Name ..... MARKING GUIDE .....Centre/Index No...../.....

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P525/1
CHEMISTRY
Paper 1
August, 2022
$2\frac{3}{4}$hours.

JINJA JOINT EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

MOCK EXAMINATIONS –AUGUST, 2022

CHEMISTRY

(Principal Subject)

Paper 1

2 hours 45 minutes.

INSTRUCTIONS TO CANDIDATES:

Answer **ALL** questions in part **A** and Six questions from part **B**.

All questions are to be answered in the spaces provided.

The Periodic Table with relative atomic masses is provided at the back.

For Examiner's Use Only

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total

 Turn Over

PART A (46 MARKS)

Attempt all questions in this section

1. (a) Complete the following nuclear transformation reactions. (3 marks)

(i) $^{239}_{94}Pu + {}^{1}_{0}n \rightarrow {}^{86}_{34}Se + {}^{150}_{60}Nd \pm 4\,{}^{1}_{0}n$

(ii) $^{242}_{96}Cm + {}^{4}_{2}He \rightarrow {}^{246}_{98}Cf$

(iii) $^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{148}_{57}La + 3\,{}^{1}_{0}n + {}^{85}_{35}Br$

(b) Francium isotope ($^{223}_{87}Fr$) emits beta particles at a rate of 14.0 counts per second. The rate of emission decreased by 6.5 counts per second in 80 seconds. Calculate the half life of the isotope. (2 ½ marks)

or $\ln\left(\frac{N_t}{N_0}\right) = -\lambda t$

$A_0 = 14.0$ Counts s^{-1}

$\ln\left(\frac{N_0}{N_t}\right) = \lambda t$ $A_t = (14 - 6.5) = 7.5$ Counts s^{-1}

$A_t = A_0 e^{-\lambda t}$

$A_t = A_0 e^{-\lambda t}$

$\ln\left(\frac{14}{7.5}\right) = \lambda \times 80$ $\frac{7.5}{14} = e^{-(\lambda 80)}$ $\ln 0.536 = -80\lambda$

$\lambda = 7.795 \times 10^{-3}\ s^{-1}$

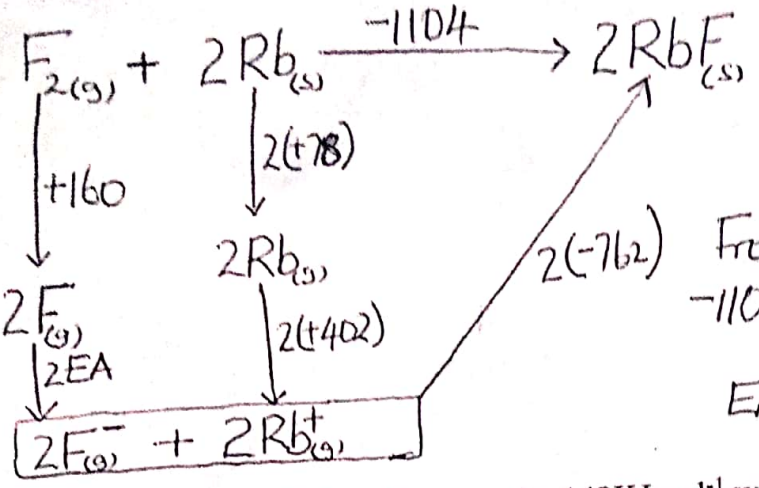
$\lambda = \frac{\ln\left(\frac{14}{7.5}\right)}{80}$ $t_{\frac{1}{2}} = \frac{\ln 2}{\lambda}$

$\lambda = 7.8 \times 10^{-3}$ $t_{\frac{1}{2}} = \frac{0.693}{7.795 \times 10^{-3}} = 88.9s$

2. The thermochemical data for some process are given in the table below.

Process	$\Delta H^{\sigma}(KJmol^{-1})$
$Rb_{(s)} \longrightarrow Rb_{(g)}$	+78
$Rb_{(g)} \longrightarrow Rb^{+}_{(g)} + e^{-}$	+402
$F_{2(g)} \longrightarrow 2F^{-}_{(g)}$	+160
$Rb^{+}_{(g)} + F_{(g)} \longrightarrow RbF_{(s)}$	-762
$F_{2(g)} + 2Rb_{(s)} \longrightarrow 2RbF_{(s)}$	-1104

