

P525/1
CHEMISTRY
PAPER 1
April 2014
2½ hrs

UGANDA ADVANCED CERTIFICATE OF EDUCATION
PRE MOCK EXAMINATIONS
CHEMISTRY
PAPER 1
Time: 2hours 30minutes

Instructions

Answer **all** questions

All questions must be answered in the spaces provided

1 mole of a gas occupies 22.4dm^3 at S.T.P

1 mole of a gas occupies 24dm^3 at room temperature.

Molar gas constant is $8.314 \text{ KJ mol}^{-1} \text{ K}^{-1}$

1. State what would be observed and in each case write equation for the reaction that takes place if,

a) Excess chlorine is dissolved in aqueous sodium thiosulphate solution.

(2 ½ marks)

Observation:

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Equation

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b) 2- 3 drops of aqueous sodium bicarbonate are added to ethanoic acid.

Observation:

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Equation

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2. a) Explain what is meant by the complex ion.

(1mark)

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b) Name the following complex ions and in each case the oxidation state of centre metal atom.

(1½ marks)

i) $Zn(OH)_4^{2-}$

Name;

Oxidation state of central atom;

ii) $[CoCl_2(NH_3)_4]^+$

Name;

Oxidation state of central atom;

iii) $Ni(CO)_4$

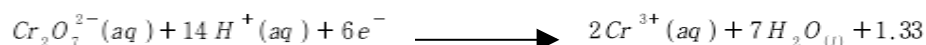
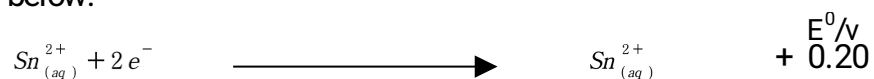
name;

oxidation state of central atom.

c) Explain why transition metals form complex ions; (1 ½ marks)

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3. The standard reduction electrode potentials for some half cell reactions are given below.



a) Write the cell notation for the cell formed when the half cells are combined. (1mark)

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b) Write equation for the reaction that takes place at the; (2marks)
anode;

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Cathode

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c) Calculate the e.m.f of cell. (1½ marks)

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d) State whether the cell reaction is feasible or not and give a reason for your answer. (1mark)

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4. Write equation for the reaction which takes place when each of the following compounds is dissolved in water. In each case state whether the resultant solution is neutral, acidic or alkaline. (2 marks each)

a) sodium methanoate.

Equation

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b) Disodium hydrogen phosphate

Equation

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c) sodium sulphate

Equation

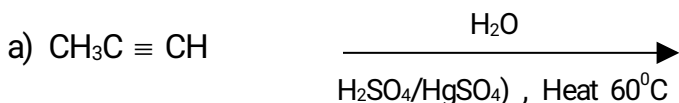
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5. Complete the following reaction equations and write the accepted mechanism.

(2marks each)

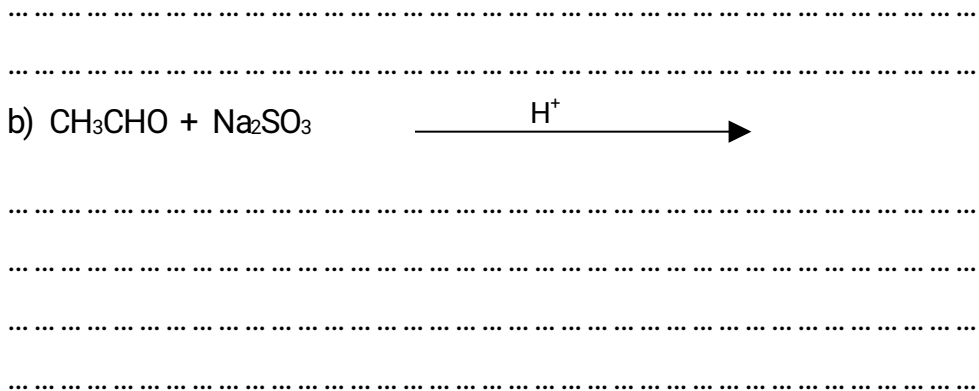


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6. a) State conditions for the reaction of silicon with the following compounds and write equation for each reaction. (2marks each)

i) Water;
condition(s)

