P525/1
CHEMISTRY
Paper 1
Nov 2020
2 ¾ hrs

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Uganda Advanced Certificate of Education
RESOURCEFUL MOCK EXAMINATION 2020
CHEMISTRY
PAPER 1
TIME: 2HOURS 45MINUTES

Instructions

- **Attempt*ALL questions in section A*** *and* ***only SIX questions*** *from section B.*
- **All questions are to be answered in the spaces provided.**
- **A periodic table with relevant atomic masses is supplied at the back of the paper.**
- **Mathematical tables (3figures) and non-programmable silent scientific calculators may be used.**
- **A piece of graph should be provided.**

For Examiner's Use Only																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total

SECTION A: (46 Marks)
Answer all questions in this section.

1. Write equations for the reactions of the following elements with hot concentrated sodium hydroxide solution.

(a) Tin (01½ marks)

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(b) Chromium (01½ marks)

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(c) Phosphorus (01½ marks)

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2. State what would be observed and write equation(s) for the reaction that takes place when;

i. Sulphur dioxide gas is passed through acidified potassium manganate (VII) solution. (02½ marks)

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ii. Carbon dioxide is passed through aqueous potassium manganate (VI) solution.

(02½ marks)

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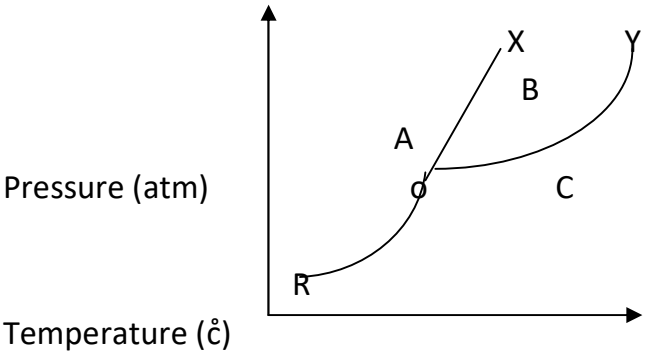
3) The figure below shows the phase diagram for carbon dioxide.



(a) State what the following represent.

i. Regions;

A……(0½ Marks)

B

……(0½ Marks)

C

……(0½ Marks)

ii. Points;

O

……(0½ Marks)

Y

……(0½ Marks)

iii. Curves;

OX

……(0½ Marks)

OR

……(0½ Marks)

OY

……(0½ Marks)

(b) Comment on the shape of the curve OX. (01 Mark)

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4. A compound Q contains 90.35% Y and the rest hydrogen.

(a) Calculate the empirical formula of Q. (Y=28.1) (02½ Marks)

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(b) Q diffuses through a porous plug two third times the rate of diffusion of nitrogen under similar conditions of pressure and temperature. Calculate the molecular formula of Q.

(02 Marks)

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(c) Write equation for the reaction between aqueous sodium hydroxide and silicon tetrahydride. (01½ marks)

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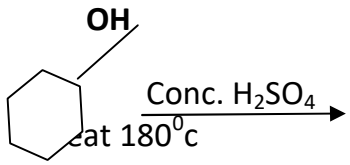
5. Complete the following reaction(s) and write the accepted mechanism(s).

(a) 

(03 marks)

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(b) $(CH_3)_3CBr$ $\xrightarrow[\text{Reflux}]{CH_3COOAg}$ (02 ½ marks)

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6) Synthetic rubber is made from (CH_2=C-CH=CH_2) as a monomer.
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(a) (i) Give the IUPAC name of the monomer. (01 mark)

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(ii)Write the structure of synthetic rubber. (01 mark)

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(iii)Name the catalyst used in the process of synthesis of rubber. (0 ½mark)

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(b) The osmotic pressure of a 2.16 % aqueous solution of synthetic rubber is 0.15mmHg at 28°c.

(i) Calculate the relative molecular mass of synthetic rubber. (02 marks)

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(ii) Determine the number of monomer units(n) in synthetic rubber. (01 ½ mark)

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(c) State one use of synthetic rubber.(0 ½ mark)

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7. (a) What is meant by the term distribution constant. (01 mark)

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(b)5g of solute M, was dissolved in 100cm^3 of water and the resultant mixture shaken with 50cm^3 of trichloromethaneand left to stand.25cm^3 of the aqueous layer reacted with 19cm^{3}of 0.5M hydrochloric acid.Calculate the

(i) Mass of M that remained in the aqueous layer.

(RFM of M=60, 1mole of M reacts with 2moles of hydrochloric acid) (02 ½ marks)

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(ii) Distribution constant (K_d) of M between trichloromethane and water. (01 ½marks)

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(c) State one application of the distribution constant. (0½ marks)

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8. Write equations in each case to show how the following conversions can be effected;

(a) BrCOOH to  (02 marks)

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(b) CH_3CH_2COOH to $CH_3CH_2NH_2$(01 ½ marks)

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9. (a) Chlorine gas was bubbled through Sodiumthiosulphate solution until in excess.

