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ICSE YEAR 2014
CHEMISTRY
(SCIENCE - PAPER 2)

- **SOLUTION OF 2014**
- **COMMENTS OF COUNCIL EXAMINERS**
- **SUGGESTIONS FOR TEACHERS**

Dedicated to all my lovely students. May God help you always.

This small booklet contains solution of 2014 ICSE Chemistry (Science Paper 2). The comments from the council examiners under solution of every question makes this a very handy guide for students to understand what the council expects as answer from the students.

I hope that the students will find this to be useful.

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23rd February, 2015

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CHEMISTRY
SCIENCE Paper - 2

Question 1

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

(i) Ionisation Potential increases over a period from left to right because the:

(A) Atomic radius increases and nuclear charge increases

(B) Atomic radius decreases and nuclear charge decreases

(C) Atomic radius increases and nuclear charge decreases

(D) Atomic radius decreases and nuclear charge increases.

(ii) A compound X consists of only molecules. Hence X will have:

(A) A crystalline hard structure

(B) A low melting point and low boiling point

(C) An ionic bond

(D) A strong force of attraction between its molecules.

(iii) When fused lead bromide is electrolysed we observe:

(A) a silvery grey deposit at anode and a reddish brown deposit at cathode

(B) a silver grey deposit at cathode and a reddish brown deposit at anode

(C) a silver grey deposit at cathode and reddish brown fumes at anode

(D) silver grey fumes at anode and reddish brown fumes at cathode.

(iv) The main ore used for the extraction of iron is:

(A) Haematite

(B) Calamine

(C) Bauxite

(D) Cryolite

(v) Heating an ore in a limited supply of air or in the absence of air at a temperature just below its melting point is known as:

(A) smelting

(B) ore dressing

(C) calcination

(D) bessemerisation

(vi) If an element A belongs to Period 3 and Group II then it will have,

(A) 3 shells and 2 valence electrons

(B) 2 shells and 3 valence electrons

(C) 3 shells and 3 valence electrons

(D) 2 shells and 2 valence electrons

(vii) The molecule containing a triple co-valent bond is:

(A) ammonia

(B) methane

(C) water

(D) nitrogen

(viii) The electrolyte used for electroplating an article with silver is:

(A) silver nitrate solution

(B) silver cyanide solution

(C) sodium argentocyanide solution

(D) nickel sulphate solution

(ix) Aluminium powder is used in thermite welding because,

(A) it is a strong reducing agent

(B) it is a strong oxidising agent

(C) it is corrosion resistant

(D) it is a good conductor of heat.

(x) The I.U.P.A.C. name of acetylene is,

(A) propane

(B) propyne

(C) ethene

(D) ethyne. [10]

(b) Fill in the blanks from the choices given within brackets:

(i) The basicity of Acetic Acid is --------- (3, 1, 4)

(ii) The compound formed when ethanol reacts with sodium is ---------- (sodium ethanoate, sodium ethoxide, sodium propanoate)

(iii) Quicklime is not used to dry HCl gas because--------- (CaO is alkaline, CaO is acidic, CaO is neutral)

(iv) Ammonia gas is collected by ---------- (an upward displacement of air, a downward displacement of water, a downward displacement of air)

(v) Cold, dilute nitric acid reacts with copper to form --------- (Hydrogen, nitrogen dioxide, nitric oxide). [5]

(c) Give one word or phrase for the following:

(i) The ratio of the mass of a certain volume of gas to the mass of an equal volume of hydrogen under the same conditions of temperature and pressure.

(ii) Formation of ions from molecules.

(iii) Electrolytic deposition of a superior metal on a baser metal.

(iv) Hydrocarbons containing a $\overset{O}{\overset{\|}{-C-}}$ functional group.

(v) The amount of energy released when an atom in the gaseous state accepts an electron to form an anion. [5]

(d) Match the options A to E with the statements (i) to (v):

A	alkynes	(i)	No. of molecules in 22.4 dm^3 of carbon dioxide at s.t.p
B	alkane	(ii)	An element with electronic configuration 2,8,8,3
C	iron	(iii)	$C_n H_{2n+2}$
D	6.023×10^{23}	(iv)	$C_n H_{2n-2}$
E	metal	(v)	The metal that forms two types of ions

[5]

(e) Write balanced equations for the following:

(i) Action of heat on a mixture of copper and concentrated nitric acid.

(ii) Action of warm water on magnesium nitride.

