

NAME .....Index No.....

Signature .....

*P525/1*

*CHEMISTRY*

*PAPER 1*

*2<sup>3</sup>/<sub>4</sub> Hours*

**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 =  $8.314 \text{ j mol}^{-1}\text{k}^{-1}$
- \*Molar volume of a gas at s.t.p is 22.4 litres

**For examiners use only**

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 =  $90 \text{ kJ mol}^{-1}$

Bond dissociation energy of hydrogen =  $436 \text{ kJ mol}^{-1}$

First ionization energy of potassium =  $418 \text{ kJ mol}^{-1}$

Lattice energy of potassium hydride =  $710 \text{ kJ mol}^{-1}$

Enthalpy of formation of potassium hydride =  $-62 \text{ kJ mol}^{-1}$  (3 marks)

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2. An organic compound Z has a structure



**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. (1½ 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. (1½ 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  $^{79}_{35}\text{Br}$  and  $^{81}_{35}\text{Br}$ . Determine which of the two isotopes is the most abundant. (2½ marks)

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(c) Sketch the mass spectrum for bromine.

(1½ marks)

5. (a) Oxygen diffuses 2.31 times as fast as a compound Z with the formula Ni(CO)<sub>n</sub>.

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)

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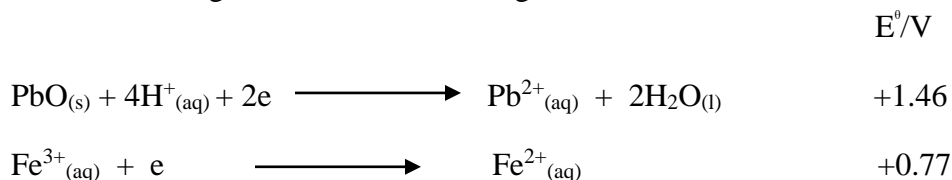
(ii) oxidation number of nickel in compound Z. (1/2 mark)

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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;



(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  $\text{CH}_3(\text{CH})_{10}\text{CH}_2\text{OH}$  describe briefly how a synthetic detergent can be prepared. (4 1/2 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 (1½ marks)

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Equation(s) (2½ marks)

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

Observation (1½ marks)

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Equation(s) (2½ marks)

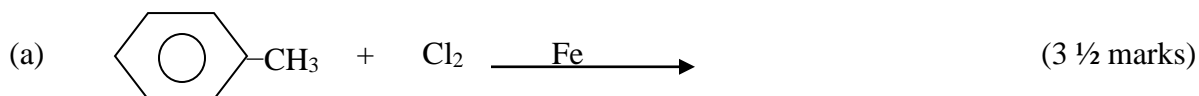
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**SECTION B: (54 Marks)**

**Answer six questions ONLY**

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



Mechanism

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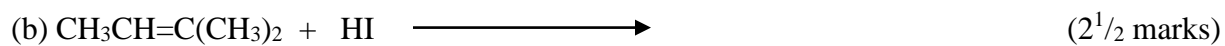
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Mechanism

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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
$\text{CS}_2$			
$\text{POBr}$			
$\text{SnO}_3^{2-}$			

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(b) Compare the bond angle of POBr and SnO<sub>3</sub><sup>2-</sup>. 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 <sup>-1</sup>	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 (1 1/2 marks)

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13. (a) Explain what is meant by the term **partition coefficient**. (1 1/2 marks)

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(b) 100cm<sup>3</sup> of an aqueous solution of X containing 30g per litre of X was shaken with 100cm<sup>3</sup> of trichloromethane. The distribution coefficient of X between trichloromethane and water is 2. Calculate the mass of X which was extracted. (2 1/2 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 50cm<sup>3</sup> of trichloromethane. (4 marks)

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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  $2.63\text{gdm}^{-3}$  at 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.

(1½ marks)

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

(i) Identify Y ( 1/2 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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(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



(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  $2.67 \times 10^{-2}$  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.**

## THE PERIODIC TABLE

1	2											3	4	5	6	7	8
1 H 1.0																1 H 1.0	2 He 4.0
3 Li 6.9	4 Be 9.0											5 B 10.8	6 C 12.0	7 N 14.0	8 O 16.0	9 F 19.0	10 Ne 20.2
11 Na 23.0	12 Mg 24.3											13 Al 27.0	14 Si 28.1	15 P 31.0	16 S 32.1	17 Cl 35.4	18 Ar 40.0
19 K 39.1	20 Ca 40.1	21 Sc 45.0	22 Ti 47.9	23 V 50.9	24 Cr 52.0	25 Mn 54.9	26 Fe 55.8	27 Co 58.9	28 Ni 58.7	29 Cu 63.5	30 Zn 65.7	31 Ga 69.7	32 Ge 72.6	33 As 74.9	34 Se 79.0	35 Br 79.9	36 Kr 83.8
37 Rb 85.5	38 Sr 87.6	39 Y 88.9	40 Zr 91.2	41 Nb 92.9	42 Mo 95.9	43 Tc 98.9	44 Ru 101	45 Rh 103	46 Pd 106	47 Ag 108	48 Cd 112	49 In 115	50 Sn 119	51 Sb 122	52 Te 128	53 I 127	54 Xe 131
55 Cs 133	56 Ba 137	57 La 139	72 Hf 178	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 Tl 204	82 Pb 207	83 Bi 209	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)															
			57 La 139	58 Ce 140	59 Pr 141	60 Nd 144	61 Pm (145)	62 Sm 152	63 Eu 150	64 Gd 152	65 Tb 159	66 Dy 162	67 Ho 165	68 Er 167	69 Tm 169	70 Yb 173	71 Lu 175
			89 Ac (227)	90 Th 232	91 Pa 231	92 U 238	93 Np 237	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf 251	99 Es (254)	100 Fm (257)	101 Mv (256)	102 No (254)	103 Lw

1.  Indicates atomic number.
2.  Indicates relative atomic mass.