Candidate's Name: Joseph Wilson Ogwang.

Signature: .....

Random No.					Personal No.		
P	5	2	5	/	0	5	0

(Do not write your School/Centre Name or Number anywhere on this booklet.)

P525/1
CHEMISTRY
Paper 1
Nov./Dec. 2018
2¾ hours

2019. 01. 09.

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

CHEMISTRY

Paper 1

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 attached at the end of the paper.

Mathematical tables (3–figure tables) are adequate or non-programmable scientific electronic calculators may be used.

Illustrate your answers with equations where applicable.

Where necessary, use the following:

Molar gas constant, $R = 8.31\ JK^{-1}\ mol^{-1}$.
Molar volume of gas at s.t.p. is 22.4 litres.
Standard temperature = 273 K.
Standard pressure = $101325\ Nm^{-2}$.

For Examiners' Use Only																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	**Total**

©2018 Uganda National Examinations Board

SECTION A: (46 MARKS)

Answer **all** *questions in this section.*

1. Various concentrations of **X** and **Y** were reacted at a constant temperature. The table below shows the initial concentrations of **X** and **Y** and their intitial rates for the reaction.

Experiment	[X] (mol dm^{-3})	[Y] (mol dm^{-3})	Initial rate (mol s^{-1})
1	0.2	0.2	3.5×10^{-4}
2	0.4	0.4	1.4×10^{-3}
3	0.8	0.4	5.6×10^{-3}

(a) State the order of reaction with respect to **X** and **Y**.

(i) **X** ..... 2 ✓ ..... (½ mark)

02.

(ii) **Y** ..... 0 ✓ ..... (½ mark)

(b) Give reasons for your answers in (a). (02 marks)

Doubling the concentration of X while keeping the concentration of Y constant, the rate goes up four times ⇒ order 2 w.r.t X

Doubling both concentration of X and Y, the rates goes up four times ⇒ Zero order w.r.t Y.

02.

(c) Determine the overall order of the reaction. (½ mark)

01

=(2+0) =2 ✓

(d) Calculate the value for the rate constant for the reaction. (1½ marks)

Using experiment 1. Rate = $K[X]^2[Y]^0$

01½

$3.50 \times 10^{-4} = K(0.2)^2$

06½

$K = 8.75 \times 10^{-3}$ (Ignore units).

2. (a) A solid ***Q*** contains 9.37% by mass of magnesium, 10.39% nitrogen and 42.18% water.

(i) Calculate the empirical formula of ***Q***. (02 marks)

% of Oxygen atoms = $100 - (9.37 + 10.39 + 42.18) = 38.06$

Elements:	Mg	N	O	H_2O
No of Moles.	$\frac{9.37}{24}$	$\frac{10.39}{14}$	$\frac{38.06}{16}$	$\frac{42.18}{18}$
2½. Mole ratio	$\frac{0.39}{0.39}$	$\frac{0.781}{0.39}$	$\frac{2.38}{0.39}$	$\frac{2.34}{0.39}$

1 : 2 :: 6 : 6

Empirical formula Q = $MgN_2O_6H_6$

(i) Determine the molecular formula of **Q**. *(01 mark)*
(RFM of **Q** *= 256)*

Molecular formula $= (MgN_2O_6 \cdot 6H_2O)n = 256$.

$256n = 256$

$n = 1$

$= MgN_2O_6 \cdot 6H_2O$

01

(b) Solution of **Q** reacts with iron(II) suphate in the presence of concentrated sulphuric acid to form a brown ring. Identify **Q**. *(½ mark)*

Magnesium Nitrate hexahydrate or $Mg(NO_3)_2 \cdot 6H_2O$

01/2

(c) Write equation for the reaction that would take place if **Q** was heated. *(1½ marks)*

$2Mg(NO_3)_2 \cdot 6H_2O(s) \longrightarrow 2MgO(s) + 4NO_2(g) + O_2(g) + 6H_2O(g)$.

01½

3. Name a reagent that can be used to distinguish between the following pairs of compounds.

In each case, state what would be observed if each member of the pair was treated with the reagent you have named.

(a) $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}}\, C \equiv C\, CH_3$ and $CH_3CH_2\, \underset{\displaystyle CH_3}{\underset{|}{CH}}\, C \equiv CH$

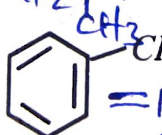
Reagent Ammoniacal silver nitrate solution *(01 mark)*

or Ammoniacal copper(I) chloride solution

Observation *(02 marks)*

03. $CH_3\underset{\displaystyle CH_3}{\underset{|}{CH}}C \equiv CCH_3$ – No observable change

$CH_3CH_2\underset{\displaystyle CH_3}{\underset{|}{CH}}C \equiv CH$ – White ppt formed.

(b)  and CH_3CHO

= No observable change

= Reddish-brown ppt formed.

3. 06

Reagent Fehling's solution or Iodine soln and Sodium hydroxide solution *(01 mark)*

03.

