NANDI NORTH AND NANDI CENTRAL JOINT EXAMINATIONS 2016

233/2
CHEMISTRY
PAPER 2
THEORY
JULY / AUGUST 2016
TIME: 2 HOURS

1. The grid below is a Periodic Table. The letters used are not the actual chemical symbols of the elements. Study the table and answer the questions that follow.

G								
			R	J	Q		Y	
D	T				W		U	Z
	E	X						
V								

(a) What name is given to the elements that occupy region X? (1mk)
(b) Write an equation to show how element Y forms an ion. (1mk)
(c) Compare the atomic and ionic radius of T. (1mk)
(d) Explain why the ionization energy of V is lower than that of D. (2mks)
(e) Name the chemical family to which E belongs. (1mk)
(f) An element A is in period 3 and it loses three electrons to form an ion. Write the electronic configuration of an atom of A. (1mk)
(g) Elements D and U combine to form a compound with a giant structure.
(i) Name the giant structure. (1mk)
(ii) State **two** characteristics of the structure. (1mk)
(h) Write the formula of the compound formed when T and Y react. (1mk)
(i) State and explain the change in electrical conductivity from D to T. (2mks)

2. (a) An electrolytic cell is set up a form two class to perform an electrolysis of brine using carbon chloride.
(i) What is brine? (1mk)
(ii) Identify the cations in brine. (1mk)
(iii) Identify the ion discharged at anode and name its factor of discharge. (2mks)
(b) The diagram below shows an electrochemical cell to determine the E^0 of Iron.
The reading on the voltmeter is -0.44V.
(i) On the diagram show by an arrow the direction of the flow of electrons. (2mks)
(ii) State **two** functions of the salt bridge. (2mks)
(iii) Write an equation for the reaction in the Fe^{2+} / Fe half cell. (1mk)
(iv) Identify the reference half cell. (1mk)
(v) Calculate the cell emf given that the reference half-cell has an E^0 value of 0.00V. (2mks)
(vi) Write the cell representation. (1mk)

3. (a) The graph below is temperature-time curve obtained when a block of ice is heated from -4^0C to just over 100^0C.
(i) Name the heat change occurring in region 2. (1mk)
(ii) Identify the state of the substance at region 3. (1mk)
(iii) Explain why there is no change in temperature in region 4. (2mks)
(iv) In which of the regions is there a solid-liquid mixture? (1mk)

(b) To determine the heat of combustion of ethanol, a form four class used the set-up shown below.

Table showing observations

Measurements	**Values**
Steady final temperature of 50ml of water used.	69.5^0C
Initial temperature of water	18.0^0C
Temperature change, □ in K	
Initial mass of Ethanol Burner and Ethanol before burning	28.8g
Final Mass of Ethanol Burner with remaining Ethanol after burning	28.4g
Mass of Ethanol that burnt	

(i) Fill in the missing information in the class table. (1mk)
(ii) The 50ml of water used is de-ionised and its specific heat capacity c, is 4.2kJ/Kg/K. Calculate heat of combustion of the ethanol used. (2mks)
(iii) Calculate the moles of ethanol that were burnt (RMM of ethanol = 46). (2mks)
(iv) Calculate the heat of combustion per mole of ethanol. (2mks)

4. (a) Describe the chemical test that can be used to distinguish sodium sulphate from sodium sulphite. (2mks)
(b) Starting with lead oxide, describe how a pure sample of lead carbonate can be prepared in the laboratory. (3mks)

(i) What is solubility? (1mk)

(ii) The table below shows the solubility of solids X and Y at different temperatures.

TEMPERATURE (^{0}C)	SOLUBILITY IN g PER 100g OF WATER	
	X	Y
68.0	112.0	65.0
58.0	74.0	55.0
53.0	58.0	48.0
47.0	47.0	45.0
43.0	36.0	43.0

I) Draw the solubility curves on the same axes. (Temperature on the X-axis). (1mk)

II) A solution of 68.0^{0}C contains 80g of solid X and 80g of solid Y. The mixture is cooled to 53.0^{0}C. Using the graph you have drawn in I) above, give the composition of the solid formed. (2mks)

5. (a) A, B, C are three homologous series of organic compounds.