(iii) Action of concentrated sulphuric acid on carbon.

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

(v) Preparation of ethane from sodium propionate. [5]

(f) Distinguish between the following pairs of compounds using the test given within brackets:

(i) Iron(II) sulphate and iron(III) sulphate (using ammonium hydroxide)

(ii) A lead salt and a zinc salt (using excess ammonium hydroxide)

(iii) Sodium nitrate and sodium sulphite (using dilute sulphuric acid)

(iv) Dilute sulphuric acid and dilute hydrochloric acid (using barium chloride solution)

(v) Ethane and ethene (using alkaline potassium permanganate solution) [5]

(g) (i) Oxygen oxidises ethyne to carbon dioxide and water as shown by the equation: following equation:

$$2C_2H_2 + 5\ O_2 \rightarrow 4CO_2 + 2H_2O$$

What volume of ethyne gas at s.t.p. is required to produce 8.4 dm^3 of carbon dioxide at s.t.p.? [H = 1, C = 12, O = 16]

(ii) A compound made up of two elements X and Y has an empirical formula X_2Y. If the atomic weight of X is 10 and that of Y is 5 and the compound has a vapour density 25, find its molecular formula. [5]

Examiners' Comments

(a)(i) The two facts responsible for the observed trend in the periodic table were either completely incorrect or one of them was incorrectly represented.

(ii) Most candidates answered this part correctly. A few however selected the property which was associated with ionic bond.

(iii) Candidates made errors in the colours of the products – interchanged them or replaced the word fumes by deposit and vice versa.

(iv) The term referred to was either smelting or bessemerisation.

(b)(i) Majority of candidates wrote the correct option but some recalled it incorrectly as Bauxite

(ii) Some of the candidates had wrongly identified the gas as H_2S instead of SO_2. Perhaps there was confusion between Potassium Sulphite and potassium sulphide.

Suggestions for teachers

- Insist on students reading instructions carefully. Confusion about the colour changes with litmus and acid or alkali indicates insufficient lab experience.
- Certain organic equations need to be taught using structural formulae as this helps in understanding how products are formed
- Ensure students are well versed with the IUPAC and trivial nomenclature of organic compounds.
- Stress on the general equations of acids so as to be able to differentiate between similar sounding compounds.
- Ensure students know the variation in products as concentration of HNO_3 differs and also adequate practice needs to be given in writing correctly balanced equations.

(iii) Perhaps keeping in mind the oxidizing nature of HNO_3 candidates suggested the formation of SO_2 instead of NO_2.

(iv) Many candidates suggested NO_2 instead of O_2.

(v) Some candidates recorded the gas as greenish yellowish gas instead of Chlorine.

(c) (i) Some candidates wrote incomplete observations. If the focus was on colour then the change from blue to white (not colourless as it does not apply to solids) was expected to be mentioned. If the focus was placed on state then crystalline state to amorphous or powder form would have completed the answer.

(ii) Most candidates answered this part correctly. Some identified the gas instead of stating its characteristic smell while others failed to record the smell correctly and called it pungent smelling.

(iii) Many candidates failed to specify the colour or state of the product and instead named the product.

(iv) White precipitate was incorrectly replaced by gelatinous by some, while others failed to record the solubility of the white ppt in NH_4OH.

(v) Some candidates mentioned the ions formed at the electrode instead of naming the products lead and bromine. Some did not match the observation with the electrode correctly or the colour stated of Bromine or Lead was incorrect.

(d) (i) Most candidates answered correctly but some mentioned covalent bond and a marginal number stated electrovalent bond.

(ii) Most candidates answered this part correctly but few made an error of calling it a basic salt.

(iii) Although a majority of candidates answered this part correctly, a few addressed it as Replacement reaction or addition reaction while some others referred to it as dehydrohalogenation.

(iv) The term water of crystallization was incorrectly referred to as hydrated crystals.

Suggestions for teachers

- Ensure students have clarity regarding the different terms by supplying variety of compounds and asking students to classify them into those that show the properties and those that do not.
- Train students to state the result of the test, with both substances, besides mentioning the choice of reagent. Students need to be given adequate practice in distinguishing substances and teachers could assist students by enumerating the results in a tabular form.
- Written practice in differentiating substances must be given from time to time. Students should be trained to respond correctly to the instructions given.
- Adequate practical work would take care of these type of questions.
- Emphasize on certain key words when carrying out the practical work or during explanations.
- Students need to remember the 1st 20 elements.
- Ensure students understand the concept of bonding with relevant examples.
- Develop an understanding of the types of electrolytes by incorporating a large number of examples.
- Ensure students have knowledge of the existence of various types of oxides and know the criteria to classify them.
- Enumerate these reactions in a tabular form with the associated properties after explaining the various roles of sulphuric acid.