Observation *(02 marks)*

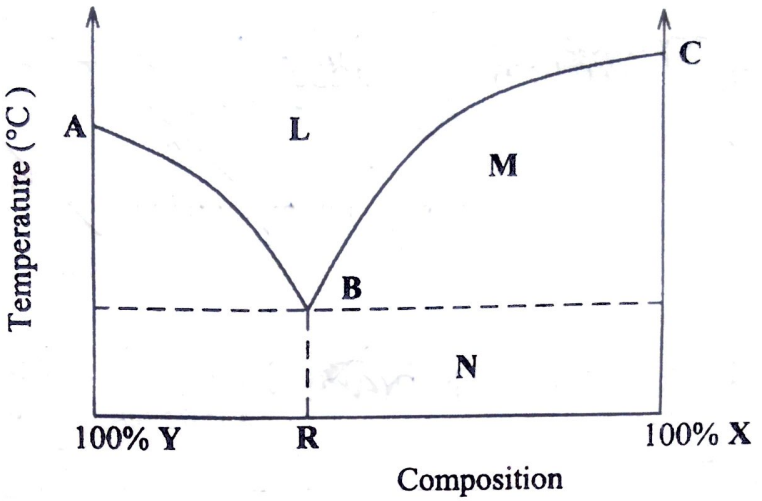
OR.  CHO – No observable change

CH_3CHO – pale yellow ppf or yellow ppf.

$CH_3CHO + 3I_2(aq) + 4NaOH(aq) \longrightarrow CHI_3(s) + HCOONa(aq) + 3NaI(aq) + 3H_2O$

06

4. The temperature – composition diagram for a system containing two components *X* and *Y* is shown below.



(a) State what the following represents;

(i) Regions: **L** Liquid mixture or liquid phase. (½ mark)

M Solid X and Liquid mixture (½ mark)

N Solid X and Solid Y or Solid mixture (½ mark)

(ii) Points: **A** Freezing pt or Melting pt of pure Y (½ mark)

B Eutectic point. (½ mark)

C Melting point of pure X. (½ mark)

(iii) Curves: **AB** Lowering or decreasing freezing pt of Y (½ mark)

BC Increasing freezing pt / Melting pt of X as amount of Y reduces. (½ mark)

06

(b) State what would happen when a mixture of composition ***R*** is heated. (½ mark)

Solid mixture Melts at B to a liquid mixture of the same composition, or solid mixture Melts.

5. Write equation for the reaction between aqueous sodium hydroxide and

(a) chromium(III) oxide. (1½ marks)

$Cr_2O_{3(s)} + 6\bar{O}H_{(aq)} + 3H_2O_{(l)} \longrightarrow 2Cr(OH)_6^{3-}{}_{(aq)}$

OR $Cr_2O_{3(s)} + 2\bar{O}H_{(aq)} + 3H_2O_{(l)} \longrightarrow 2Cr(OH)_4^-{}_{(aq)}$

(b) beryllium oxide. (1½ marks)

$BeO_{(s)} + 2\bar{O}H_{(aq)} + H_2O_{(l)} \longrightarrow Be(OH)_4^{2-}{}_{(aq)}$

OR $BeO_{(s)} + 2\bar{O}H_{(aq)} \longrightarrow BeO_2^{2-}{}_{(aq)} + H_2O_{(l)}$

(c) tin(II) oxide. (1½ marks)

$SnO_{(s)} + 2\bar{O}H_{(aq)} \longrightarrow SnO_2^{2-}{}_{(aq)} + H_2O_{(l)}$

04½ $SnO_{(s)} + 2\bar{O}H_{(aq)} + H_2O_{(l)} \longrightarrow Sn(OH)_4^{2-}{}_{(aq)}$

$SnO_{(s)} + \bar{O}H_{(aq)} + H_2O_{(l)} \longrightarrow Sn(OH)_3^-{}_{(aq)}$

6(b) $CH_3CH_2\overset{O}{\overset{\|}{C}}Cl + AlCl_3 \longrightarrow CH_3CH_2\overset{O}{\overset{\|}{C}}{}^{+} + AlCl_4^-$

6. Complete the following equations and in each case, write a mechanism for the reaction.

(a) $(CH_3)_2C=CHCH_3 \xrightarrow{HBr}$ *(2½ marks)*

Mechanism:

$(CH_3)_2C=CHCH_3 \longrightarrow (CH_3)_2\overset{+}{C}CH_2CH_3 + Br^-$

$H-Br$

$(CH_3)_2CCH_2CH_3$

Br

03

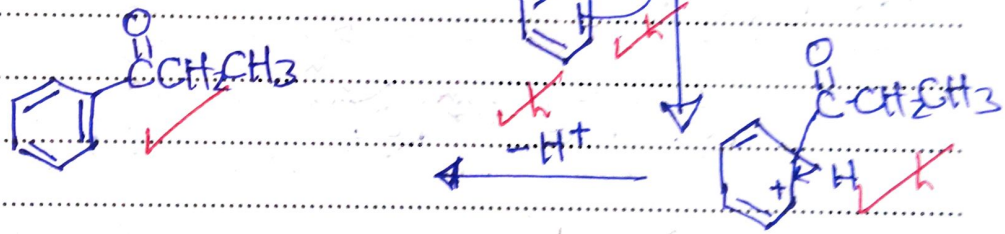
(b) $C_6H_6 + CH_3CH_2-\overset{O}{\overset{\|}{C}}-Cl \xrightarrow[50^\circ C]{AlCl_3}$ *(2½ marks)*

Reject H^+

Mechanism:

$CH_3CH_2\overset{O}{\overset{\|}{C}}Cl + AlCl_3 \longrightarrow CH_3CH_2\overset{O}{\overset{\|}{C}}{}^{+} + AlCl_4^-$

03



06

7. When a current of 0.65 A was passed through copper(II) sulphate solution using platinum electrodes for 35 minutes, 0.0143 g of hydrogen and 0.113 g of oxygen were evolved.

