CHEMISTRY III 2005

SECTION A

ANSWER 001

(a) X: 2,8,3

(b) Group 3

(c) Ionic / electrovalent

(d) X_2Y_3

ANSWER 002

(a) Sulphorous acid

(b) $SO_2 + H_2O \rightarrow H_2SO_3$

(c) Nitrogen dioxide

(d) Nitric acid / Nitrous acid

ANSWER 003

(a) (i) Hydrated copper II sulphate

(ii) Copper II nitrate

(iii) Ammonium chloride

b) (i) Hydrated copper II sulphate and barium chloride

(ii) $Ba^{2+}_{(aq)} + SO_4^{2-}((aq) \rightarrow BaSO_{4(s)}$ (white precipitate)

ANSWER 004

(a) Copper II Sulphate

(c) M→ + (positive)

(d) $Ag^{+}_{(aq)} + e \rightarrow Ag_{(s)}$

ANSWER 005

(a) Aluminium ion (Al^{3+}) .

(b) Chloride ion (Cl^-) .

(c) AgCl .

(d) Amphoteric .

ANSWER 006

(a) Number of moles = $\frac{mass}{Rmm} = \frac{0.32}{64} = 0.005$.

(b) 1st find the mass of oxygen = 0.40 – 0.32 = 0.08

Number of moles of oxygen $\frac{0.08}{16} = 0.005$

(c)

Cu	O
$\frac{0.005}{0.005}$	$\frac{0.005}{0.005}$
1	1

Ratio of Cu: 0 = 1:1

ANSWER 007

(i) It reacts with it .

(ii) Pass ammonia through a gas jar of HCl, white fumes are observed

i.e $NH_3 + HCl \rightarrow NH_4Cl$.

(iii) Ammonia gas is very soluble in water .

ANSWER 008

First Rmm of $CuSO_4 . 5H_2O$

→ 64 + 32 +16 x 4 + 5 (1 x2+16)

64 + 64 + 32 +90 = 250

% oxygen = 64+80 = $\frac{144x100}{250}$ = 57.6%

ANSWER 009

a) Isotopes are atoms of the same element with same atomic number but different mass numbers.

b) Allotropes are different forms in which an element can exist .

ANSWER 010

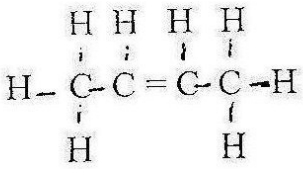
a) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

b) *It causes soil erosion

* It may global warming .

ANSWER 011

(a)



b) Pentane

ANSWER 012

C	H	O
$\frac{40}{12}$	$\frac{6.7}{1}$	$\frac{53.3}{16}$
$\frac{3.33}{3.33}$	$\frac{6.7}{3.33}$	$\frac{3.33}{3.33}$
1	2	1

Empirical formula is CH_2O

b) M.F $(CH_2O)n = 90$

$(12+1x2+16)n = 90$

$30n = 90$

$n = \frac{90}{30} = 3$

M.F = $(CH_2O)_3 = C_3H_6O_3$

ANSWER 013

(a)A= $Fe(NO_3)_2 + 2Ag$

b) B= $FeCl_2 + H_2$

(c) $C \rightarrow FeCL_3$

SECTION B

ANSWER 014

(a) Number of moles of HCl = $\frac{2 \times 20}{1000} = \frac{4}{100} = 0.04$

(b) From the above equation :

2 moles of HCl react with 1 mole of CO_3^{2-}

1 mole of HCl reacts with $\frac{1}{2}$ moles of CO_3^{2-}

But Number of moles = $\frac{Molavity \times volume}{1000}$

$$0.02 = \frac{Mb \times 25}{1000}$$

$$Mb = \frac{0.02 \times 100}{25} = 0.8M$$

(c) Concentration in g/dm^3

= molarity x Rmm

Rmm of Na_2CO_3 = 23 x 2 +12 +16 x3

46 + 12 + 48 = 106

Concentration in $g/dm^3 = 0.8 \times 106 = 84.8 g/dm^3$

d) Evaporate the mixture to dryness .

ANSWER 015

(a) Reversible reaction .

(b) (i) It increases.

(ii) It decreases.

(c) (ii) Temperature : 450°C – 500°C.