- Regular objective tests will help in remembering better.
- Comparative study of the properties of ionic and covalent compounds essential.
- Drill work needed on the main constituents of alloys and the change in properties brought about by alloying.

(v) Some candidates incorrectly answered as efflorescent or hygroscopic.

(e) (i) Common error that was repeated among all the sub parts was that even if the reagent was correctly chosen the result with both the substances under consideration was not specified.
The reagent, conc. H_2SO_4, was incorrectly chosen by many candidates.
The solution state of NaCl and $NaNO_3$.

Suggestions for teachers
- Students must be clear about the basic concepts so that understanding relation between mole, molar mass and molar volume is possible.
- Students must be given adequate practice in application of Avogadro's law after explaining it and pointing out the variations from Gay Lussacs law

(ii) Many candidates differentiated on the basis of smell and did not fulfil the requirement of chemical test. Some suggested blue litmus turning red for HCl and the other way round for H_2S. Few of the candidates did not use the same reagent for both gases.

(iii) Many candidates brought out the difference on the basis of bonds present i.e double bond and single bonds and did not give a chemical test to distinguish. Some other candidates specified the kind of reactions shown by both i.e addition and substitution reactions respectively or the type of compounds as being unsaturated and saturated.

(iv) Candidates used NaOH as the distinguishing reagent and stated the colour of the ppt with each solution but failed to specify the solubilities of the ppt in the reagent.
Many candidates were not aware that $Ca(NO_3)_2$ solution does not form ppt with NH_4OH.

(v) Many candidates did not associate the word solution / paper / acidified with $K_2Cr_2O_7$ or $KMnO_4$.
Some others used lime water test which was answered by both gases

(f) (i) Chlorine and lithium were the occasional wrong answers.

(ii) Most attempted correctly. Few candidates chose Ammonia as the correct options.

(iii) Most candidates answered correctly.

(iv) Some of the candidates wrote acetic acid.

(v) Most of the candidates answered correctly.

(vi) Oxide chosen at random.

(vii) Some incorrectly answered this part as dehydrating agent.

(viii) Generally correctly answered. Few candidates incorrectly answered as Ammonium nitrate.

(ix) Most candidates answered this part correctly. Occasional errors showed a lack of understanding of the properties of ionic compounds.

(x) There was confusion between the components of brass and bronze.

(g) (i) Candidates failed to calculate the gram molecular weight correctly

(ii) Knowledge of gram molecular volume was missing.

(iii) Most candidates answered this part correctly. Some suggested 6.023×10^{23} molecules of N2 or multiplied X by 6.023×10^{23} molecules.

MARKING SCHEME
Question 1

a) i) D
ii) B
iii) C
iv) A
v) C
vi) A
vii) D
viii) C
ix) A
x) D

b) i) 1
ii) Sodium ethoxide
iii) CaO is alkaline
iv) downward displacement of air
v) nitric oxide

c) i) Vapour density
ii) ionization
iii) electroplating
iv) ketones
v) electron affinity

d) i) A (iv) $C_n 2_{n-2}$
ii) B (iii) $C_n 2_{n+2}$
iii) C (v) The metal that forms two types of ions
iv) D(i) Number of molecules in 22.4 dm^3 of carbon dioxide at s.t.p.
v) E (ii) An element with electronic configuration 2, 8, 8, 3

e) i) $Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$
ii) $Mg_3N_2 + 6H_2O \rightarrow 3Mg(OH)_2 + 2NH_3$
iii) $C + 2H_2SO_4 \rightarrow CO_2 + 2H_2O + 2SO_2$
iv) $Na_2S + 2HCl \rightarrow 2NaCl + H_2S$
v) $H_3C\text{-}CH_2.COONa + NaOH \rightarrow C_2H_6 + Na_2CO_3$

f) i) Add ammonium hydroxide in excess to solutions of Iron(II)sulphate and iron(III) su;phate. Iron(II)sulphate will form an insoluble dirty green ppt while Iron(III)sulphate will form an insoluble reddish brown ppt.
ii) Add Ammonium Hyroxide in excess to solutions of a lead salt and a zinc salt. The lead salt will form insoluble chalky white ppt while the zinc salt will form a gelatinous white ppt which dissolves in excess to form a colourless solution.
iii) Add dilute Sulphuric acid separately to sodium nitrate and sodium sulphite. The sodium sulphite will form a colourless gas with a suffocating odour that turns pink acidified potassium permanganate colourless or turns acidified potassium dichromate solution from orange to green. No effect on sodium nitrate.
iv) Add barium chloride solution to dilute sulphuric acid and to dilute nitric acid. A white

ppt is formed in dilute sulphuric acid and no such ppt is formed in dilute nitric acid.