(a) Write equation for the reaction that took place at the

(i) anode. *(01 mark)*

$4OH^-(aq) \longrightarrow 2H_2O(l) + O_2(g) + 4e^-$

03

(ii) cathode. *(01 mark)*

$Cu^{2+}(aq) + 2e^- \longrightarrow Cu(s)$

or $2H^+(aq) + 2e^- \longrightarrow H_2(g)$

(b) Determine the quantity of electricity required to evolve 1 mole of gas at each electrode.

(ii) At the anode. *(02 marks)*

Quantity of electricity passed $= 0.65 \times 35 \times 60$

$= 1365C.$

02 $\therefore 0.113g$ of O_2 gas was liberated by 1365 C

$\therefore 32g$ of O_2 gas will be liberated by $\frac{32 \times 1365}{0.113}C$

$= 386685C$

(ii) At the cathode. No of Moles of H_2 evolved = 0.0143 *(01 mark)*

7.15×10^{-3} Moles of H_2 was evolved by 1365C $\quad \frac{2}{} = 7.15 \times 10^{-3}$

1 Mole of H_2 will be evolved by $\frac{1 \times 1365}{7.15 \times 10^{-3}} = 190909C$

01 / 06

8. State what would be observed and write equation for the reaction that would take place when:

(a) excess concentrated hydrochloric acid was added to lead(II) oxide. *(2½ marks)*

Yellow solid dissolved forming a colourless solution

$PbO_{(s)} + 4Cl^-_{(aq)} + 2H^+_{(aq)} \longrightarrow PbCl^{2-}_{4\,(aq)} + H_2O_{(l)}$.

OR $PbO_{(s)} + 4HCl_{(aq)} \longrightarrow H_2PbCl_{4\,(aq)} + H_2O_{(l)}$

(b) potassium iodide was added to copper(II) sulphate solution. *(2½ marks)*

Solution turns from blue to brown and a white solid / ppt is formed.

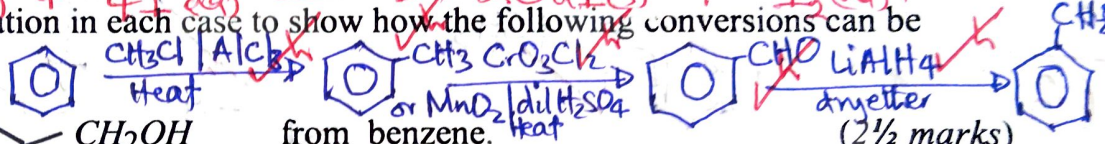
$2Cu^{2+}_{(aq)} + 4I^-_{(aq)} \longrightarrow Cu_2I_{2(s)} + I_{2(aq)}$.

$2Cu^{2+}_{(aq)} + 4I^-_{(aq)} \longrightarrow 2CuI_{(s)} + I_{2(aq)}$.

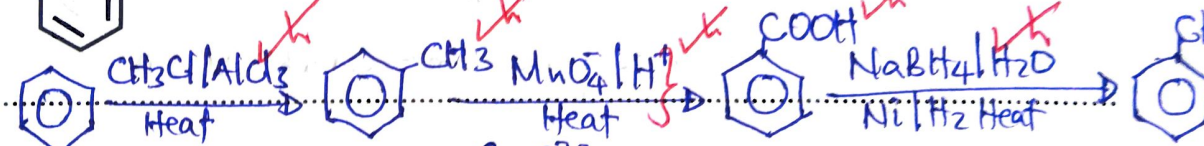
06

9. Write equation in each case to show how the following conversions can be effected:

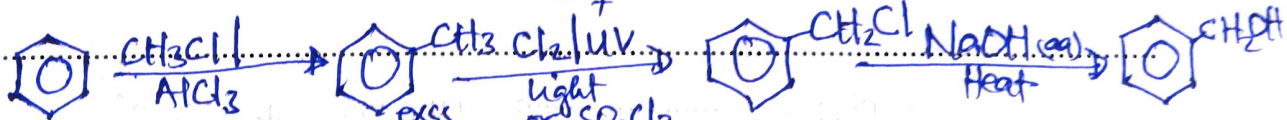
(a)  CH_2OH from benzene. *(2½ marks)*



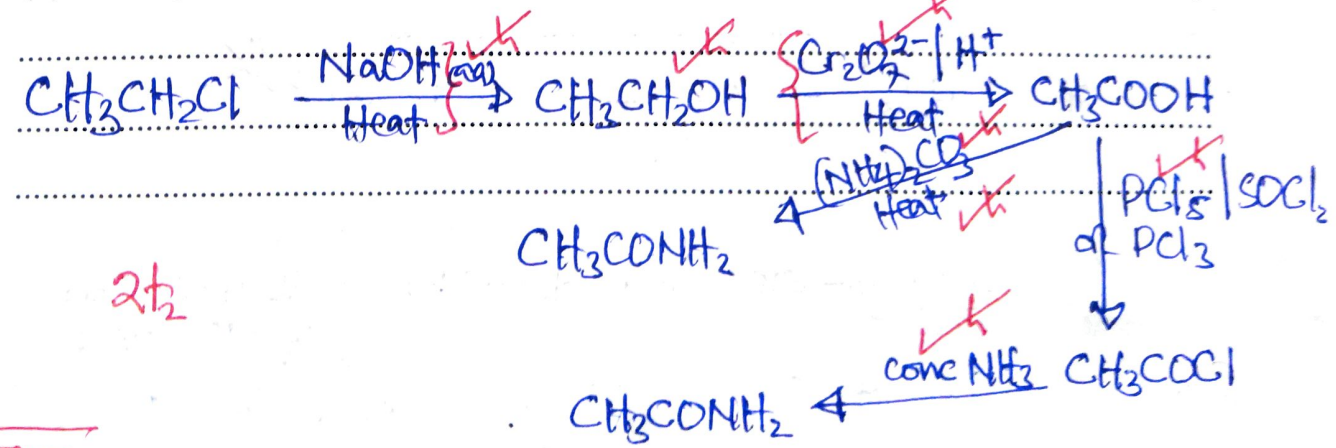
OR:



OR:



(b) $CH_3\,CONH_2$ from chloroethane. *(2½ marks)*

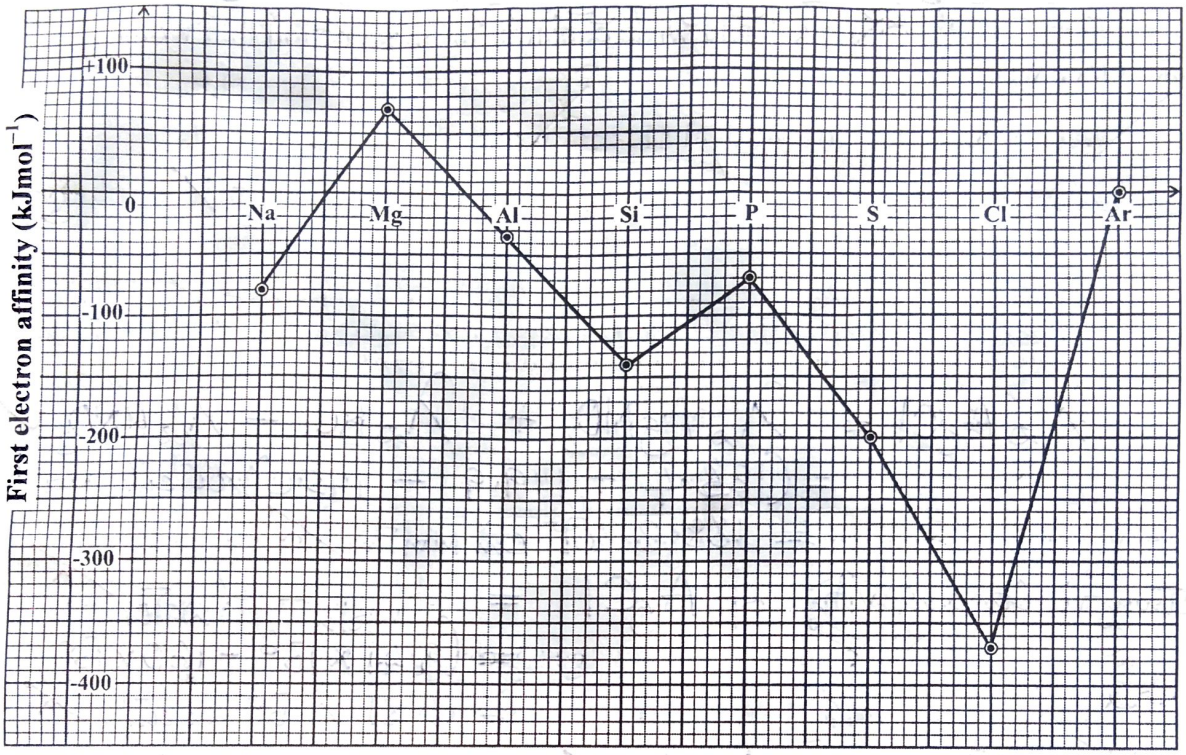


02 / 05

SECTION B: (54 MARKS)

Answer any **six** *questions from this section.*

10. The figure below shows the variation of the first electron affinity of the elements in Period 3 of the Periodic Table.



Explain each of the following observations:

(i) There is a general increase in the first electron affinity from sodium to argon. *(1½ marks)*

From Na to Argon, atomic radius decreases, effective nuclear charge increases, as a result, the attraction for the incoming electron/added electron increases thus 1st electron affinity increases.

(ii) The first electron affinity of magnesium is higher than that of aluminium. *(04 marks)*

Mg $1s^2 2s^2 2p^6 3s^2$, Al = $1s^2 2s^2 2p^6 3s^2 3p^1$

In Mg electron is added to an energy level that has completely filled 3S subshell which is stable, the electron experiences greater repulsion from existing electrons than nuclear attraction. In Al, 3P sub energy level has one electron and is unstable thus added electrons experience more attraction from nucleus

(iii) The first electron affinity of phosphorous is less than that of sulphur. *(3½ marks)*

P(15): $1s^2 2s^2 2p^6 3s^2 3p^3$, S(16): $1s^2 2s^2 2p^6 3s^2 3p^4$.

In Phosphorus, the electron is added to a half filled 3P subenergy level which is energetically stable thus the incoming electrons experiences more repulsion hence lower electron affinity.

In sulphur electron is added to the 3P subenergy level with 4 electrons which is energetically unstable, the incoming electron experiences more nuclear attraction than repulsion hence high electron affinity.

11. (a) Silver chloride dissolves in water according to the following equation.

$$AgCl_{(s)} \rightleftharpoons Ag^{+}_{(aq)} + Cl^{-}_{(aq)}.$$

Write the expression for the solubility product, *Ksp* of silver chloride.

$K_{sp} = [Ag^+][Cl^-]$ ✓ ..... *(01 mark)*

(b) The electrolytic conductivity of a saturated solution of silver chloride in water at 25°C is $3.41 \times 10^{-6}\ \Omega^{-1}\ cm^{-1}$ and that of pure water is $1.6 \times 10^{-6}\ \Omega^{-1} cm^{-1}$. Calculate the solubility product of a saturated solution of silver chloride at 25°C.