Pressure:

(iii) SO_3 is first dissolved in concentrated sulphuric acid

i.e. $SO_3 + H_2SO_4 \rightarrow 2H_2SO_4$

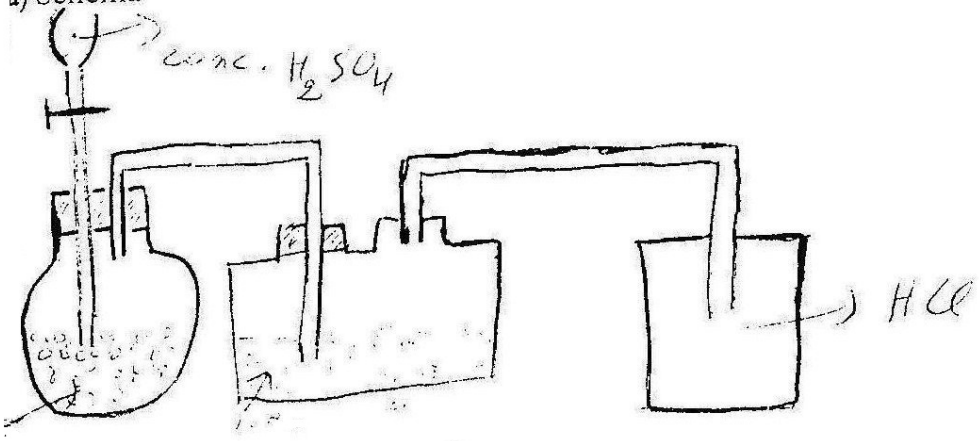
d) Two uses of H_2SO_4

-It is used in the manufacture of fertilizers.

-Used in the manufacture of soaps and detergents.

ANSWER 016

a) Schema

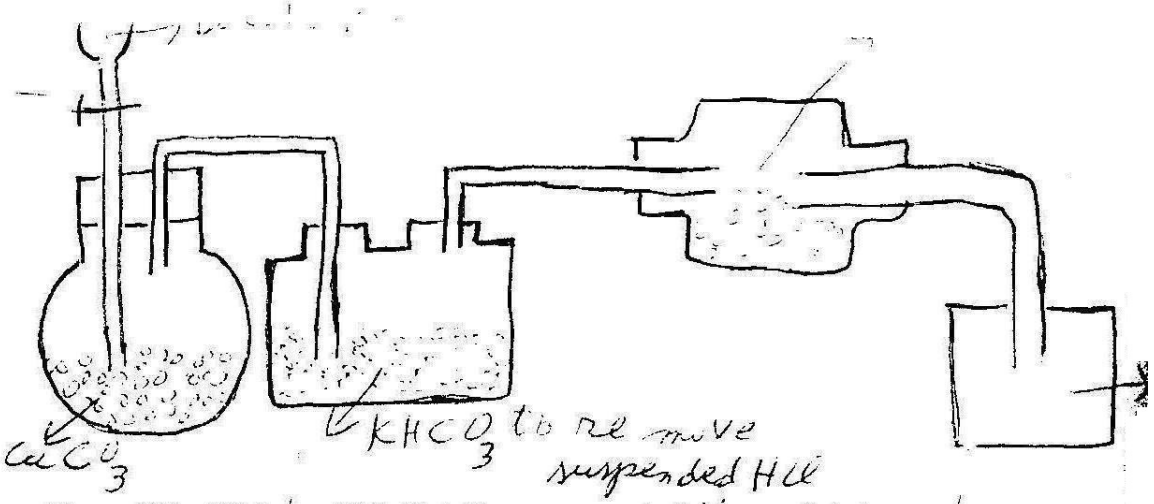


b) (i) $HCl + NH_3 \rightarrow NH_4Cl$

(ii) $Fe + 2HCl \rightarrow FeCl_2 + H_2$

ANSWER 017

a) Schema



b) $CO_2 + 2Mg \rightarrow 2MgO + C$

$CO_2 + C \rightarrow 2CO$

c) When CO_2 accumulates in the atmosphere; it forms a blanket preventing the penetration of reflected radiations hence causing global warming.

ANSWER 018

(a) Platinum –Rhodium gauze

(b) Neutralization

(c) Oxidation : Reason: H_2 has been removed from H_2O

(d) A compound of any metal above copper in the reactivity series

(e) NH_4NO_3

(f) Rmm of NH_4N0_3 = 14 + 1 x4 +14 +16 x3

28 + 4 +48 = 80

$$\% \text{ of nitrogen} = \frac{28}{80} \times 100 = 35\%$$

h) May cause water pollution or land pollution .