v) Add alkaline potassium permanganate solution to test tubes containing ethane and ethene. In ethane the purple colour of the permanganate is retained but in ethene the purple colour is decolourised or it turns green. (In all the cases both the reactions should be given.)

g) i) $2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O$
4x22.4 dm3of CO_2 is formed from 2x22.4 dm3 of ethyne
So 8.4 dm3 of CO_2 is formed from (2x22.4x8.4) / (4x22.4)
Volume of ethyne= 4.2dm3

ii) Empirical Formula is X2Y
Empirical formula weight = 10x2+5=25
Molecular weight=2VD=2x25=50
n=50/25=2
Molecular formula is X4Y2

Question 2

(a) State your observation in each of the following cases:

(i) When dilute hydrochloric acid is added to sodium carbonate crystals.

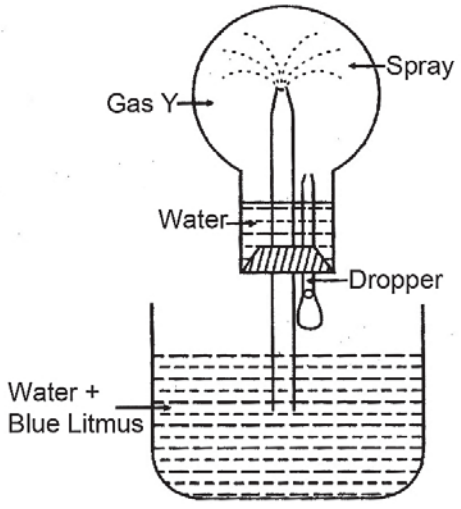
(ii) When excess sodium hydroxide is added to calcium nitrate solution.

(iii) At the cathode when acidified aqueous copper sulphate solution is electrolyzed with copper electrodes.

(v) When calcium hydroxide is heated with ammonium chloride crystals.

(v) When moist starch iodide paper is introduced into chlorine gas. [5]

(b) Study the figure given below and answer the questions that follow:



(i) Identify the gas Y.

(ii) What property of gas Y does this experiment demonstrate?

(iii) Name another gas which has the same property and can be demonstrated through this experiment. [3]

(c) (i) Name the other ion formed when ammonia dissolves in water.

(ii) Give one test that can be used to detect the presence of the ion produced. [2]

Examiners' Comments

(a)(i) Candidates focused on identifying the products instead of stating the observation of a colourless gas, turning lime water milky, being evolved.

(ii) Candidates failed to mention the colour of the precipitate or the formation of ppt itself and its solubility.

(iii) Most candidates answered correctly. However some of the varied incorrect responses were
- Cathode diminishes in size.
- Blue colour fades at cathode.
- Red deposit of copper at the cathode or simply, copper is deposited at the cathode.

(iv) The products such as calcium chloride and ammonia were listed instead of incorporating the smell of ammonia or any test of ammonia

(v) Although many candidates recorded the observation correctly some wrote that the paper gets bleached or turns black.

(b)(i) Most candidates answered this part correctly, barring a few who named the gas erroneously as hydrochloric acid instead of hydrogen chloride gas.

(ii) Candidates lost marks for not mentioning the high / extreme solubility of the gas in water. Some mentioned the nature of the gas which did not match with the question that followed.

(iii) Almost all candidates answered this part correctly.

(c)(i) Many candidates wrote H_3O^+ or NH_4^+

(ii) Incorrect answers written by many candidates.