(The molar conductivities at infinite dilution of silver nitrate, potassium nitrate and potassium chloride are 133.4, 145.0 and 149.9 $\Omega^{-1}cm^2\ mol^{-1}$ respectively at 25°C). *(4½ marks)*

$\lambda_\infty AgCl = \lambda_\infty AgNO_3 + \lambda_\infty KCl - \lambda_\infty KNO_3$ ✓½

$= (133.4 + 149.9 - 145.0)\ \Omega^{-1}cm^2\ Mol^{-1}$.

$= 138.3\ \Omega^{-1}cm^2\ Mol^{-1}$. ✓½

Electrolytic Conductivity of AgCl = $K_{soln} - K_{water}$ ✓½

$= (3.41 \times 10^{-6} - 1.60 \times 10^{-6})$ 04½

$= 1.81 \times 10^{-6}\ \Omega cm^{-1}$. ✓½

$[AgCl] = \frac{1000 \cdot K}{\lambda}$ ✓½

$= \left(\frac{1.81 \times 10^{-6} \times 1000}{138.3}\right)$ Moldm^{-3} ✓½

$= 1.31 \times 10^{-5}$ Moldm^{-3}. ✓½

$\therefore Ksp = (1.31 \times 10^{-5})^2$ ✓½ $Mol^2 dm^{-6}$

$= 1.72 \times 10^{-10}$ ✓½ $Mol^2 dm^{-6}$

(Ignore units)

(c) Ammonia solution was added to a solution containing silver chloride.

(i) State how the solubility of silver chloride was affected. *(01 mark)*

Solubility of AgCl Increases. ✓ 01

(ii) Explain your answer in (c)(i) above. *(2½ marks)*

Ammonia rxts with Silver ions ✓½ to form Complex Ions which reduces / lowers the concentrations of Ag^+ ✓½ ions. The ✓½ more Silver chloride dissolves ✓½ inorder to restore the eq≡M and the value of solubility products. ✓½ 2½

12. Compound **T**, C_3H_6O reacts with 2, 4- dinitrophenylhydrazine to form a yellow precipitate.

(a) Write the names and the structural formulae of all possible isomers of **T**. *(03 marks)*

CH_3COCH_3 or $CH_3\overset{O}{\overset{\|}{C}}CH_3$ - propanone.

CH_3CH_2CHO or $CH_3CH_2\overset{O}{\overset{\|}{C}}H$ - propanal.

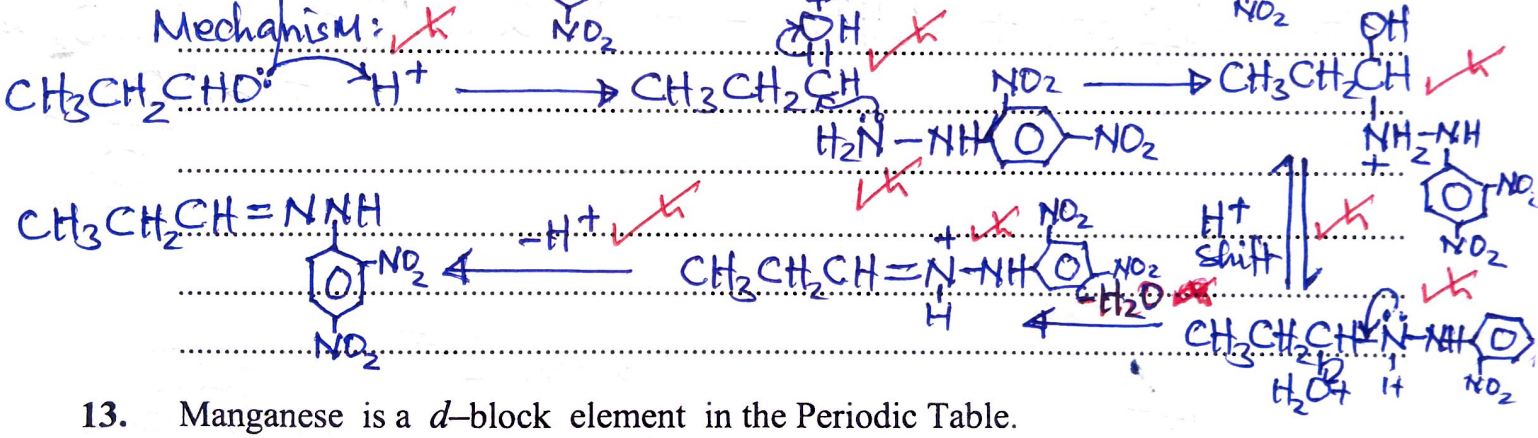
(b) **T** reacts with ammoniacal silver nitrate solution to form silver. Identify **T**. *(01 mark)*

T is propanal or $CH_3CH_2\overset{O}{\overset{\|}{C}}H$.

(c) Write equation and indicate a mechanism for the reaction between **T** and 2, 4- dinitrophenylhydrazine under acidic condition. *(05 marks)*

$CH_3CH_2CHO + H_2NNH(C_6H_3(NO_2)_2) \xrightarrow{H^+} CH_3CH_2CH{=}N{-}NH(C_6H_3(NO_2)_2) + H_2O$

Mechanism:



13. Manganese is a *d*–block element in the Periodic Table.

(a) Define the term ***d*–block element**. *(01 mark)*

d- block is an element in which the outer most Valency electrons fill the d-sub energy level (or are found in the d sub energy level.

(b) (i) Write the electronic configuration of manganese. *(½ mark)*

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^2$

(ii) State the common oxidation states exhibited by manganese in its compounds. *(1½ marks)*

+2, +4 and +7.

