NAME:…… RANDOM: ……

SCHOOL: …….

**P525/1**
**CHEMISTRY**
**PAPER 1**
**JULY/AUG 2024**
**$2\frac{3}{4}$ Hours**

**ASK INTEGRATED TEACHERS MOCK EXAMINATIONS BURREAU**

# AITEL JOINT MOCK EXAMINATIONS.

## Uganda Advanced Certificate of Education

CHEMISTRY

**Paper 1**

**2 hours 45 minutes**

**INSTRUCTIONS TO CANDIDATE.**

*This paper consists of two sections A and B*

*Section A is compulsory*

*Attempt only six questions in section B*

*Any work done on pencil will not be marked*

*All working must be clearly shown*

*Silent non-programmable scientific calculators may be used.*

| FOR EXAMINER'S USE ONLY | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | | | | | | | | | | | | | | | | |

## SECTION A: (46 MARKS)

Answer all questions inn this section

1. (a) write the equation of the reaction between sodium hydroxide and

(i) Lead (IV) oxide $(1\,{}^{1}/_{2}\,marks)$

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(ii) Chromium (III) oxide $(1\,{}^{1}/_{2}\,marks)$

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(b) Concentrated nitric acid was added to a solution of manganese (II) sulphate followed by Lead (IV) oxide

(i) State what was observed $({}^{1}/_{2}\,marks)$

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(ii) Write equation for the reaction $(1\,{}^{1}/_{2}\,marks)$

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2. (a) The emission spectrum of the element hydrogen contains several series of lines.

(i) Give a general expression for the energy of the lines in a hydrogen line spectrum. (1 mark)

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(ii) What do the different lines in a given series have in common? (1 mark)

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(b) The frequency of hydrogen at the point of ionization is $32.8\,x10^{14}$ Hz. Calculate the ionization energy of hydrogen in KJmol $^{-1}$. (Planks constant = 6.6 x $10^{-34}$ Js) (3 marks)

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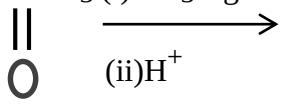
3. Complete the following organic equations and in each case name the main organic product

(a) $CH_3\,C\,CH_3$ (i) $CH_3MgI$ (1 mark)



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(b) $CH_3\,C = CH_2$ $\xrightarrow{Mn\bar{O}_4/\bar{O}H}$ (1 mark)

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(c) n $(CH_2=CCH= CH_2)$ $\xrightarrow{\text{catalyst}}$ (1 mark)

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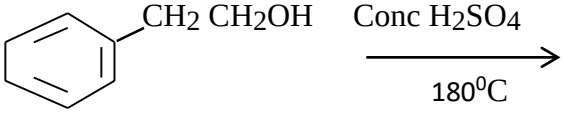
(d)




(1 mark)

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(e) $(CH_3COO)_2Ca$ $\xrightarrow{\text{heat}}$ (1 mark)

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4. Silver Chromate is sparingly soluble inn water.

(a) write

(i) Equation for the solubility of silver chromate in water (1 mark)

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(ii) The expression for solubility product of silver chromate (1 mark)

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(b) Calculate the silubility of silver chromate in the presence of 0.005M potassium chromate (VI) solition ($Ksp = 9 \times 10^{-12}\ mol^3dm^{-9}$) (3 marks)

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5. Complete the following equations in each case outline the mechanism for the reaction

(a) $CH_3CH{=}CH_2 \xrightarrow[\text{Heat}]{H^+/\ H_2O}$ (2 marks)

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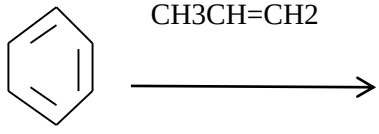
(b) 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6. state what is observed and write equation for the reaction that would take place when sodium hydroxide solution is added to :

(a) iron (ii) sulphate solution $(1\,{}^{1}/_{2}\,marks)$

Observation

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Equation $(1\,{}^{1}/_{2}\,marks)$

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(b) Chromium (III) sulphate solution

Observation $(1\,{}^{1}/_{2}\,marks)$

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Equation $(1\,{}^{1}/_{2}\,marks)$

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7. (a) State Raoult's law (1 mark)

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(b) A solution conntains 1 mole of trichloromethane and 4 moles of propanone has vapour pressure of 0.4 atmospheres at $25^{\circ}$C. At this temperature the vapour pressure of pure trichloromethane and propanone are 0.359 and 0.453 atmospheres respedtively.

(i) calculate the vapour pressure of the solution. State your assumption(s)

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(ii)State whether trichloromethane and propanone form a minimum or maximum boiling azeotrope. Give a reason.

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8. (a) A chloride of chromium X conntains 19.512% chromium, 39.96% chlorine and the rest water of crystallization.

Deerminne:

(i)The empirical formula of X $(1\,{}^{1}/_{2}\,marks)$

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(ii) The molecular formular of X (Vapour dennsity of X is 133.25) (1 mark)

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(c)An aqueous solution of X was treated with excess sodium hydroxide followed by hydrogen peroxide.