Suggestions for teachers

- Draw the attention of students to the fact that when observations are asked merely identifying the product is not sufficient.
- Tabulated results of observations during practicals may be put up on charts for students to be able to recall during examination.
- Insist on students answering observations based questions in regular tests.
- Highlight the colour of freshly deposited copper as reddish brown or pink.
- Enumerate the various changes occurring at both electrodes during such an electrolysis instead of focusing on any one observation.
- Emphasize on mentioning the tests for colourless gases or specifying the characteristic odours of gases.
- Ensure students get to see such observations or colour changes.
- Ensure students learn to identify and name compounds correctly.
- Train students to read the questions carefully and not rush into answering them.
- Ensure students understand the reason for the formation of fountain.
- Solubility of ammonia in water and its subsequent ionization must be explained clearly.
- Means of detecting the ions formed on ionization must be explained to students.

MARKING SCHEME

Question-2

a) i) Brisk effervescence of a gas which turns lime water milky.
ii) A chalky white ppt insoluble in excess sodium hydroxide.
iii) Reddish brown deposit.
iv) Gas with a pungent odour evolved.
v) The paper turns blue black.

b) i) HCl or Hydrogen Chloride
ii) very high solubility of HCl in water
iii) ammonia
iv) Hydroxyl ion.
v) Add copper sulphate solution – pale blue ppt formed *or* ferrous sulphate solution – dirty green ppt formed. Any such test for OH^- .

Question 3

(a) State the conditions required for the following reactions to take place:

(i) Catalytic hydrogenation of ethyne.

(ii) Preparation of ethyne from ethylene dibromide.

(iii) Catalytic oxidation of ammonia to nitric oxide.

(iv) Any two conditions for the conversion of sulphur dioxide to sulphur trioxide. [5]

(b) State the main components of the following alloys:

(i) Brass.

(ii) Duralumin.

(iii) Bronze. [3]

(c) Give balanced equations for the following:

(i) Laboratory preparation of nitric acid.

(ii) Preparation of ethanol from monochloroethane and aq. sodium hydroxide. [2]

Examiners' Comments

(a) (i) Most of the answers were correct. However some candidates wrote the wrong example of catalyst (Fe) or incorrect temperature

(ii) Candidates failed to see the difference between the effect of alcoholic KOH and aqueous KOH.

(iii) Catalyst incorrectly mentioned as Fe or Mo or temperature at 250º / 450ºC.

(iv) Most candidates listed the correct conditions. Some of the errors were:

Temp : 700 – 900ºC
Pressure : 200 atm
Catalyst : Fe

(b) Instead of the main components, all the metals that form the alloys were written by a large number of candidates. Others wrote incorrect combinations. Probably many resorted to guess work.

(c) (i) Candidates referred to the reaction at temperatures higher than 200ºC and hence lost marks.

(ii) Many candidates inadvertently used KOH instead of NaOH while some others did not know the correct formula of monochloro ethane.

Suggestions for teachers

- Bring out the conditions for a particular reaction and point out their importance
- Teach the reaction using structural formulae and thereby showing the mechanism involved.
- Bring out the differences in the products formed by comparing reactions with both reagents, stressing on the fact that one is an elimination reaction while the other is a substitution reaction.
- Tabulated comparative study of industrial preparation of gases with the relevant conditions and equations would be useful in recalling them. Regular testing of such knowledge based questions essential.
- Focus on the single main component and the next significant component.
- Quizzing in class would make learning a little more interesting.
- Point out the reaction used to prepare HNO_3 and explain why the reaction at high temperature is **not used**.
- Equation in organic when depicted with structural formula becomes easy to understand and remember.

MARKING SCHEME
Question - 3

a) i) Catalyst Ni(1/2), temperature 300°C (1/2)
ii) Alcoholic KOH or NaOH
iii) catalyst Pt (1/2), temperature(700-800)°C (1/2)
iv) catalyst V2O5, temperature(450-500)°C, pressure (1-2)atms. (any 2)

b) i) copper, zinc
ii) aluminium, copper
iii) copper, tin

c) i) $KNO_3 + H_2SO_4(conc) \rightarrow KHSO_4 + HNO_3$ or with $NaNO_3$
ii) $C_2H_5Cl + NaOH \rightarrow C_2H_5OH + NaCl$

Question 4

(a) Give the structural formula of the following;

(i) ethanol.

(ii) 1-propanal

(iii) ethanoic acid

(iv) 1, 2, dichloroethane. [4]

(b) Draw the structure of the stable positive ion formed when an acid dissolves in water. [2]

(c) State the inference drawn from the following observations:

(i) On carrying out the flame test with a salt P a brick red flame was obtained. What is the cation in P?

(ii) A gas Q turns moist lead acetate paper silvery black. Identify the gas Q.

(iii) pH of liquid R is 10. What kind of substance is R.