(iii) Write the formulae of oxides of manganese in each of the oxidation states you have stated in (b)(ii). *(1½ marks)*

MnO, MnO_2, Mn_2O_3 or Mn_2O_7

(c) A black oxide, **Y** of manganese was fused with a mixture of potassium hydroxide and potassium nitrate to give a compound which when treated with water gave a green solution.

The green solution turned purple when acidified with sulphuric acid.
Identify:

(i) **Y** Manganese (IV) oxide or MnO_2. *(01 mark)*

(ii) the ion that gives the green solution its colour. *(01 mark)*
Manganate(VI) ion or MnO_4^{2-}

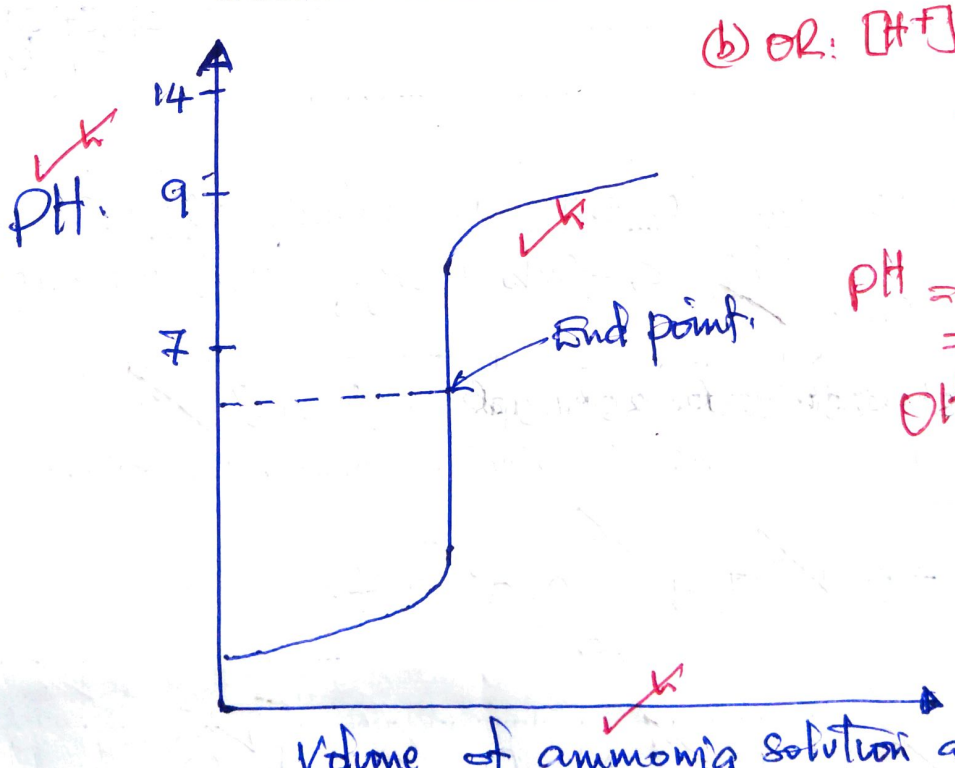
(iii) the ion that gives the purple solution its colour. *(01 mark)*
Manganate(VII) ion or MnO_4^-
Accept: Permanganate ion

(d) Write ionic equation for the reaction leading to the formation of the purple solution. *(1½ marks)*

$3MnO_4^{2-}(aq) + 4H^+(aq) \longrightarrow 2MnO_4^-(aq) + MnO_2(s) + 2H_2O(l)$

09

14. (a) (i) Sketch a graph to show the pH change when hydrochloric acid is titrated with ammonia solution. *(1½ marks)*



(b) OR: $[H^+] = K_a \cdot \frac{[Acid]}{[Salt]}$

$= \frac{1.8 \times 10^{-5} \times 0.04286}{0.0286}$

$= 2.70 \times 10^{-5}$

$pH = -\log[H^+]$

$= -\log 2.7 \times 10^{-5}$

$pH = 4.57$.

Explanation:
Initially, the pH is low bcoz the concentration of H^+ ions is high from a strong acid. the pH then gradually rises as ammonia soln is added bcoz H^+ are being neutralized.

(ii) Explain the shape of your sketch graph in (a)(i). *(3½ marks)*

This is followed by a sharp rise in pH with little ammonia solution added signifying end point has been reached.
The pH of the solution at the end point is less than 7 bcoz the salt formed is hydrolyzed by water forming hydroxonium ions.
After the end point, there is a gradual rise in pH due to excess ammonia solution added which together with the salt (ammonium chloride) form a buffer soln.

(b) Calculate the pH of a resultant solution formed when 10 cm^3 of a 0.1M sodium hydroxide solution is added to 25 cm^3 of a 0.1M ethanoic acid at 25 °C.

(*Dissociation constant of ethanoic acid at 25 °C = 1.8 × 10^{-5} mol dm^{-3}*). *(04 marks)*

No. of Moles of NaOH used = $\frac{0.1 \times 10}{1000} = 1.0 \times 10^{-3}$

No. of Moles of CH_3COOH used = $\frac{0.1 \times 25}{1000} = 2.5 \times 10^{-3}$

$CH_3COOH_{(aq)} + NaOH_{(aq)} \longrightarrow CH_3COONa_{(aq)} + H_2O_{(l)}$

No. of salt formed = 1.0×10^{-3}

∴ Excess Acid $CH_3COOH = (2.5 - 1.0)$

$[CH_3COOH] = \frac{1.5 \times 10^{-3} \times 1000}{35} = 0.0428M$

$[CH_3COONa] = \frac{1.0 \times 10^{-3} \times 1000}{35} = 0.0286M$

$pH = pKa + \log \frac{[salt]}{[Acid]}$

$= -\log 1.8 \times 10^{-5} + \log \left(\frac{0.0286}{0.0428}\right)$

$pH = 4.57$.

