

Name U0025/ Combination

KCB

Uganda Advanced Certificate Examinations

Mock 2019

Chemistry P525/1

Time allowed: 2hours 45 minutes Date 21st May, 2019 (2-4.45pm)

Instructions

Answer **all** questions in section A and any **six** questions in section B

Illustrate your answers fully with appropriate diagrams and equations.

Your answers should be very clear and neat.

Where necessary, assume the following constants;

Avogadro's number = 6.02×10^{23}

Universal gas constant = 8.314 J/K/mol

Atmospheric pressure is 101325 Nm^{-2}

Faradays constant = 96500 C .

For examiners use only

| Q | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | Total | |
|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|-------|--|
| M | | | | | | | | | | | | | | | | | | | |

Section A: Answer **all** questions in this section

1 (a) (i) The decay law is given the expression

$$-\frac{dN}{dt} = \lambda N$$

State what the symbols represent.

(01½ marks)

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(ii) Using the above expression derive the expression for the relation between half life and the decay constant. (02 marks)

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(b) (i) Nickel(⁶³Ni) decays to copper (⁶³Cu)

Name the particle emitted and write the equation for the reaction:

Name of particle;

(01mark)

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Equation

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[B];

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(ii) Write the expression for the rate equation (0½ mark)

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(b) The rate of reaction under certain conditions for temperature and pressure is x. Express the rate in terms of x when the following changes are made.

(0 ½ mark each)

(i) The concentration B is halved while the concentration of A remains unchanged

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(ii) The rate constant is doubled, by increasing temperature, but keeping the concentrations of A and B unchanged.

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(iii) If 90% of B is removed by precipitation, without affecting concentration of A.

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(c) Calculate the value of the rate constant and state its units. (02 marks)

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3 Calculate the pH of a 0.1 mol dm^{-3} solution of aluminium nitrate
(Acid dissociation constant, K_a at 25°C for $\text{Al}(\text{H}_2\text{O})_6^{3+}$ is $1.4 \times 10^{-5} \text{ mol dm}^{-3}$) (5 marks)

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4 a) State three factors that can favour formation of complexes. (01 ½ marks)

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b) Determine the coordination number of the central species and name the following complexes.

| Formula of complex | Coordination number | Name of complex |
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| $[\text{CrCl}_2(\text{H}_2\text{O})_4]^+$ | | |
| $[\text{Ag}(\text{NH}_3)_2]^+$ | | |
| $[\text{Fe}(\text{SCN})(\text{H}_2\text{O})_5]^{2+}$ | | |

5 a) i) What is meant by the term ionization energy of an element (2marks)

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Write equation to show the first ionization energy of magnesium. (1 mark)

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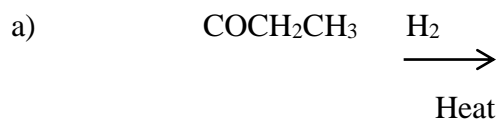
b) The second and third ionization energies of magnesium are 1450 and 7730kJmol^{-1} respectively. Give a reason for the large difference between the second and third ionization energies of magnesium. (2marks)

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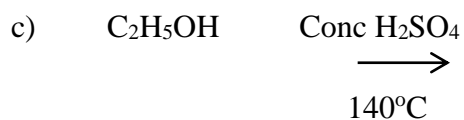
6 Name the product after completing the following equations.



Name



Name.....



Name.....

7 Complete the equations and suggest the mechanism.

a) Methanal with hydroxyl amine

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b) Silver acetate with bromoethane

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8 Explain the following terms.

a) Addition polymerization.

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b) Condensation polymerization.

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c) Give an example of;

i) A natural addition polymer and identify its structure.

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ii) Synthetic condensation polymer and identify its structure.

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9 a) Explain the term eutectic mixture. (2marks)

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b) Solder is eutectic mixture of tin and lead.

i) State one use of solder. (1mark)

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ii) In an experiment to determine the percentage of tin in solder, a student dissolved 4.0g solder in nitric acid to make 1litre of solution. Every 25.0cm³ portion of the

solution reacted completely with 15.5cm^3 of 0.01M iodine solution. Determine percentage of tin in solder. (r.a.m for tin is 118.7).

(2marks)

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SECTION B. Answer any **six** questions from this section

10. (a) Nitrogen reacts with hydrogen in a mole ratio of 1:3 to form ammonia.

Write;

(i) equation for the reaction that takes place. (01 ½)

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(ii) the expression for the equilibrium constant (K_c) (0 ½)

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(b) State the conditions used to obtain maximum yield of ammonia during its manufacture by the Habers process. (01½)

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ii) Fat.

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b) Identify any two differences between a fat and oil.

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c) Explain how scum formation is a disadvantage in use of soap.

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d) Identify the monomer(s) , give the name(s) of monomer(s) identified and type of polymerization process that formed it.

| polymer | Monomer(s) | Type of polymerization |
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| $(\text{HN}(\text{CH}_2)_6\text{NHCO}(\text{CH}_2)_8\text{CO})_n$ | | |
| $(\text{CH}_2\text{C}(\text{CN})\text{CH}_2(\text{CN})\text{CH}_2\text{C}(\text{CN}))_n$ | | |

c) C_6H_4BrOH and $C_6H_{11}ClOH$

Reagent(s)

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Observation

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13 a) Write equation and state the conditions for the reaction leading to the formation of;

i) Tin (II) chloride. (2½ marks)

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ii) Tin (IV) chloride. (3 marks)

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b) Tin (II) chloride and tin (IV) chloride were separately exposed to air.

i) State what was observed in each case. (1 mark)

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ii) Write the equation(s) for the reaction(s) that took place. (1½ marks)

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c) Write equation for the reaction between tin (II) chloride and iron (III) chloride solution. (1½ marks)

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14 a) Explain the term relative atomic mass. (2marks)

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b) Explain how ions of different charge to mass ratios can be focused on the detector in the mass spectrometer. (2marks)

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c) Copper consists of two isotopes, Cu-64 and Cu-65 in intensity ratios of 4:1.

i) Explain the term intensity. (1 mark)

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ii) Name the most abundant isotope of copper and give reason for the answer. (½ marks)

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iii) Determine the relative atomic mass of copper. (2marks)

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iv) State three advantages about this data. (1½marks)

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15 a) i) Explain the term ideal gas. (1mark)

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ii) State four characteristics of and ideal gas. (2marks)

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b) The graph shown below shows behavior of gases. Use it to answer the questions after it.

Explain the shape for:

(2marks)

i) Helium.

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ii) Nitrogen gas.

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c) The isotherms for carbon dioxide are shown below.

i) State the critical temperature for the gas. (1mark)

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ii) Explain the term critical temperature of gas. (1mark)

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16 a) When 2.0g of X was dissolved in 100.0g of water, the solution froze at -0.1°C . If the molal freezing constant for water is $1.8^{\circ}\text{C/mol/kg}$;

Deduce molar mass of X. (2marks)

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b) When 2g of X was dissolved in 1000cm^3 of hexane, the solution exerted an osmotic pressure of 40Pa.

i) Determine the molar mass using this data. (1mark)

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i) Explain differences in the two molar masses. (1mark)

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c) An aqueous solution containing 2.8g/litre of R exerts an osmotic pressure of 380 mmHg at standard temperature and pressure. Calculate the molar mass of R .

(2marks)

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d) When 3.4g of R was burnt in excess oxygen, 5.04 litres of carbon dioxide and 2.7g of water formed.

i) Calculate the empirical formula of R. Molar gas volume is 22.4 litres

(2marks)

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ii) Deduce molecular formula of R. (1mark)

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END Success