**NAME ……………………………………………………………………………Index No……...**

**Signature …………………………………………**

***P525/1 CHEMISTRY PAPER 1 23/4 Hours***

**ACEITEKA MOCK EXAMINATIONS, 2019**

**Uganda Advanced Certificate of Education**

***PAPER I***

**2 hours 45 minutes**

**INSTRUCTIONS TO CANDIDATES** \*Answer **all** questions in section A and **six** questions in section B \*All questions must be answered in the spaces provided \*The periodic Table with relative atomic masses is provided. \*Illustrate your answers with **equations** where applicable \* Molar gas constant = 8.314 j mol-1k-1 \*Molar volume of a gas at s.t.p is 22.4 litres

**For examiners use only**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | Total |
| Marks |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**SECTION A: (46 Marks)**

Answer **all** the questions

1. (a) Explain what is meant by the term **electron affinity**. (1 mark)

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(b) Calculate the electron affinity of hydrogen using the following data ; Enthalpy of atomization of potassium = 90 kJ mol-1 Bond dissociation energy of hydrogen = 436 kJ mol-1 First ionization energy of potassium = 418 kJ mol-1 Lattice energy of potassium hydride = 710 kJ mol-1 Enthalpy of formation of potassium hydride = -62 kJ mol-1(3 marks)

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2. An organic compound Z has a structure

RCH=CHCH2COOH

**Name** the functional group which is present in Z and in each case **name** the reagent that can be used to identify the functional group, **state the observation** made and **write equations** for the reaction that takes place when the compound is reacted with the reagent. (i) Name of the functional group (1/2 mark )

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Reagent. (1/2 mark )

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Observation. (1/2 mark )

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Equation (1 mark )

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(ii) Name of the functional group (1/2 mark )

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Reagent. (1/2 mark )

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Observation. (1/2 mark )

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Equation (1 mark )

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3. (a) Water was added to anhydrous iron(III) chloride drop wise until there was no further change . (i) State what was observed. (1 mark)

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(ii) Write equation for the reaction that took place. (11/2 marks)

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(b)To the solution formed in (a) was added a piece of magnesium ribbon. (i) State what was observed. (1 mark)

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(ii) Write equation for the reaction that took place. (11/2 marks)

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4. (a) Explain what is meant by the term **isotopes**. (1 mark)

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(b) Bromine has relative atomic mass of 79.9 and consists of two isotopes and . Determine which of the two isotopes is the most abundant. (21/2 marks)

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(c) Sketch the mass spectrum for bromine. (11/2 marks)

5. (a) Oxygen diffuses 2.31times as fast as a compound Z with the formula Ni(CO)n. Determine the molecular formula of Z. (3 marks)

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(b) State the; (i) co-ordinate number of nickel in compound Z. (1/2 mark) ………………………………………………………………………………………………………………………………………………………………………………………………………………

(ii) oxidation number of nickel in compound Z. (1/2 mark)

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6. Write equations to show how Phenyl ethanoate can be synthesized from Chloroethane. Indicate the reagents and conditions necessary. (4 marks)

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7. The following half cell reactions are given; Eᶿ/V

PbO(s) + 4H+(aq) + 2e Pb2+(aq) + 2H2O(l) +1.46

Fe3+(aq) + e Fe2+(aq) +0.77

(a) Write the cell notation for the cell formed by combining the two half cells. (2 marks)

(b) State what will be observed and write equations for the reactions that takes place at; (i) Anode Observation (1/2 mark)

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Equation (1 mark)

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(ii) Cathode

Observation (1/2 mark)

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Equation (1 mark)

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(c) Calculate the e.m.f of the cell. (1 mark)

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8. (a) Starting with dodecan-1-ol CH3(CH)10CH2OH describe briefly how a synthetic detergent can be prepared. (41/2 marks)

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(b) State any **two** advantages of synthetic detergent over soapy detergents. (1 mark)

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9. State what will be observed and write equations for the reaction that takes place when; (a) Nickel ethanoate is heated strongly and the gaseous products passed through acidified 2,4-dinitrophenyl hydrazine. Observation (11/2 marks)

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Equation(s) (21/2 marks)

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(b) Ammonium hydroxide solution is added drop wise until in excess to aqueous solution of Nickel ethanoate.