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Equation;

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b) State two properties in which silicon resembles boron. (2marks)

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7. a) Explain what is meant by the term molar conductivity. (1mark)

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b) State three factors that can affect molar conductivity. (1 ½ marks)

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c) The molar conductivity at infinite dilution and electrolytic conductivity of ethanoic acid at 25°C are $3.91 \times 10^{-2} \text{Sm}^2 \text{mol}^{-1}$ and $5.21 \times 10^{-2} \text{Sm}^{-1}$ respectively. Calculate the degree of dissociation of ethanoic acid. (2 ½ marks)

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8. Name the reagent(s) that can be use to distinguish between the following pairs of compounds. In each case state what is observed if a member of the pairs is separately treated with the reagent. (2 ½ marks each)

a) CH_3COOH and HCOOH .

Reagent(s)

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Observation(s)

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b) CH_3CHO and $\text{CH}_3\text{CH}_2\text{CHO}$

Reagent (s)

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Observations

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9. 20cm^3 of a gaseous hydrocarbon X was exploded with 100cm^3 of oxygen. After the

explosion the volume of the residue gas was found to be 90cm^3 . On addition of concentrated potassium hydroxide to the residual gas the volume decreased to 50cm^3 .

a) Determine the molecular formula of X. (2marks)

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b) X reacts with ammoniacal copper (I) chloride I, state what is observed.

($\frac{1}{2}$ mark)

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ii) Write equation for the reaction that takes place. (1mark)

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SECTION B

(Attempt only **six** questions from this section)

10. A calcium salt Y contains, 31.25% carbon, 3.75% hydrogen and 40% oxygen the rest being calcium.

a) calculate the;

i) empirical formula of y. (2 ½ marks)

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ii) molecular formula of Y (molar mass of Y = 158)

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b) Y decomposes on heating to a white solid Z and liquid W. R reacts with iodine and excess sodium hydroxide solution forming a yellow precipitate but does not react with acidified potassium dichromate solution. Identify Z, W and the yellow precipitate.

(1 ½ marks)

Z

W

Yellow precipitate

c) Write equation for the reaction that takes place between W and iodine solution in aqueous sodium hydroxide. (1mark)

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d) Write a mechanism for the reaction between W and hydrazine.

(2 ½ marks)

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11. Lead (II) fluoride is sparingly soluble in water.

a) Write the;

i) equation for the solubility of lead (II) fluoride in water. (1½ marks)

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ii) expression for the solubility product constant (K_s). (1mark)

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b) The maximum amount of lead (II) fluoride that will dissolve at 20°C is 0.466gdm⁻³ of water. Calculate the solubility product for lead (II) fluoride at 20°C.

(2marks)

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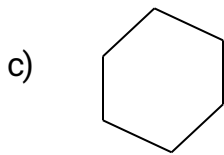
c) When 0.02 moldm⁻³ solution of lead(II) nitrate is added to a solution in (b) some lead(II) fluoride precipitates out. Calculate the;

i) mass of lead (II) fluoride precipitated. (2 ½ marks)

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ii) concentration of fluoride ions left in solution.

[illegible][illegible][illegible][illegible]



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13. a) Explain what is meant by the term thermosetting plastic. (1mark)

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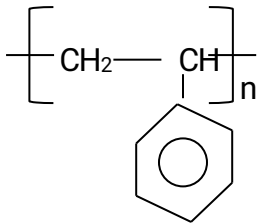
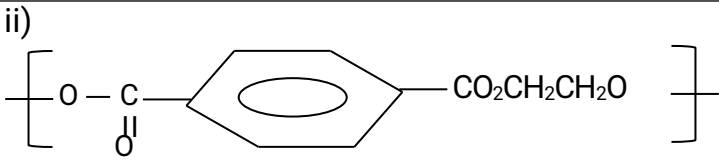
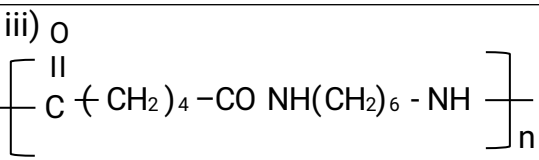
ii) Name one thermosetting plastic. (½ mark)

