

NAME.....COMB.....

SIGN.....

P525/1

JUL/AUG 2019

CHEMISTRY

2 ½ HOURS



UGANDA ADVANCED CERTIFICATE OF EDUCATION

END OF TERM TWO EXAMINATIONS

CHEMISRTY

(Principal subject)

Paper one

2 Hours 30 minutes.

INSTRUCTION TO CANDIDATES:

- Answer all questions in this paper
- Illustrate your answer with equations where applicable

SECTION A (46 MARKS)

1. A compound contains 79.78% chlorine and the rest aluminium. The vapor of this compound has density $2.28 \times 10 \text{ gm}^{-3}$ at 1427K and $1.013 \times 10^5 \text{ pa}$.

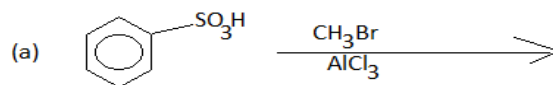
(a) Determine the molecular formula of Q and draw its structure (3 marks)

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(b) State the conditions under which the above structure exists. (1 mark)

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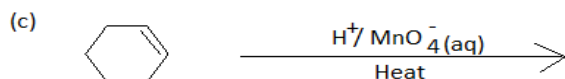
2. Complete the following equations and in each case state the IUPAC name for the major product (6 marks)



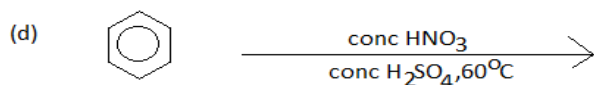
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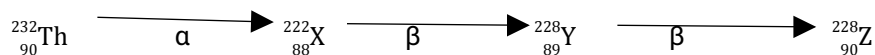


Name.....



Name

3. (a) a radioactive isotope of the element Thorium $^{232}_{90}\text{Th}$ decays according to the following scheme.



Identify X, Y and Z. (1 ½ marks)

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- (b). (i) what is meant by stability of nucleus? (1 mark)

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- (ii) explain the factors that determine the stability of the nucleus. (2marks)

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4. Two isomeric compounds X and Y have the following percentage compositions by mass, carbon, hydrogen and chlorine with 66.6%, 5.5% and 28.1% respectively. the molecular mass of compounds is 126.5.

(a) Determine the molecular formula of X and Y. (3 marks)

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- (b) (i) one of the compounds X, yields a white precipitate when warmed with aqueous silver nitrate, but Y does not. Explain the observation. (1 ½ marks)

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(ii) suggest a structure for X, and give one of possible structures for Y (1mark)

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5. Distinguish between the following pair of compounds using suitable reagents and in each case state the observations.

(a) Ethyne and ethanol (3marks)

Reagent

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Observation

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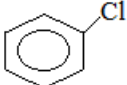
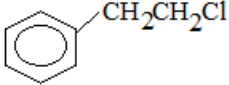
(b) $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)_2$ and $\text{CH}_2=\text{CHCH}(\text{CH}_3)_2$ (3marks)

Reagent

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Observation

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(c)  and  (3marks)

Reagent

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Observation

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6. (a) Explain why lithium does not form peroxide or super oxide when burnt in oxygen. (2marks)

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(b) State what is observed when potassium superoxide is dropped in water. write equation for

the reaction. (2 ½ marks)

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7. (a). what is meant by; (1mark @)

(i) Osmosis

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(ii) Osmotic pressure

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(b). state the significance of osmosis (1marks)

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(c) the osmotic pressure of solution containing 1.24% of a polymer is 3.1×10^{-3} atmospheres at 25°C . Determine the relative molecular mass of the polymer. ($R=0.0821 \text{ atm mol}^{-1}\text{C}^{\circ}$). (2 ½ marks)

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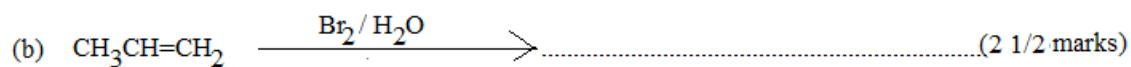
8. Complete the equations below and outline the mechanism of each reaction.



Mechanism

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Mechanism

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9. Given the following thermochemical data;

Salt	Hydration energy (KJmol ⁻¹)	Lattice energy (KJmol ⁻¹)
AX	880	860
BX	790	800

(a) Which salt is more soluble (1 mark)

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(b) Explain your answer (2 ½ marks)

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SECTION B (54 MARKS)

10. (a) State Boyle's law (1 mark)

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(b). The table below shows the time (t) taken for gases of different molecular mass (Mr) to diffuse through a narrow opening under similar conditions.

t (s)	25.00	34.23	41.67	47.62
Mr	16	30	44	58

Plot a graph of rate of diffusion, (1/t) against $\sqrt{\frac{1}{M_r}}$ (4 marks)

c) Using your graph in (b) above, find the molecular mass of a gas;

i) whose rate of diffusion is 0.025s^{-1} (1 mark)

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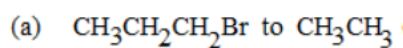
ii) that takes 38.42s to diffuse (2 marks)

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d) State four applications of gaseous diffusion (2 marks)

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11. Write equations to show how each of the following conversions can be effected and indicate the reagents and conditions for the reactions. (1 ½ marks @)

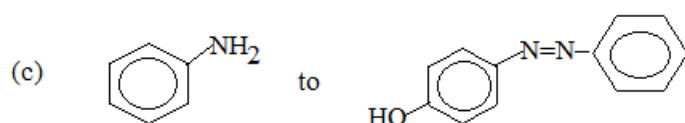


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(b) CH_3CHO to $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$

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12. The table below shows the first ionization energy in KJmol^{-1} of the elements A, B and C. one of the elements belongs to group VII.