SECTION C

ANSWER 019

(a) H = Ca

I = water

J = H_2

L = $Ca(OH)_{2(s)}$

M : $Ca(OH)_{2\,(aq)}$

O : CaO

P = $CaCO_3$

Q = $Ca(OH)_2$

b) (i) $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

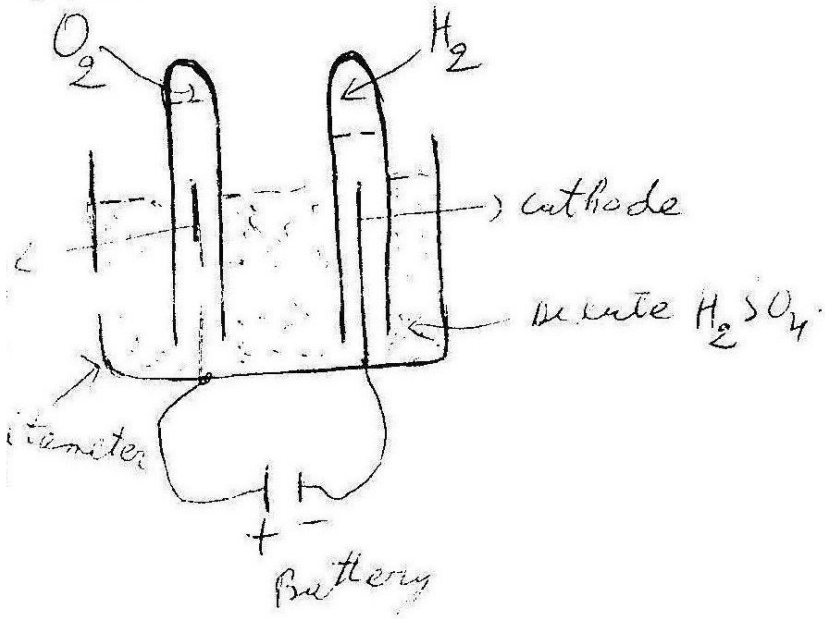
(ii) $CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$

c) There is colour change from colourless to red

$2KBr + Cl_2 \rightarrow 2KCl + Br.$

ANSWER 020

20) a) Schema:



b) At Cathode (-) At Anode (+)

$2H^+ + 2\bar{e} \rightarrow H_2$ $4OH^- - 4\bar{e} \rightarrow 2H_20 + 0_2$

c) At anode $= \frac{5}{2} = 2.5$ml of 0_2

d) (i) NaOH

(ii) CH_3COOH

(iii) Copper (any metal)

(iv) Plastics

(v) Sugar solution

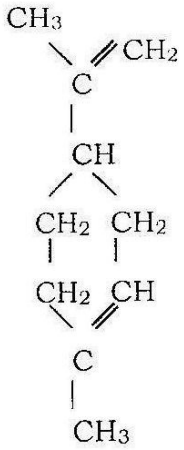
SECTION A: Answer ALL questions

HYDROGEN gas was passed over hot copper(II) oxide until the reaction was over.

(a) Write a balanced equation for the reaction. **(1mark)**
(b) Identify the oxidising agent in the reaction. **(1mark)**
(c) Name the salt formed when copper(II) oxide reacts with sulphuric acid. **(1mark)**

THIS question concerns the following solutions:
$CuSO_{4(aq)}$, $KCl_{(aq)}$, $H_2SO_{4(aq)}$, $AgNO_{3(aq)}$, $NH_{3(aq)}$, $MgSO_{4(aq)}$.
EACH solution may be used once or not at all.
Choose from the above list the formula of a solution which:
(a) is alkaline **(1mark)**
(b) is used to test for chloride ions **(1mark)**
(c) forms a white precipitate when mixed with barium nitrate solution. **(1mark)**
(d) produces hydrogen gas when added to magnesium. **(1mark)**

Limonene is a liquid hydrocarbon found in orange peel. Its structure shown below:



(a) What is meant by the term "hydrocarbon"? **(1mark)**
(b) What is the molecular formula of limonene? **(1mark)**
(c) Some limonene was mixed with a few drops of aqueous bromine (bromine water). What colour change would you see in the aqueous bromine. **(1mark)**
(d) Which functional group present in the structure of lemonene is responsible for reacting with bromine? **(1mark)**

What is meant by 'hard water'? **(1mark)**

Explain the difference between permanent hardness and temporary hardness of water. **(2marks)**