15. (a) Beryllium, magnesium, calcium and barium are some of the elements that belong to Group II of the Periodic Table.

State how the elements react with sulphuric acid and give the conditions for the reactions. *(03 marks)*

Be rxts with warm dil H_2SO_4 while Mg rxt with cold dilute H_2SO_4 to form $BeSO_4$ and $MgSO_4$ + hydrogen gas. Calcium and Barium rxt slowly with cold dil H_2SO_4 and rxn soon stops due to formation of insoluble sulphates.
Be, Mg rxts with hot concentrated H_2SO_4 to form $BeSO_4$, $MgSO_4$, SO_2 and water. Ca/Ba rxts with hot concentrated sulphuric acid to form the insoluble sulphates which stop the rxn.

$Mg_{(s)} + 2H_2SO_{4(aq)} \longrightarrow MgSO_{4(aq)} + 2H_2O_{(l)} + SO_{2(g)}$

(b) (i) State how the solubilities of the sulphates of Group II elements vary down the group. *(01 mark)*

Solubility of sulphates of group II decreases down the group.

(ii) Explain your answer in (b)(i). *(02 marks)*

Both lattice energy and hydration energy decrease down the group due to increase in cationic radii. However, hydration energy decreases more rapidly than lattice energy leading to a decrease in solubility.

(c) Write equation for the reaction of:

(i) beryllium with sodium hydroxide solution. *(1½ marks)*

$Be(s) + 2OH^-(aq) + 2H_2O(l) \longrightarrow Be(OH)_4^{2-}(aq) + H_2(g)$

$Be(s) + 2OH^-(aq) \longrightarrow BeO_2^{2-}(aq) + H_2(g)$.

(ii) calcium carbide with water. *(1½ marks)*

$CaC_2(s) + 2H_2O(l) \longrightarrow Ca(OH)_2(s) + C_2H_2(g)$.

16. In the manufacture of ammonia, nitrogen is catalytically hydrogenated to give ammonia according to the following equation.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) \quad \Delta H = 92.5 \text{ kJ}$$

(a) (i) Name the catalyst used in the reaction. *(½ mark)*

Iron (Reject: symbol and Name if given)

(ii) Write the expression for the equilibrium constant, K_p for the reaction. *(01 mark)*

$K_p = \dfrac{P^2_{NH_3}}{P_{N_2} \times P^3_{H_2}}$ or $\dfrac{(P_{NH_3})^2}{(P_{N_2})(P_{H_2})^3}$

(b) State what would happen to the position of the equilibrium if:

(i) pressure was increased. *(01 mark)*

Eq≡M position would shift to the right.

(ii) temperature was increased. *(01 mark)*

Eq≡M position would shift to the right.

(c) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$.

	N_2	H_2	NH_3
Initial	1	3	0
At Eq≡M	$1-x$	$3-3x$	$2x$

let x = moles of N_2 that reacted

∴ Total moles = $(1-x) + (3-3x) + 2x = (4-2x)$

$\therefore \frac{2x}{4-2x} = \frac{25}{100}$ $x = 0.4$

∴ Total moles $= (4 - 0.8) = 3.2$.

(c) When 3 moles of hydrogen and 1 mole of nitrogen were mixed and allowed to attain equilibrium at 100 atms and 400°C, the equilibrium mixture contained 25% of ammonia by volume.

Calculate the:

Moles of $N_2 = (1 - 0.4) = 0.6$ moles

Moles of $H_2 = (3 - 1.2) = 1.8$ moles.

(i) number of moles of nitrogen and hydrogen at equilibrium. (03 marks)

$P_{NH_3} = \frac{0.8}{3.2} \times 100 = 25$ atm

$K_p = \frac{P^2_{NH_2}}{P_{N_2} \times P^3_{H_2}}$

$\therefore K_p = \frac{(25)^2}{18.75 \times (56.25)^3}$

$= 1.87 \times 10^{-4}$ atm.

$P_{N_2} = \frac{0.6 \times 100}{3.2} = 18.75$ atm

$P_{H_2} = \frac{1.8}{3.2} \times 100 = 56.25$ atm

(ii) value of the equilibrium constant, K_p at 400°C. (2½ marks)

2½

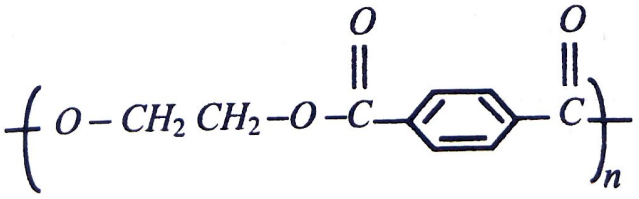
09

17. (a) Differentiate between **addition** and **condensation** polymers. (02 marks)

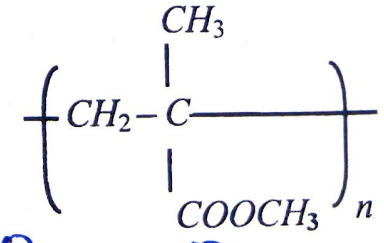
Condensation polymer is one formed when two different bifunctional monomers combine with elimination of small molecules like water while addition polymers is one formed when very many molecules of one similar unsaturated compounds combine without loss of small molecules

(b) The structural formulae of two polymers **R** and **T** are shown below.