Element	1 st I.E	2 nd I.E	3 rd I.E	4 th I.E
A	730	1500	7730	10500
B	500	4560	6900	9010
C	580	1815	2740	8720
D	1310	3460	5300	7020

(a) (i) define the term ionization energy (1mark)

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(ii). Identify element that belong to group I of periodic table and give reason for your answer.

(1 ½ marks)

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(iii). Which of the following elements form a cation with charge +3? (1 ½ marks)

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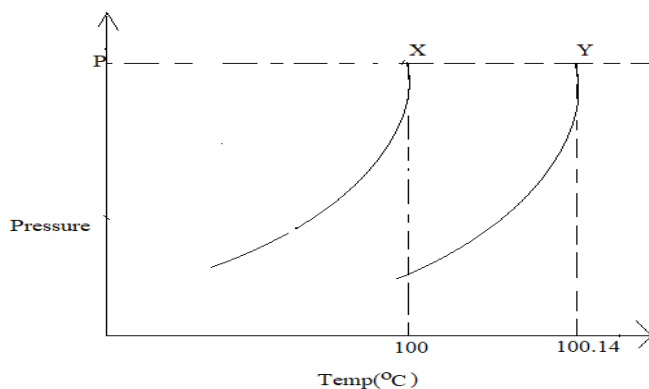
(iv). Write the formula of the compound between atoms of the element B and D. (1 ½ marks)

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(b) Explain why there is increase in successive ionization energy. (2 ½ marks)

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13. 5.5g of a non-volatile substances B was dissolved in 125g of a solute. The vapour pressure curve of the solution and pure solvent at constant pressure P are shown.



a) identify the curve for the solution and the solvent(½mark @)

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- b) calculate the molecular mass of B (boiling point elevation constant for the solvent; K_b is $0.52^\circ\text{Cmol}^{-1}\text{kg}^{-1}$) (3marks)

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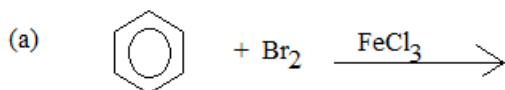
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- c) state the limitations of your calculations(2marks)

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14. complete the following organic reactions and outline the accepted reaction mechanism. (3 ½ marks @)



Mechanism

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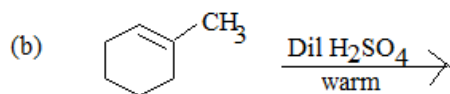
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Mechanism

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15. Explain the following observations

- (a) the heat of hydrogenation of cyclohexane is -120 KJmol^{-1} and that of benzene is -210 KJmol^{-1} . (3marks)

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- (b) the melting point of methylbenzene is -95°C lower than that of benzene which has the highest molecular weight. (3marks)

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- (c) methylbenzene reacts bromine in presence of Aluminium chloride catalyst to form two products, while benzenesulphonic acid forms one product. (4marks)

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16. a mass spectrum of chlorine shows the molecular peaks at 70, 72 and 74.

- (a) Explain this observation (2marks)

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- (b) The peaks at 70, 72 and 74 are in the ratio of 9:6:1. calculate the average atomic mass of chlorine. (3marks)

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- (c) Calculate the relative abundance of Cl^{35} and Cl^{37} (2marks)

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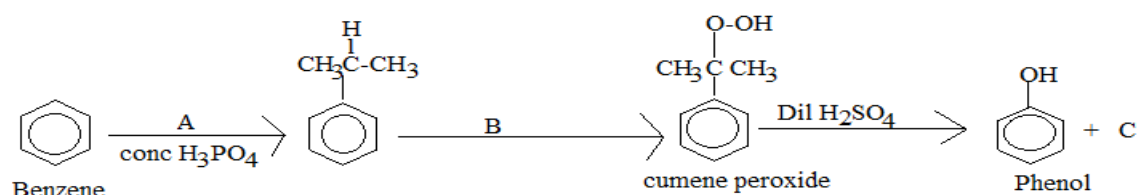
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17. The flow chart below shows how phenol (hydroxybenzene) can be made from benzene and compound A in the process below.



- (a) (i) identify compounds A, B and C. (3marks)

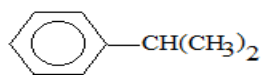
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- (ii). What is the name given to the process above? (1mark)

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(b) Outline the mechanism for formation of (2 ½ marks)

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