(i) Use the above data to calculate the first electron affinity of fluorine. (3 marks)



Grue-full Credit with or without thermochemical cycle/Energy Level diagram

From Hess' law

$-1104 = +160 + 2EA + 2(+78) + 2(+402) + 2(-762)$

$EA = \frac{-200}{2} = -350\ kJmol^{-1}$ (−ve)

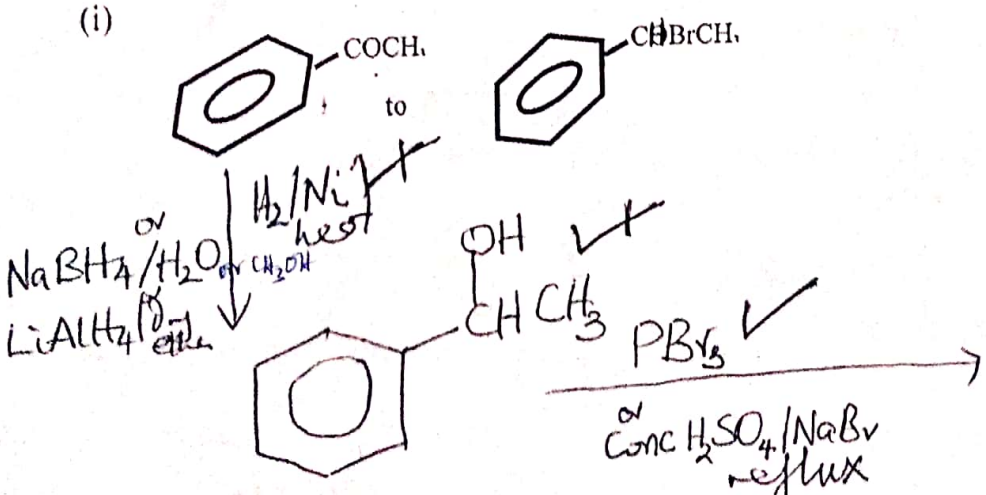
(ii) The first electron affinity of oxygen is $-142 KJmol^{-1}$ whereas the second electron affinity is $+791\ KJmol^{-1}$. Explain this observation. (2 marks)

The first electron added to the gaseous oxygen atom experiences a greater nuclear attraction than repulsion from the existing electrons thus 1st EA is exothermic (negative).

However on addition of the second electron to the oxygen anion (O^-), the electron added experiences a greater repulsion from the negative charge than nuclear attraction. Thus energy must be supplied to overcome the repulsive forces. 2 EA is endothermic positive