(i) State what was observed. (0½ marks)

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(ii) Write equation for the reaction that took place. (01 ½ marks)

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(b) When an aqueous solution of sodium chlorate (I) (NaOCl) and Lead (II) nitrate was warmed, a brown precipitate was formed.
Explain this observation.(02 ½ marks)

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SECTION B: (54 MARKS)

Answer any six questions from this section.

10. Lead is an element in GroupIV in the periodic table.

(a) i) Write the general electronic configuration of group IV elements. (0 ½ mark)

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(ii)State the common oxidation states exhibited by group IV elements. (01 mark)

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(iii) Write the formulae of oxides of Lead. (01 ½ marks)

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(b) A red Lead Oxide was treated with concentrated nitric (V) acid. State what is observed and write the equation for the reaction that takes place. (02marks)

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(c) The resultant mixture in (b) was filtered. In each case state what is observed and write equation for reaction that takes place when;

(i) Aqueous sodium chromate solution was added to the filtrate. (02marks)

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(ii) Concentrated hydrochloric acid was added to the residue and mixture warmed.
(02 marks)

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11. (a) A gaseous hydrocarbon W contains 90% carbon.
(i) Calculate the empirical formula of W. (02 ½ marks)

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(ii) Determine the molecular formula of W. (the density of R atstp=1.785gdm^{-3})
(02marks)

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(b) W reacts with Copper (I) Chloride solution to form a red precipitate.
Identify R. (0 ½ mark)

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(c) Write equation(s) to show how;
(i) W forms a red precipitate. (01 ½ marks)

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(ii) Wcan besynthesized from propanol. (02 ½ marks)

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12. (a) i) Write the chemical formula and name of the ore used to extract Aluminium.
(01mark)

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(ii) Give the names of three impurities in the ore in (i). (01 ½ marks)

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(b) Describe how the ore can be purified.
(Your answer should include relevant equations) (04 ½ marks)

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(c) i) State the use of ***cryolite*** during the electrolysis of the purified ore. (0½ marks)

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(ii) Write equation to show how anhydrous Aluminium Chloride can be obtained from the purified ore. (01 ½ marks)

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13.a) Define the term enthalpy of solution. (01 mark)

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(b) In an experiment to determine the enthalpy of solution of anhydrous and hydrated Copper (II) Sulphate salts, 4.0g of the anhydrous salt ($CuSO_4$) was added to 50g of water and the temperature of water rose by 8.0^0c.
When 4.0g of the hydratedsalt ($CuSO_4.5H_2O$) was added to 50g of water, the temperature of water dropped by 1.3^0c.
Calculate the enthalpy of solution in $KJmol^{-1}$ of;

(i)Anhydrous Copper (II) Sulphate.(02 ½ marks)
(Specific heat capacity of solution is 4.2$Jg^{-1}/^{\circ}c$)

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(ii) hydrated copper (II) sulphate. (02 marks)

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(c) Comment on the difference in values of enthalpy of solution calculated in (b).
(02marks)

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(d) Calculate the enthalpy change for the reaction;
$CuSO_{4(s)}$, + $5H_2O_{(l)}$ ⟶ $CuSO_4.5H_2O_{(s)}$(01 ½ marks)

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14. Explain the following observations.
(a) The first electron affinity of sulphur is negative whereas the second electron affinity is positive. (03 marks)

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(b) When hydrogen sulphide gas is passed into an aqueous acidified solution containing both Lead (II) nitrate and Zinc (II) nitrate, only Lead (II) sulphideis precipitated. (03 marks)

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(c) Bromoethanoic acid is a relatively stronger acid thanethanoic acid. (03 marks)

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15. a) Distinguish between the terms order and molecularity of a reaction. (02 marks)

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(b) The kinetic data for the decomposition of dinitrogenpentoxide (N_2O_5) in carbon tetrachloride at 45^0c is given in the table below.

$[N_2O_5]$ of ($moldm^{-3}$)	2.33	1.95	1.68	1.42	1.25	0.95
Time(s)	0	250	500	750	1000	1500
Log_{10} $[N_2O_5]$						

(i) Complete the table. (01½ marks)

(ii) Plot a graph of Log_{10} $[N_2O_5]$ against time. (03 marks)

(c) Use the graph you have drawn to;

(i) Determine the order of decomposition of N_2O_5.(01 marks)

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(ii) Determine half life and the rate constant for the decomposition of N_2O_5.
(01 ½ marks)

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16. a) Write equation for the reaction between;

(i) Tin (II) chloride and water.(01 ½ marks)

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(ii) Brady's reagent and ethanal. (01 ½ marks)

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(b) Write the mechanism for the reaction in a (ii). (04 ½ marks)

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17. Name a reagent that can be used to distinguish between the following pairs of ions and in each case state what is observed when the reagent is separately treated with each member of a pair.

(a) Ca^{2+} and Ba^{2+}(03marks)

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(b) Sn^{2+} and Sn^{4+}(03marks)

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(c) COO^-
$COO^-$and CH_3COO^-(03marks)

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