Observation (11/2 marks)

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Equation(s) (21/2 marks)

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**SECTION B: (54 marks**)

**Answer six questions only**

(10) Complete the following organic reactions and outline the reaction mechanism

−CH3

(a) + Cl2 Fe (3 ½ marks)

Mechanism

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(b) CH3CH=C(CH3)2 + HI (21/2 marks)

Mechanism

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(c) CH3COCH3 KCN/H+ (3 marks) 200C

Mechanism

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11. (a) Draw the structure and name the shape of the following species. In each case state the oxidation state of the central atom in the structure. (6 marks)

|  |  |  |  |
| --- | --- | --- | --- |
| Species | Structure | Shape | Oxidation state |
| CS2 |  |  |  |
| POBr |  |  |  |
| SnO32- |  |  |  |

(b) Compare the bond angle of POBr and SnO32-.Give reason for your answer. (3 marks)

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12. (a) The bond dissociation energies of the following compounds are given;

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Elements | Fluorine | Chlorine | Bromine | Iodine |
| Bond dissociation energies/ kJ mol-1 | 33.3 | 57.8 | 46.1 | 36.2 |

State and explain variation in bond dissociation energies of the above given elements. (4marks).

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(b) Bromine and iodine can be prepared by reacting concentrated sulphuric acid with sodium bromide and sodium iodide respectively however chlorine cannot be prepared using the same method. Explain. (3 marks)

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(c) State what will be observed and write equation for the reaction that takes place when concentrated sulphuric acid is added to solid sodium bromide.

Observation (1/2 mark)

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Equation (11/2 marks)

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13. (a) Explain what is meant by the term **partition coefficient**. (11/2 marks)

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(b) 100cm3 of an aqueous solution of X containing 30g per litre of X was shaken with 100cm3 of trichloromethane. The distribution coefficient of X between trichloromethane and water is 2. Calculate the mass of X which was extracted. (2 ½ marks)

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(c) Calculate the mass of X which will be extracted if the solution of X in (b) is shaken with two successive portions of 50cm3 of trichloromethane. (4marks)

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(d) Comment on your answer in (b) and (c) (1 mark)

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(e) State one application of partition coefficient apart from solvent extraction. (1/2 mark)

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14. Write equations to show how the following synthesis can be carried out. In each case indicate the reagents and conditions necessary. (a) Propanone from ethanol (3 marks)

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(b) Ethanoic acid to Phenyl ethanol. (3 marks)

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(c) 2-Methyl propan-2-ol from 2-Bromo propane. (3 marks)

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15. A compound Y contains by mass 61.02% carbon,15.25% hydrogen and the rest nitrogen. (a) Determine the empirical formula of Y. (2 marks)

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(b) Compound Y has a density of 2.63gdm-3at s.t.p.Determine the molecular formula of Y.

(2 marks)

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(c) Write the structural formula of the possible isomers of Y. (11/2 marks)

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(d) Compound Y forms yellow oils when reacted with cold concentrated hydrochloric acid and sodium nitrite. (i) Identify Y ( ½ mark)

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

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(e) (i) Name the reagent that can be used to confirm the functional group in compound Y.

(1/2 mark)

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(ii) State the observation made. (1/2 mark)

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(iii) Write equation for the reaction that takes place when the named reagent in (e) (i) is reacted with compound Y. (1 mark)

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16. (a) Iron metal is extracted from one of its ore **siderite**. The ore is mixed with coke and lime stone and then heated strongly in a blast furnace. Write equations for the reactions that lead towards formation of iron metal in the blast furnace.

(41/2 marks)

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(b) 1.6g of an impure sample of tin (II) chloride was added to an aqueous solution of iron(III) chloride and the mixture heated until there was no further change. The solution was diluted to 250cm3 with water. 25cm3 of the solution was acidified with dilute sulphuric acid and titrated with 0.02M potassium permanganate solution.16.0cm3 of oxidant was required to reach the end point. Determine the percentage purity of tin(II) chloride. (4 ½ marks)

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(17) (a) Distinguish between terms thermosetting plastics and thermosoftening plastics. Name one example in each case. (3 marks)

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(b) A polymer Q has a structural formula of

[ CH2CHCH2CH ]n

Cl

Cl

(i) Write the name and structural formula of the monomer of the above given polymer

(1½ marks)

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(ii) Name the type of polymerization by which the above given polymer is formed.( ½ marks)

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(c) When 71.76g of the monomer in (a) i was polymerized 2.67 x 10-2 moles of the polymer was formed. Determine the; (i) molecular mass of the polymer. (1 ½ marks)

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(ii) number of monomers in the polymer. (2 marks)

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(d) State one use of the polymer Q. ( ½ mark)

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**END.**