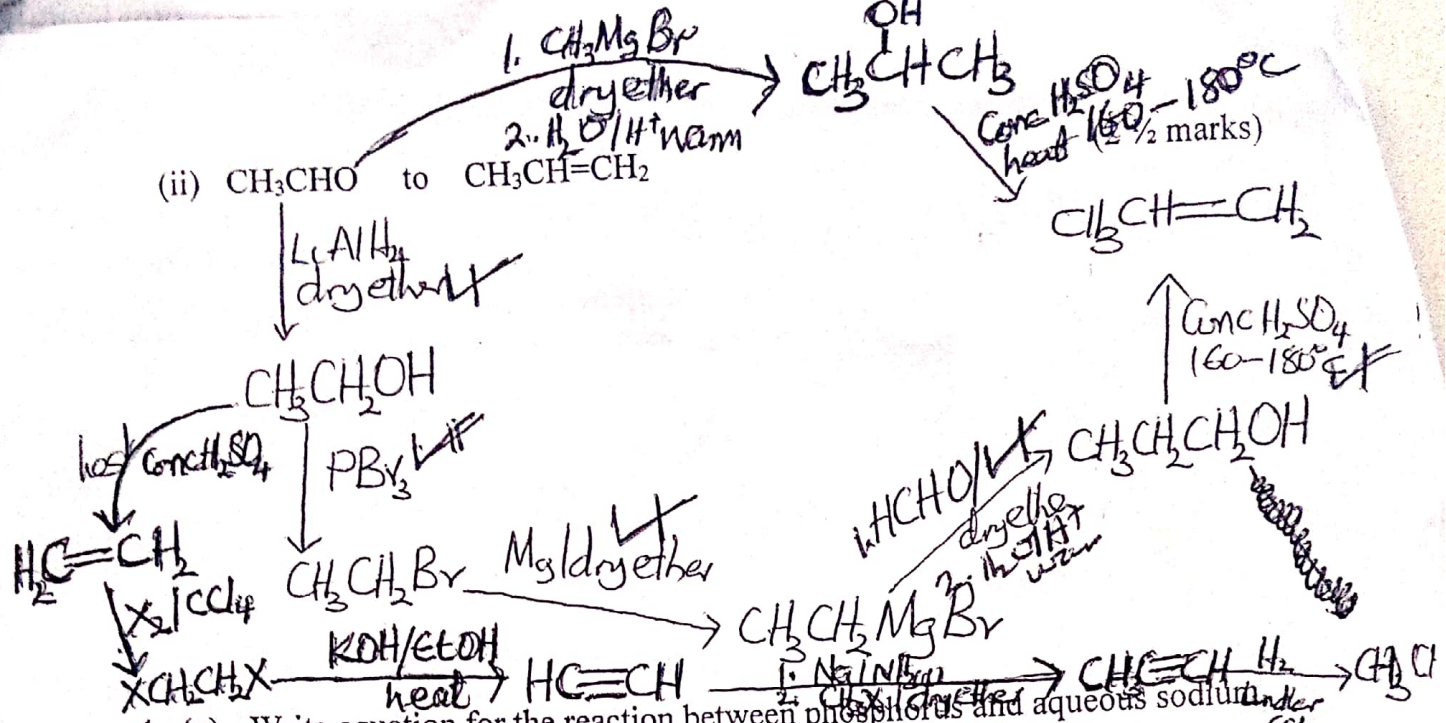
3. Write equations to show how the following conversions can be effected. (2 marks)

(i)



reji: PBr_5 doesn't exist

(ii) CH_3CHO to $CH_3CH=CH_2$ (2½ marks)



4. (a) Write equation for the reaction between phosphorus and aqueous sodium hydroxide solution. (1 ½ marks)

$$P_{4(s)} + 3NaOH_{(aq)} + 3H_2O_{(l)} \longrightarrow PH_{3(g)} + 3NaH_2PO_{2(aq)}$$

OR

$$4P_{(s)} + 3NaOH_{(aq)} + 3H_2O_{(l)} \longrightarrow PH_{3(g)} + 3NaH_2PO_{2(aq)}$$

Accept ionic

(b) Compound G, contains 56.4% phosphorus the rest being oxygen.

(i) Calculate the molecular formula of G (molar mass of G is 110) (3 ½ marks)

% of Oxygen = 100 − 56.4 = 43.6

	P	O
No of moles	$\frac{56.4}{31}$	$\frac{43.6}{16}$
	1.819	2.725
mole ratio	$\frac{1.819}{1.819}$:	$\frac{2.725}{1.819}$
	(1 :	1.5) × 2
	2 :	3

Empirical formular of G is P_2O_3

$(P_2O_3)_n = 110$

$62n + 48n = 110n = 110$; $n = 1$

Molecular formular of G = P_2O_3

(ii) Write equation for the reaction between G and water. (1 ½ marks)

$P_2O_{3(s)} + 3H_2O_{(l)} \longrightarrow 2H_3PO_{3(aq)}$ ✓✓ (1½)

5. (a) Define the term solvent extraction. (1 mark)

Is Partial removal of Solute from one Solvent to another Solvent in which its more Soluble, both Solvents being Immiscible to each other ✓ (01)

or Equiv: mass transfer or in Contact with one another

=CH₂

(b) An aqueous solution contains 10g of hydroxybenzene per litre. When 100cm³ of this solution is shaken with 20cm³ of ether, the layer extracts 0.8g of hydroxybenzene. Calculate the mass of hydrobenzene extracted when 500cm³ of aqueous layer was shaken with 50cm³ of ether. (3 ½ marks)