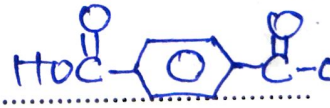
R

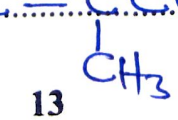


T

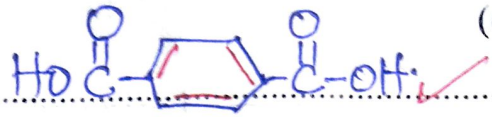


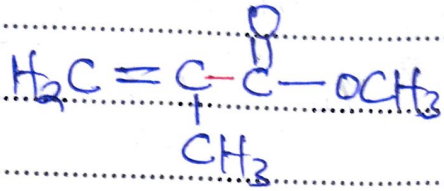
Name the polymer:

Terylene 4(i) **R** $HOCH_2CH_2OH$,  (01 mark)

Perspex 4 (ii) **T**  (01 mark)

(c) Write the structural formula(e) of monomer(s) of the polymers **R** and **T** respectively. *(03 marks)*

R- $HOCH_2CH_2OH$ ✓ and  ✓

T=  ✓

(d) Give **one** use of :

(i) **R** Making fabrics ✓ *(01 mark)*

(ii) **T** - Making lenses ✓ *(01 mark)*

- corrugated roof light
- Making aeroplane windows.
- Car windscreens.

09

Accept Dacron

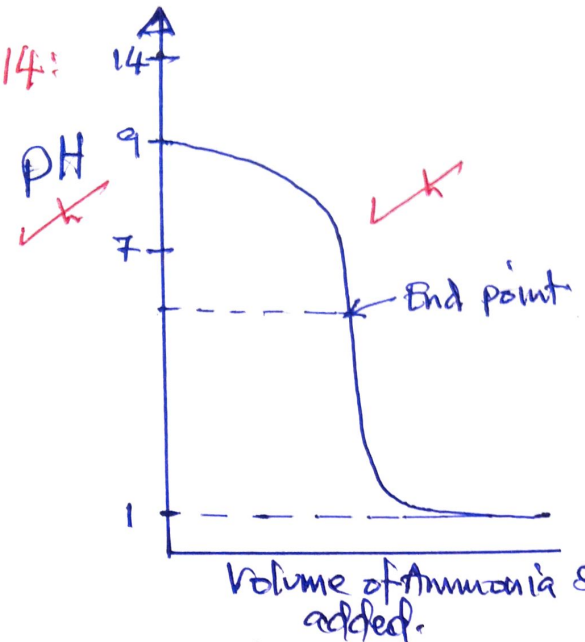
THE PERIODIC TABLE

1	2											3	4	5	6	7	8
1.0 H 1																1.0 H 1	4.0 He 2
6.9 Li 3	9.0 Be 4											10.8 B 5	12.0 C 6	14.0 N 7	16.0 O 8	19.0 F 9	20.2 Ne 10
23.0 Na 11	24.3 Mg 12											27.0 Al 13	28.1 Si 14	31.0 P 15	32.1 S 16	35.4 Cl 17	40.0 Ar 18
39.1 K 19	40.1 Ca 20	45.0 Sc 21	47.9 Ti 22	50.9 V 23	52.0 Cr 24	54.9 Mn 25	55.8 Fe 26	58.9 Co 27	58.7 Ni 28	63.5 Cu 29	65.7 Zn 30	69.7 Ga 31	72.6 Ge 32	74.9 As 33	79.0 Se 34	79.9 Br 35	83.8 Kr 36
85.5 Rb 37	87.6 Sr 38	88.9 Y 39	91.2 Zr 40	92.9 Nb 41	95.9 Mo 42	98.9 Tc 43	101 Ru 44	103 Rh 45	106 Pd 46	108 Ag 47	112 Cd 48	115 In 49	119 Sn 50	122 Sb 51	128 Te 52	127 I 53	131 Xe 54
133 Cs 55	137 Ba 56	139 La 57	178 Hf 72	181 Ta 73	184 W 74	186 Re 75	190 Os 76	192 Ir 77	195 Pt 78	197 Au 79	201 Hg 80	204 TI 81	207 Pb 82	209 Bi 83	209 Po 84	210 At 85	222 Rn 86
223 Fr 87	226 Ra 88	227 Ac 89															

			139 La 57	140 Ce 58	141 Pr 59	144 Nd 60	147 Pm 61	150 Sm 62	152 Eu 63	157 Gd 64	159 Tb 65	162 Dy 66	165 Ho 67	167 Er 68	169 Tm 69	173 Yb 70	175 Lu 71
			227 Ac 89	232 Th 90	231 Pa 91	238 U 92	237 Np 93	244 Pu 94	243 Am 95	247 Cm 96	247 Bk 97	251 Cf 98	254 Es 99	257 Fm 100	256 Md 101	254 No 102	260 Lw 103

END.

Q14:



Initially, the pH is slightly higher than 7 because ammonia is a weak base (conc of OH^- is low) the pH then gradually decreases as hydrochloric acid is added because OH^- are being neutralized and the remaining ammonia solution together with NH_4Cl formed a buffer soln

This is followed by a sharp drop in pH with little hydrochloric acid added signifying end point has been reached.

The pH of solution at the end point is less than 7 because the salt formed is hydrolyzed by water forming hydroxonium ion / acidic solution.

After end point there is gradual decrease in pH due excess hydrochloric acid added.