**NAME ………………………………………………………….. SIGNATURE …………………..**

**P525/2**

**CHEMISTRY**

**PAPER 2**

**JULY/AUGUST**

**2½ Hours.**

**RESOURCEFUL MOCK EXAMINATIONS 2017**

**Uganda Advanced Certificate of Education**

**CHEMISTRY**

(Theory)

P525/2

**Paper 2**

2 ½ hours

**Instructions to the Candidates:**

* *Attempt 5 questions in all including 3 questions from section A and 2 questions from section B.*
* *Begin each question on a fresh page.*
* *Attach the question paper and indicate the questions in the table below.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Questions** |  |  |  |  |  |
| **Marks** |  |  |  |  |  |

**Section A (answer 3 questions from this section)**

1. a) Give;

(i) Two reasons why fluorine differs from the rest of the group VII elements of the periodic table. (2mrks)

(ii) Any four properties in which fluorine differs from the rest of the members of group

VII of the periodic table. (4mrks)

b(i) Define the term disproportionation reaction. (1mrk)

(ii) Apart from chlorine and iodine compounds, give one other compound that can undergo disproportionation and write the equation involved. (2mrks)

c) Describe the reactions of fluorine and chlorine.

With; (i) water (4mrks)

(ii) Sodium hydroxide solution (7mrks)

2. a) State what is meant by the term

(i) Radioactivity (1mrk)

(ii)Half-life(1mk)

b) The table below shows data for radioactive decay of an element Z.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time (hours) | 0.0 | 5.0 | 10.0 | 15.0 | 20.0 | 25.0 | 30.0 |
| Activity (counts per minute) | 25.00 | 23.00 | 21.25 | 19.50 | 18.00 | 16.50 | 15.25 |

1. Plot a graph of activity against time. (3mrks)
2. Determine the value of the half-life of element Z. (1 ½ mrks)
3. Determine the decay constant and state its units (2mrks)
4. The kinetic data for the reaction between substance X and Y are shown.

|  |  |  |  |
| --- | --- | --- | --- |
| Experiment | Initial X(Moldm-3) | Initial Y (Moldm-3 | Initial rate (moldm-3 S-1) |
| I | 5.0 x 10-3 | 5.0 x 10-3 | 3.0 x 10-3 |
| II | 1.0 x 10-2 | 1.0 x 10-2 | 2.4 x 10-2 |
| III | 5.0 x 10-3 | 1.0 x 10-2 | 6.0 x 10-3 |

Determine the;

1. Rate equation for the reaction (2mrks)
2. Value of the rate constant and state its units (2mrks)
3. Initial rate of the reaction when the concentration of X and Y are 1.5 x 10-2 and 7.5 x 10-3 moldm-3 respectively (1 ½ mrks)

d) Explain how the following factors affect the rate of a chemical reaction.

(i) Temperature (2mrk)

(ii) Concentration (2mrks)

(iii) Surface area (2mrks)

3. Complete the following and in each case, outline a mechanism.

Conc. H2SO4

a) CH3CHCH2CH3 (3mrks)

OH

180oC

b) CH3CH2OH + CH3COCl (3mrks)

(aq)

c) (CH3)3CBr (2 ½ mrks)

Heat

Conc.H2SO4

d) + CH3CH = CH2 (4mrks)

e) CH3CHO + NaHSO3 (3 ½ mrks)

H+

NO2

f) CH3CHO + H2N-NH (4mrks)

ON

4. a) Explain why a solution containing 2.5g of glucose C6H12O6, in 100g of ethanol boils at 83oC at 760mmHg pressure whereas pure ethanol boils at 78oC at the same pressure. (3 ½ mrks)

b) Using the data in (a), calculate the molar boiling point constant, Kb of ethanol. (4mrks)

c) The figure below shows the boiling point- composition diagram for the benzene – ethanol system.