Series	General formula
A	C_nH_{2n-2}
B	C_nH_{2n}
C	C_nH_{2n+2}

(i) What is the name given to series C? (1mk)

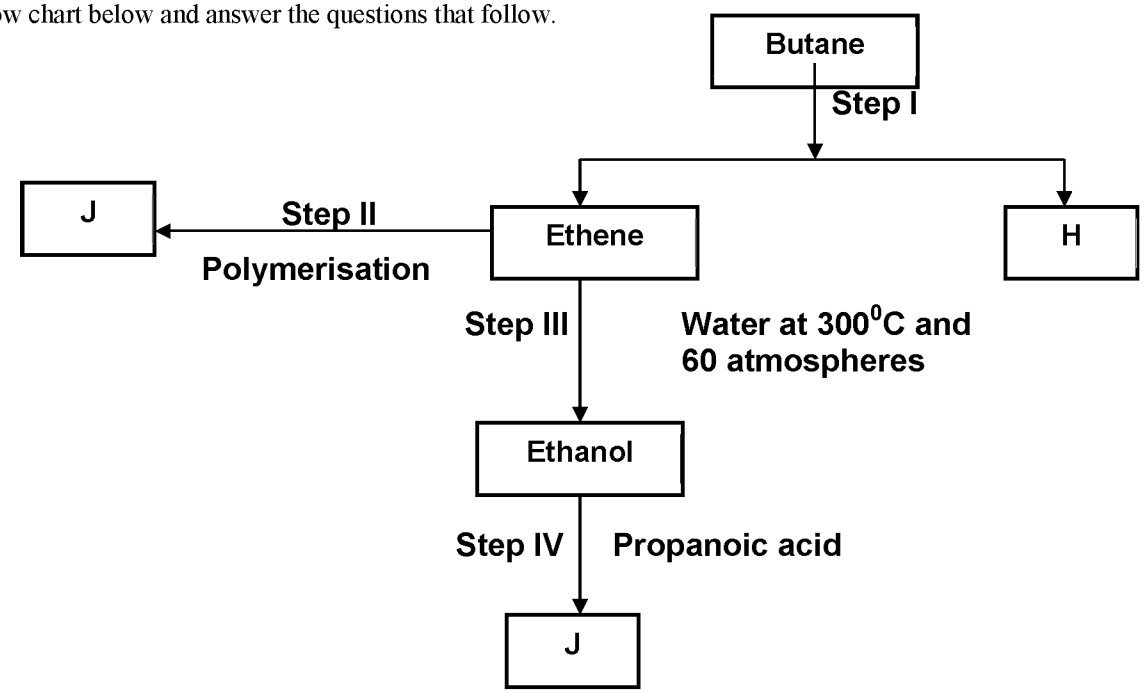
(ii) Write down the name and structural formula of the second member of series "B". (2mks)

(iii) Draw the structural formulae of the first two members of the series 'A'. (2mks)

(iv) Complete the balance in the following equation:

$CH_3CH_3 + O2 \rightarrow$

(b) Study the flow chart below and answer the questions that follow.



(i) State the conditions for the reaction in step I to occur. (1mk)

(ii) Identify substance H. (1mk)

(iii) Give:-

(I) One disadvantage of the continued use of substances such as J. (1mk)

(II) The name of the process that takes place in step III. (1mk)

(III) The name and the formula of substance K. (2mks)

Name:……

Formula:……

(iv) The relative molecular mass of J is 16,800. Calculate the number of monomers that make up J. (2mks)

6. (a) The first step in the industrial manufacture of nitric acid is the catalytic oxidation of ammonia gas.

(i) What is the name of the catalyst used? (1mk)

(ii) Write the equation for the catalytic oxidation of ammonia gas. (1mk)

(iii) Nitric acid is used to make ammonia nitrate. State **two** uses of ammonium nitrate. (1mk)

(b) Study the apparatus and answer the questions that follow.

(i) Why does nitric (v) acid appear yellow? (1mk)
(ii) Give the identity of gas Q and give its test. (1mk)
(iii) State the use of glass wool and the role of sand in the experiment. (2mks)
(iv) Write an equation to show the decomposition of nitric acid when strongly heated. (1mk)
(c) Determine the oxidation of nitrogen in NO^-_3. (1mk)

7. In the laboratory small quantities of oxygen gas can be generated using the following set-up. Study it and answer the questions that follow.

(a) (i) Give the name of substance R. (1mk)
(ii) What is the purpose of the apparatus labeled S? (1mk)
(iii) Write an equation for the reaction taking place in the round bottom flask. (1mk)

(b) Sodium peroxide react with water at room temperature to produce $0.4dm^3$ of oxygen gas. Determine the mass of sodium peroxide which was reacted with water.
(Molar gas at r.t.p = 24.0 dm^3, Na = 23, O = 16, H = 1) (2mks)

(c) A burning piece of magnesium ribbon continues to burn in a gas jar containing carbon (IV) oxide. Explain. (2mks)

(d) State **two** commercial uses of oxygen gas. (1mk)