(i) State what was observed. (1 mark)

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

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9.(a) Draw the structure and name the shape of the following oxyannions of sulphur

| oxyanion | structure | shape |
|---|---|---|
| $SO_3^{2-}$ | | |

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|---|---|---|
| $S_2O_3^{2-}$ | | |
| $S_4O_6^{2-}$ | | |

(2 marks)

(c) Write the equation pf the reaction between

(i) $S_2O_3^{2-}$ and Iodine solution $(1\,{}^{1}/_{2}\ marks)$

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(ii) $S_2O_8^{2-}$ and potassium iodide $(1\,{}^{1}/_{2}\ marks)$

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## SECTION B (54 MARKS)

***Attempt only six questions in this section***

10. Elements tinn and lead belong to group (IV) of the periodic table. Describe the reactions of the elements with;

(a) Water (3 marks)

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(b) Concentrated sulphuric acid (3 marks)

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(c) Alkalis (3 marks)

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11. Define the terms

(i) Eutectic point (2 marks)

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(ii) Eutectic mixture (2 marks)

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(b) Two metals A and B form a eutectic mixture with a eutectic point of 80°C and 72% B

Draw a well labelled phase diagram for the two metals. (Melting points of A and B are 242°C and 185°C (4 marks)

(c) State two similarities beyween eutectic mixture and a metal (1 mark)

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12. The molecular formular of an organnic compound Q is $C_4H_8O$. Compound Q forms a yellow precipitate with Brady's reagent

(a) Write the structural formulae annd names of all the possible isomers of A (2 marks)

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(b) Q reacts with iodine inn an aqueous solution of sodium hydroxide to form a yellow precipitate (1 mark)

(i) Identify Q

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(ii) Write the equation for the reaction which took place $(1\,{}^{1}/_{2}\,marks)$

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(c) Write;

(i) Equations indicating conditions to show how Q can be converted to an alkene (2 marks)

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(ii) Equation and outline the mechanism for the reaction between Q and Brady's reagent $(2\,{}^{1}/_{2}\,marks)$

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13. (a) Explain the term buffer solution (2 marks)

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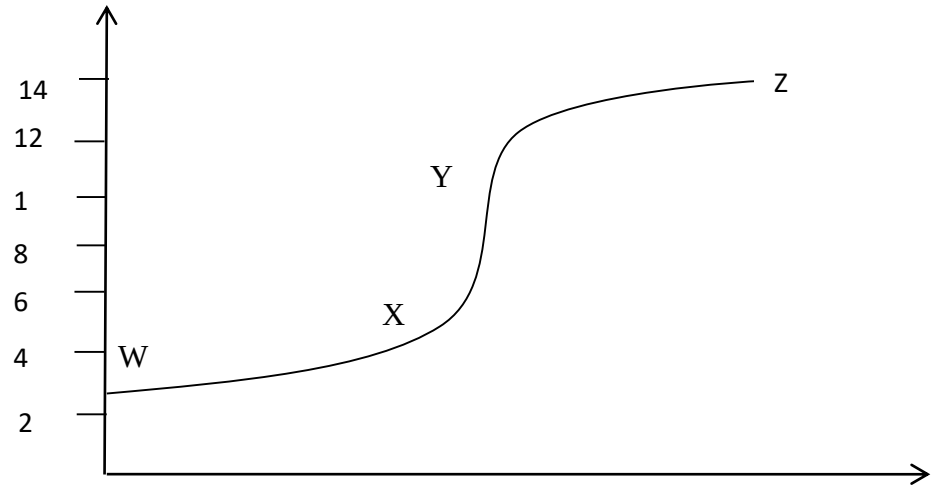
(b) the graph below shows the changes in pH during the titration of a weak acid (ethanoic acid) with a strong alkali (sodium hydroxide)




Volume of NaOH (aq) added

(i) Explain the shape of the graph ($5\,{}^{1}/_{2}\,marks$)

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(ii) Calculate the pH at mid-point of titration (Ka CH3COOH) = 1.8 x $10^{-5}$ $moldm^{-3}$ )
($1\,{}^{1}/_{2}\,marks$)

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14. (a) Outline the industrial preparationn of sulphuric acid from zinc sulphide (use equations only) (6 marks)

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(b) Write equation of the reaction between sulphuric acid and;

(i)Calcium phosphate $(1\,{}^{1}/_{2}\,marks)$

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(ii)Propan -2-ol $(1\,{}^{1}/_{2}\,marks)$

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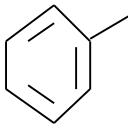
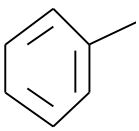
15. Name a reagent(s) that can be used to distinguish between the following pairs of compounds. In each case state what would be observed if the reagent is treated separately with each member of an pair

(a)  $COCH_2CH_3$ AND  $COCH_3$

Reagent: (1 mark)

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Observations (2 marks)

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(b) $CH_3CH_2CH_2CH_2OH$ and $(CH_3)_3COH$

Reagent: (1 mark)

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Observations (2 marks)

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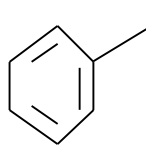
(c) $CH_3CH_2CH_2CH_2NH_2$ and 


Reagent: (1 marks)

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Observations (2 marks)

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16.(a) (i) What is the chemical nature of soap (1 mark)

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(iii) A fat has a molecular formular $C_{17}H_{35}COOR$. Writs an equation for the reaction leading to the formationn of soap from the fat (2 marks)

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(b) (i) Explain why soapless detergents are better cleansing agents than soaps. (3 marks)

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(ii) Starting from $CH_3(CH_2)_{10}CH_2OH$ show how a soapless detergent can be synthesized. (3 marks)

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17. Explain the following observations

(a) Hydrofluoric acid is a weaker acid than hydro-bromic acid. (3 marks)

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(b) The pH of a solution of chromium (III) chloride is less than 7. (3 marks)

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(c) Ammonia is a weaker base than ethyl amine. (3 marks)

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