CHEMISTRY DEPARTMENT 2023
S.6 BRAINSTORMING TEST
TEST ON;ANALYSIS QUESTIONS

NAME……**INDEX number**……
Signature …… **expected score(%)**……
Instructions; Attempt *all questions in this paper.*

1. (a) An organic compound **Y** contains 68.8%, carbon, 4.92% hydrogen and the
rest being oxygen.

(i) Calculate the empirical formula of **Y**. (1 ½ mks)

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(ii) The vapour density of **Y** is 61. Determine the molecular formula of **Y**. (1mark)

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b) **Y** burns with a sooty flame and its aqueous solution has pH 7.
Identify **Y**. (½ mks)

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c) Write equations;

i) for the reactions between **Y** and methanol. Indicate the conditions for the reaction. (01mark)

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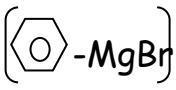
ii) to show how **Y** can be obtained from phenyl magnesium bromide  (2 ½ mks)

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d) Outline the mechanism for the reaction in (c) (i). (3 ½ mks)

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2. When 0.0291 g of compound **R**was burnt, it gave 0.0581 g of carbon dioxide and 0.0239 g of eater.

(a) Calculate the empirical formula of **R**. *(2½ marks)*

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(b) When 0.140 g of **R** was vaporized at 20°C and 740 mm Hg, it occupied a volume of 39.5 cm^3. Determine the:

(i) relative molecular mass of **R**. *(02 marks)*

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(ii) molecular formula of **R** *(1½ marks)*

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(c) On addition of sodium hydrogen carbonate to **R**, there is effervescence of colourless gas.

(i) Identify **R**. (½ mark)

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3. (a) Write the structural formulae and names of all possible isomers of an organic compound having the molecular formula C_3H_8O

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(b) When one of the isomers**P** in (a) above was reacted with acidified potassium dichromate compound **Q** was formed. **Q** reacted with phosphorous pentachloride to form compound **R** and hydrogen chloride gas
Identify

P……..

Q……..

R……..

4. A certain compound X contains 62.1% carbon, 10.3% hydrogen the rest being oxygen. The vapour density of X is 29.

(a) Determine

(i) the empirical formula of X *(2½ marks)*

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(ii) the molecular formula of X *(1 mark)*

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(b) (i) Write down the structures of the possible isomers of X

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(ii) Compound X gave a silver mirror when treated with ammoniacal silver nitrate solution. Identify X *(½ marks)*

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5. 1.64 g of a bromo alkylhalide **Q**, $C_nH_{2n+1}Br$ was refluxed with aqueous sodium hydroxide. The resultant solution was cooled and acidified with excess nitric acid and diluted to 100 cm^3. 10 cm^3 of solution required 13.0 cm^3 of 0.1 M silver nitrate for complete precipitation of silver bromide.

(a) Write equations of reaction(s) that take place. *(2 marks)*

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(b) Calculate the molecular formula of **Q** *(2½ marks)*

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(c) Write the structural formulae and IUPAC names of all the possible isomers of **Q**. *(2 marks)*

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6. (a) 1.363g of compound **R** containing carbon, hydrogen and bromine gave on combustion 1.10g of Carbon dioxide and 0.45g of water.

(i) Calculate the empirical formula of R. (2½ marks)

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(ii) when 0.35g of Y is vapourised, it occupies 39.5cm^3 of 20^{o}c and 750mmHg. Calculate the molecular formula of Y. (3 marks)

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(b) **Y** forms an alkyne **Z** with hot alcoholic potassium hydroxide . **Z** reacts with ammoniacal silver nitrate solution to form a white ppt.

Identify **Y**

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7. (a) $30cm^3$ of a hydrocarbon Q was exploded with $200cm^3$ of oxygen in excess. The volume of the residual gas on cooling to room temperature was found to be $155cm^3$. When the residual gas was treated with concentrated potassium hydroxide solution, the volume reduced to $35cm^3$.

a) Calculate the molecular formula of Q. (3marks)

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b) Write the structures of all possible open chain isomers of Q. (1mark)

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8. (a) An organic compound Z has a molecular formula $C_3H_6Br_2$.

Write down the structural formula and IUPAC names of all isomers of Z. (3marks)

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b) When Z was heated with sodium metal in ethanol a compound Y was formed. Y reacts with water in the presences of sulphuric acid and Mercurous sulphate at 60^0C to form a compound **X**. **X** does not react with Fehling's solution but forms an orange precipitate with Brady's reagent. Identify compound X, Y and Z.

(1½ marks)

X ……

Y ……

Z ……

c) Write the equation and suggest the mechanism for the reaction between

i) Z and sodium metal in ethanol.

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ii) X and Brady's reagent. (2 ½ mks)

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9. A Compound Y contains carbon , hydrogen and nitrogen only. On complete combustion ,2.325g of Y yielded 6.6g of carbon dioxide and 295.4cm^3 of nitrogen gas measured at 15^{o}C and at 760mmHg.

(a) Calculate the empirical formula of **Y**. (05marks)

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(b) When compound was steam distilled at 97^{o}C and 755mmHg , the distillate contained 45.49 % by mass of **Y**. (The saturated vapour pressure of water at this temperature 650mmHg). Determine the molecular formula of **Y**. (3$\frac{1}{2}$marks)

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(c) **Y** burns with a sooty flame. Write the structural formula and name of **Y**. (01mark)

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(d) When **Y** treated with a mixture of concentrated hydrochloric acid and sodium nitrite solution at 5°C , compound **Z** was formed. State what would be observed and write equation for the reaction when

(i) an alkaline solution of naphthalen – 2- ol was added to **Z**. (02marks)

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(ii) **Z** was warmed with acidified water. (02marks)

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END.