**R**

**78OC**

**C**

**A**

**80**

**B**

**Curve X**

**Curve Y**

**TempoC**

**Mole fraction of ethanol**

**0**

**1**

**Q**

**T**

(i) identify curves X and Y and point R. (3mrks)

(ii) A mixture at point R was boiled, state what happened to its composition.(1mrk)

(iii) State the relationship between A, B and C (2mrks)

(iv) Explain the shape of curve Y between T and R. (3mrks)

(v) Draw a labelled diagram to illustrate the vapour – pressure composition diagram for the benzene – ethanol system (3 ½ mrks)

**SECTION B (answer 2 questions from this section)**

5. a) Write equations to show how the following compounds can be synthesized, indicate the reagent and conditions in each case.

(i) (CH3CH2)2O from CH2 = CH2 (2mrks)

(ii) COOH from Benzene (2mrks)

(iii) CH3CHCH3 from propyne (2mrks)

OH

(iv) propan – 2 –ol to propylamine (3mrks)

(v) CHCH3 from CH2CH2Br (3mrks)

OH

(vi) (CH3)2C = N- OH from propan – 2-ol (2mrks)

b) Name the reagent(s) that can be used to distinguish between the following compounds and in each case, state what would be observed if each member of the pair is treated with the reagent(s).

(i) CH3CH2CHO and CH3CHO (3mrks)

(ii) Phenol and Benzoic acid (3mrks)

6. a) Define the term eutectic mixture (2mrks)

b) The table below shows the melting points of various mixtures of lead and tin.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| % tin | 0 | 20 | 40 | 70 | 80 | 100 |
| Melting point(oC) | 327 | 280 | 234 | 193 | 206 | 232 |

1. Draw a fully labelled diagram for the tin-lead system (6mrks)
2. Determine the eutectic temperature and the composition of the eutectic. (3mrks)

c) Describe the changes that would take place when a liquid mixture of the above system containing 40% tin is cooled from 400C to 100C. (6mrks)

d(i) State one application of the tin – lead eutectic mixture (1mrk)

(ii) Name oneother pair of metals which can give a similar phase diagram as in b(i). (1mrk)

(iii) State one similarity between a eutectic mixture and a pure metal. (1mrk)

7. a(i) What is a transition element? (1mrk)

(ii) State three characteristics of chromium as a transition element and in each case give an example/illustration (3mrks)

b) Hydrated chromium (III) chloride, CrCl3.6H2O) exhibits hydration isomerism. Write the formulae for the possible isomers of hydrated chromium (III) chloride.(2mrks)

c) The stated isomers were separately treated with excess silver nitrate solution. State the isomer that formed.

(i) the thickest precipitate (1 ½ mrks)

(ii) no precipitate at all. (1 1/2mrks)

Give a reason in each case.

d) Potassium chromium (III)sulphate was dissolved in water and to a sample of the resultant solution, sodium hydroxide solution was added drop wise until in excess. Explain what was observed. (4mrks)

e) Potassium dichromate in acidic medium is commonly used as an oxidizing agent.

(i) Determine the oxidation state of chromium in potassium dichromate. (1mrk)

(ii) To a solution of potassium dichromate, an acidified solution of sodium sulphite was added dropwise. State what was observed and write equation for the reaction. (2 ½ mrks)

(iii) 10.5cm3 of a solution of potassium dichromate reacted completely 21.00cm3 of 0.5M solution of acidified sodium sulphite. Calculate the concentration in g/l of the potassium dichromate. (K = 39, Cr = 52, 0=16) (3 ½mrks)

8. Explain the following observations;

a) Diethylamine is a stronger base than aminobenzene (5mrks)

b) Carbondioxide is a gas at room temperature whereas silicon (IV)oxide is a solid with a very high melting point. (4mrks)

c) Anhydrous copper (II)sulphate dissolves in water exothermically while copper (II)

sulphatepentahydrate dissolves exothermically. (4mrks)

d) Phenol is a stronger acid than cyclohexanol (2mrks)

c) When sodium carbonate solution was added to a solution of aluminium chloride, a

white precipitate was formed and a colourless gas evolved. (5mrks)

**END**