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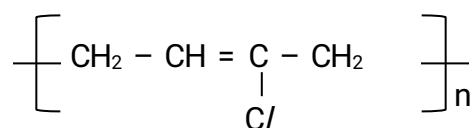
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b) The structural formulae of some polymers are given in the table below. For each polymer write the name of monomer(s) used to prepare the polymer.

(2 ½ marks)

Polymer	Name of monomer (s)
i) 	
ii) 	
iii) 	

c) A synthetic polymer has the structure



9. 89×10^{-2} mole of polymer was formed when 350g of monomer was polymerized.

Calculate the;

i) value of n (2 ½ marks)

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ii) molar mass of polymer. (1 ½ marks)

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d) State one application of the polymer in (c) above. (1mark)

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14. a) State three reasons why fluorine differs in some of the properties from the rest of group (VII) elements. (1½ marks)

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b) Write equations for ionization of hydrogen fluoride in aqueous solutions that are;

(3marks)

i) dilute

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ii) concentrated

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c) Write equation for the reaction between hydrogen fluoride and silicon.

(1½ marks)

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d) Explain why hydrogen fluoride is a weaker acid than hydrogen chloride.

(3marks)

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15. State what was observed when the following mixtures are heated and in each case write the equation for the reaction that would take place.

a) Benzoic acid and neutral iron(III) chloride solution. (2 ½ marks)

Observation

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Equation

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b) Methanol and propanoic acid in the presence of concentrated sulphuric acid.

(2 ½ marks)

Observation;

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Equation;

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c) Methanoic acid and ammoniacal silver nitrate solution. (2marks)

Observation

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Equation

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d) ethanol and iodine in aqueous sodium hydroxide solution. (2marks)

Observation

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Equation

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16. a) State three factors that can affect hydration energy. (1 ½ marks)

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b) The table below shows the enthalpies of hydration of cations of group (II) elements of the periodic table.

Cation	Mg ²⁺	Ca ²⁺	Sr ²⁺	Ba ²⁺
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Enthalpy of hydration (kJmol ⁻¹)	- 1920	- 1640	- 1480	- 1360
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i) State how hydration energy of the cations vary. (1mark)

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ii) Explain your answer in b(i) above. (2marks)

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iii) Explain why the values for hydration energy are negative. (1mark)

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c) The values for some energy changes are given below.

	Energy (KJmol ⁻¹)
Lattice energy of CaCl _{2(s)}	- 2230
Enthalpy of hydration of Cl ⁻ _(g)	- 343

i) Calculate the enthalpy of solution of calcium chloride. (2marks)

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ii) State how the solubility of calcium chloride would be affected when temperature is increased. Give a reason for your answer. (1 ½ marks)

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17. a) i) Explain what is meant by the term solvent extraction. (1mark)

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ii) State two conditions under which the partition law is valid. 91mark)

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b) 25cm³ of ammonia solution in excess was added to 25cm³ of 0.1M CuSO₄.5H₂O solution and the resulting solution shaken with 50cm³ of trichloromethane.

50cm³ of the trichloromethane layer required 25.5cm³ of 0.05M hydrochloric acid and 20cm³ of the aqueous layer required 33.3cm³ of 0.5M hydrochloric acid for complete neutralization. Calculate the molar concentration of;

i) ammonia in the trichloromethane layer. (2marks)

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ii) ammonia fixed in the complex $Cu(NH_3)_n^{2+}$

(Partition coefficient of ammonia between water and trichloromethane is 25.0)
(3marks)

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c) Determine the value of n in the complex ion in b(ii) (1mark)

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d) State one other application of the partition law. (1mark)

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*****END *****