(iv) Salt S is prepared by reacting dilute sulphuric acid with copper oxide. Identify S. [4]

Examiners' Comments

(a) (i) Most candidates drew the correct structure. A Few candidates lost marks for writing the condensed formula.
$CH_3–CH_2–OH$ and some candidates lost mark showing a double bond between C and O.

```
    H   O
    I   II
H – C – C – H
    I   I
    H   H
```

(ii) Erratic structures such as

```
    H   H   H   O
    I   I   I   II
H – C – C – C – C - H
    I   I   I
    H   H   H
```

OR

```
    H   H   H
    I   I   I
H – C – C – C – OH
    I   I   I
    H   H   H
```

were drawn by some candidates.

Suggestions for teachers

- Repetitive practice in naming of organic compounds and drawing the structures need to be given.
- Students need to be clear about the differences in the functional group especially aldehydic and alcoholic groups.
- Stress on the fact that the carbon atom belonging to aldehydic or alcoholic or carboxylic acid group is a part of the chain when numbering them.

(iii) Many candidates lost marks for not showing a double bond between C and O or for showing 3 carbon atoms in the chain or for not linking the carbon with O of OH.

(iv) Some candidates had placed 4 chlorine atoms instead of 2 chlorine atoms.

(b) Few candidates represented the structures of ammonium ion instead of hydronium ion.
Those who lost marks in the structure of H_3O+ ion had failed to show the coordinate bond or the +ve sign on the ion or the lone pair of electrons on oxygen.

(c) (i) Either the cation was wrong or the charge on the ion was missing.

(ii) Although majority of the candidates identified the gas correctly, a few of them wrote SO_2 or HCl.

(iii) Some candidates wrote base instead of alkaline

(iv) Most candidates answered correctly.

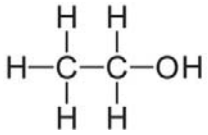
Suggestions for teachers

- Insist on students differentiating between coordinate bond and covalent bond with an arrow pointing away from the electronegative atom such as oxygen although once formed this bond is undistinguishable from covalent bond.
- Familiarize students with flame tests of appropriate cations.
- Relevance of specific words like alkali and alkaline have to be pointed out.

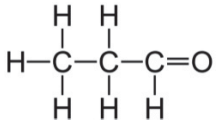
MARKING SCHEME
Question-4

a)

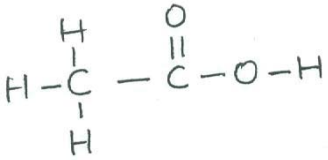
i)



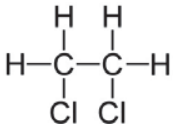
ii)



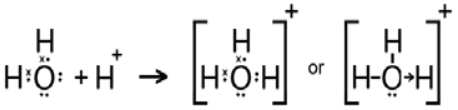
iii)



iv)



b)



c) i) Ca^{2+}
ii) H_2S
iii) alkaline
(iv) $CuSO_4$

Question 5

(a) Name the following:

(i) The property possessed by metals by which they can be beaten into sheets.

(ii) A compound added to lower the fusion temperature of electrolytic bath in the extraction of aluminium.

(iii) The ore of zinc containing its sulphide. [3]

(i) Give one equation each to show the following properties of sulphuric acid:

(i) Dehydrating property.

(ii) Acidic nature.

(iii) As a non-volatile acid. [3]

(j) Give balanced chemical equations to prepare the following salts:

(i) Lead sulphate from lead carbonate.

(ii) Sodium sulphate using dilute sulphuric acid.

(iii) Copper chloride using copper carbonate. [4]

Examiners' Comments

(a) (i) Ductility was the occasional incorrect answer.
(ii) Most candidates answered this part correctly with a few of them listing fluorspar as the substance responsible for the lowering of the fusion temperature.
(iii) Some candidates either wrote the chemical formula or its chemical name or the wrong name of the ore.
(b) (i) Some candidates failed to write the product water.
(ii) Most candidates wrote the correct answer.
(iii) Majority of candidates answered correctly but some failed to balance the equation.
(c) (i) Some candidates made the mistake of giving the reaction of lead carbonate directly with the acid. Insoluble salts of lead cannot be prepared directly in 1 step.

