is: C_5H_5N

Empirical formula weight = $60+5+14 = 79$

$$n = \frac{\text{molecular weight}}{\text{empirical formula weight}} = \frac{2 \times 39.5}{79} = \frac{79}{79} = 1$$

Molecular formula = C_5H_5N

Question 7

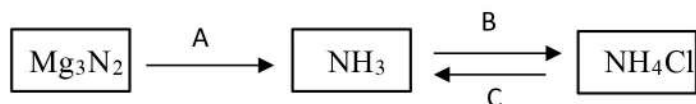
(a) Name the gas evolved in each of the following cases: [3]

(i) Alumina undergoes electrolytic reduction.

(ii) Ethene undergoes hydrogenation reaction.

(iii) Ammonia reacts with heated copper oxide.

(b) Study the flow chart given and give balanced equations to represent the reactions **A**, **B** and **C**: [3]



(c) Copy and complete the following table which refers to the **industrial method for the preparation** of ammonia and sulphuric acid: [4]

Name of the compound	Name of the process	Catalytic equation (with the catalyst)
Ammonia	(i) _____	(ii) _____
Sulphuric acid	(iii) _____	(iv) _____



Comments of Examiners

- (a) (i) Some candidates wrote the name of the gas evolved on electrolytic reduction of alumina as CO_2 instead of O_2 . A few candidates wrote the symbol of nascent oxygen, that was not acceptable.
- (ii) Several candidates wrote H_2 is evolved in the hydrogenation reaction of ethene, which was an incorrect answer.
- (iii) In the reaction of ammonia with heated copper oxide, the gas evolved was incorrectly written as N, NO or NO_2 .
- (b) After studying the given flow chart, many candidates gave correct balanced equations to represent reactions A, B and C. However, in some scripts following errors were noticed:
- For reaction A, MgO was written as the product instead of $Mg(OH)_2$
 - For reaction C, some candidates failed to use an alkali.
- (c) The table referring to the **industrial method for the preparation** of ammonia and sulphuric acid was completed correctly by a number of candidates. Some common errors made by candidates:
- (i) Name of the process was incorrectly written as Ostwald's process/Baeyer's process
- (ii) The catalyst listed was platinum/nickel, etc.
- (iii) Haber's Process was written instead of Contact Process.
- (iv) Incorrect equation was given.

Suggestions for teachers

- Train students to learn the reactions in terms of reactants, products, conditions, equations and observations.
- Give enough practice to students in writing the different types of balanced chemical reactions.
- Explain to students that a metal nitride with warm water gives metal hydroxide and ammonia; an ammonium salt reacts with an alkali and gives NH_3 gas.
- Motivate students to prepare comparative charts, power point presentations or quizzes, etc to study facts.
- Clarify industrial methods for the preparation of ammonia and sulphuric acid thoroughly.
- Give frequent revision tests.

MARKING SCHEME

Question 7

- | | |
|-----|---|
| (a) | (i) Oxygen gas or O_2
(ii) Ethane gas or C_2H_6
(iii) Nitrogen or N_2 |
| (b) | A. $Mg_3N_2 + 6H_2O \rightarrow 3Mg(OH)_2 + 2NH_3$
B. $NH_3 + HCl \rightarrow NH_4Cl$
<i>Or</i>
$8NH_3 + 3Cl_2 \rightarrow 6NH_4Cl + N_2$
C. $NH_4Cl + NaOH \rightarrow NaCl + NH_3 + H_2O$ Or with any other alkali. |
| (c) | (i) Haber's Process
(ii) $N_2 + 3H_2 \xrightarrow{Fe} 2NH_3$
(iii) Contact Process
(iv) $2SO_2 + O_2 \xrightarrow{V_2O_5} 2SO_3$ Or $2SO_2 + O_2 \xrightarrow{Pt} 2SO_3$ |