Suggestions for teachers

- Show different shapes formed from metallic sheets i.e a duct, sheet etc.
- In metallurgy, students are expected to know the role of each substance added, so regular testing on these aspects would help.
- Insist on students learning both the common names of ores as well as their chemical formulae.
- Ensure students write equations correctly and balance them and incorporate the conditions necessary.
- While discussing the preparation of salts, point out the reasons why certain salts like those of lead cannot be prepared directly in 1 step.
- Students need to be explained why certain reactions occur. While certain others do not.
- Solubility of salts is something that students **must** know.

(ii) Most candidates correctly answered the question. Only a few errors were made in balancing.
(iii) The most often occurring error was reaction of $CuCO_3$ with NaCl solution. Some candidates chose the correct reagent dil HCl but listed the product as H_2CO_3 instead of $H_2O + CO_2$.

MARKING SCHEME
Question - 5

a) Malleability
Cryolote or $Na_3 Al F_6$
Zinc blende

b) i) $CuSO_4.5H_2O \xrightarrow[H_2SO_4]{conc.} CuSO_4 + 5\ H_2O$
or $C_{12} H_{22} O_{11} \xrightarrow[H_2SO_4]{conc.} 12C + 11\ H_2O$
ii) Reaction with oxide / hydroxide / carbonate / sulphite/ sulphide with dil H_2SO_4
iii) $NaNO_3$ + conc. $H_2SO_4 \rightarrow NaHSO_4 + HNO_3$
or NaCl + conc.$H_2SO_4 \rightarrow NaHSO_4 + HCl$

c) i) $PbCO_3 + 2HNO_3 \rightarrow Pb(NO_3)_2 + H_2O + CO_2$
$Pb(NO_3)_2 + Na_2SO_4 \rightarrow 2NaNO_3 + PbSO_4$
ii) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$
iii) $CuCO_3 + 2HCl \rightarrow CuCl_2 + H_2O + CO_2$

Question 6

(a) (i) State Avogadro's Law.

(ii) A cylinder contains 68g of ammonia gas at s.t.p.

(1) What is the volume occupied by this gas?

(2) How many moles of ammonia are present in the cylinder?

(3) How many molecules of ammonia are present in the cylinder?

[N-14, H-1] [4]

(b) (i) Why do covalent compounds exist as gases, liquids or soft solids?

(ii) Which electrode: anode or cathode is the oxidising electrode? Why? [3]

(c) Name the kind of particles present in:

(i) Sodium Hydroxide solution.

(ii) Carbonic acid.

(iii) Sugar solution. [3]

Examiners' Comments

(a) (i) Following errors were committed:
1. Gay Lussac's Law was written instead of Avoqadro's Law.
2. Some related equal volumes to equal number of moles or particles.
3. Constancy of temperature, pressure conditions not mentioned or stp conditions applied.

(ii) The molecular mass was wrongly calculated as 18 by some and hence volume calculation went wrong. The common error in many paper was interchanging of the values of moles and molecules.

(b)(i) Most candidates failed to mention key words and wrote about weak electrostatic force between the molecules instead.

(ii) Although many candidates enlisted anode as the electrode, the reason for it being an oxidizing electrode was not appropriate.

(c) (i) NaOH being a strong electrolyte, candidates made an error of referring to presence of ions and molecules.

(ii) Candidates were highly confused and listed all kinds of odd particles.

(iii) A majority of candidates answered this part correctly.

Suggestions for teachers

- Definition must be learnt verbatim
- The 2 gas laws may not be taught in isolation.
- It would help if students are asked to bring out the similarities and differences between the 2 laws to ensure greater clarity.
- Ensure students understand the concept of mole, molar mass and molar volume clearly and that mole is not confused with molecules.
- Explain the essential differences between the properties of covalent and ionic compounds and the reasons responsible for the properties.
- Concept of redox forms as essential part of electrolysis and hence its importance cannot be ignored.
- Ensure students are able to distinguish between strong and weak electrolytes on the basis of the kind of particles and the reasons behind it.

MARKING SCHEME
Question-6

a) i) Equal volumes of all gases contain the same no. of molecules provided the temperature and pressure of the gases are the same.

ii) Gram Molecular Mass of ammonia = 17g

1) 17g of NH_3 at s.t.p occupies a volume of $22.4dm^3$
So 68g of NH_3 at s.t.p. occupies a volume of $(22.4\times68)/17$
or $22.4x4\ dm^3$
or $89.6\ dm^3$

2) No. of moles present = 4

3) No. of molecules present = $4\times6.023\times1023$
or $4\times6\times1023$

b) i) The molecules are held together by the weak Van der Waal's forces.
As this force of attraction is weak they are gases, liquids or soft solids.
ii) Anode - It takes up the electrons from the anions

c) A. NaOH only ions
B. Carbonic acid ions and molecules
C. Sugar solution only molecules

Question 7

(a) An element Z has atomic number 16. Answer the following questions on Z:

(i) State the period and group to which Z belongs.

(ii) Is Z a metal or a non-metal?

(iii) State the formula between Z and Hydrogen.

(iv) What kind of a compound is this? [5]

(b) M is a metal above hydrogen in the activity series and its oxide has the formula M_2O. This oxide when dissolved in water forms the corresponding hydroxide which is a good conductor of electricity. In the above context answer the following:

(i) What kind of combination exists between M and O?

(ii) How many electrons are there in the outermost shell of M?

(iii) Name the group to which M belongs.

(iv) State the reaction taking place at the cathode.

(v) Name the product at the anode. [5]

Examiners' Comments

(a) (i) Most candidates stated the correct period but referred to the group as 6 or 6A.
(ii) Majority of candidates answered this part correctly.
(iii) Error in formula by writing H_2
(iv) Most candidates answered this part correctly.

(b) (i) A few candidates made the mistake of writing covalent bond.
(ii) Some candidates predicted the number of e's to be 2.
(iii) The name of the group was given incorrectly by a number of candidates as Group II.
(iv) Many wrote incorrectly as $M^+ + e^- \longrightarrow M$.
(v) Some candidates wrote H_2 gas instead of O_2 gas or left the product as nascent oxygen.

Suggestions for teachers

- Focus the students' attention to two facts right at the beginning.
- Relation between number of shells and period number.
- Relation between number of valence electrons and the group in which the element falls.
- Train students to judge an element whether electropositive / electronegative on the basis of valence electrons and ensure electropositive element is listed first.
- Students must be taught identifying the valency from the formula.
- Acquaint students with the rules for selective discharge of ions.

MARKING SCHEME

Question-7

a) electronic configuration: 2,8,6
   i) Z belongs to Period 3 and Group 16 0r VIA
   ii) Z is a non metal
   iii) H_2Z
   iv) Covalent Compound

b) i) electrovalent combination
   ii) one
   iii) Group I or IA or alkali metal
   iv) $H^+ + e^- \rightarrow H / H + H \rightarrow H_2$ or $2H^+ + 2e^- \rightarrow H_2$
   v) Oxygen / O_2

Topics/Concepts that candidates found difficult and/or confusing:

- Observations based on practical chemistry.
- Differentiating between compounds using test given.
- Methods of preparation of salts.
- Certain terms in Periodic Table and the causes for the trends in properties across a period and down the group.
- Confusion between period/group – and determination of period / group from the atomic number.
- Bonding – single covalent bonds and triple bond.
- Properties of Ionic and covalent compounds.
- Structure of hydronium ion.
- Applications of electrolysis.
- Oxidation / Reduction applied to electrolysis / electrodes.
- Reactions at cathode and anode.
- Metallurgy – Thermite welding, ores and main components of alloys.
- Conditions of Industrial processes.
- IUPAC and trivial naming of organic compounds.
- Structural formulae and functional groups.
- Calculation of moles and molecules, application of mole concept
- Writing of formula, given the atomic number of an element.
- Conditions for various reactions involving organic compounds and Inorganic compounds

Suggestions for candidates:

- Ensure every equation written is balanced.
- Read questions carefully and practice application based questions.
- Focus on the colours of precipitates and their solubilities in reagents such as NaOH, NH_4OH.
- Solubilities of salts require special attention to understand the methods of preparation of salts.
- Develop stepwise working habit for numericals and try to solve as many varieties of numericals as possible.
- Learn the laws, principles and definitions verbatim.
- Learn the tests for identifying the cations and anions and the related observations.
- Read the rules of IUPAC nomenclature and practice drawing the structures of organic compounds.
- Tabulate Industrial preparations and make a comparative study of the details.
- Study alloys in a tabulated form highlighting the main component and the other metals.
- Remember the rules for selective discharge of ions and learn to apply them.
- Various terms in metallurgy need to be understood and atleast 2 ores of each of the metal Fe, Zn and Al must be known.
- Learn the mechanism of the various reactions in Organic chemistry using structural formulae.
- Ensure all aspects of the syllabus are covered and avoid selective study.
- Practice solving previous year Question Papers .