1000cm³ of water Contains 10g of hydroxybenzene

100cm³ of water Contain $10 \times \frac{100}{1000} = 1$g of hydroxybenzene ½✓

Mass of hydroxybenzene left in water $= 1 - 0.8 = 0.2$g

$K_D = \frac{[\text{C}_6\text{H}_5\text{OH}]_{ether}}{[\text{C}_6\text{H}_5\text{OH}]_{water}} = \frac{0.8}{20} \times \frac{100}{0.2} = 20$ ✓✓ or Alt

Let the mass extracted by 50cm³ of ether = x g ✓

Mass of hydroxybenzene left in aqueous layer = $5 - x$ ✓

$\therefore \frac{x}{50} \times \frac{500}{5-x} = 20$ ✓ $\Rightarrow 10x = (5-x)20$

$30x = 100$

$\therefore x = 3.33$ ✓✓ (½ mark)

(c) State one other application of the partition law.

- Ion exchange ✓ (Accept only one Correct app.)
- Chromatography
- Determine the formular of a Complex / Cordination number (N) of the Central metal ion in a Complex

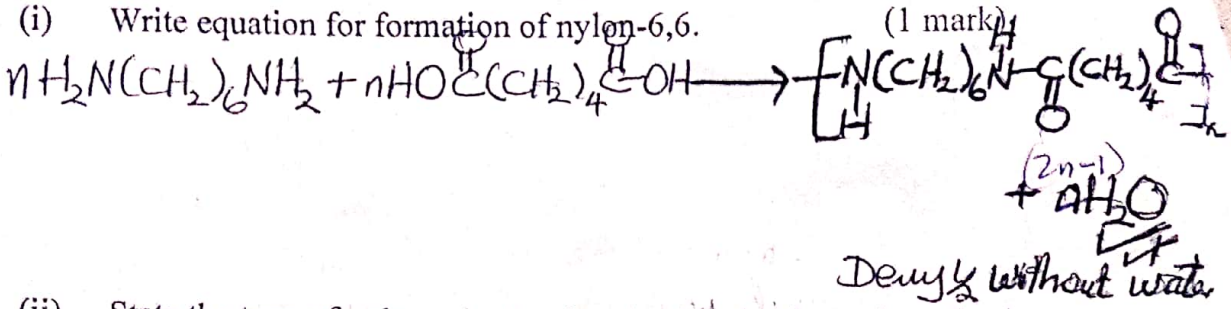
Ref investigating Complexes

- Qualitative analysis to distinguish I^- from Br^-
- To determine equilibrium Constant K_c for the reaction $I_{2(aq)} + I^-_{(aq)} \rightleftharpoons I_3^-$

 Turnover

6. (a) Nylon 6,6 is formed by reacting 1,6-diamino hexane and hexane-1,6-dioic acid.

(i) Write equation for formation of nylon-6,6. (1 mark)



Deny ½ without water

(ii) State the type of polymerization involved in the formation of nylon-6,6. (1 mark)

Condensation polymerisation

Ref: Condensational

(b) (i) The osmotic pressure of a solution containing $2gdm^{-3}$ of nylon 6,6 at 25°c was 20308 NM^{-2}.

Calculate the relative molecular mass of nylon 6,6. (2 ½ marks)

$1m = 10dm$

$\frac{1}{10}m = 1dm$

$1m^3 = 1000dm^3$

$1dm^3 = \frac{1}{10^3}dm^3$

$1dm^3 = 10^{-3}m^3$

$\pi V = \frac{m}{M_r} RT$

$20308 \times 1 \times 10^{-3} = \frac{2}{M_r} \times 8.314 \times 298$

$M_r = 244$

(Deny ½ marks if Unit (g) is indicated)

OR

10B25 is eq 1 dm

20308 is equiv to 0.2 atm

$R = 0.082$

$M_r = 243.84$

(ii) State one use of nylon 6,6. (½ mark)

- Fishing / Mosquito nets
- Surgical gloves
- Curtains
- Undergarments eg Vests, bras (Fabric) of clothes
- threads for treading
- Bristles for brushes
- Ropes

7. (a) Write equation for solubility of silver phosphate in water. (1 ½ marks)

$Ag_3PO_{4(s)} + (aq) \rightleftharpoons 3Ag^+_{(aq)} + PO^{3-}_{4(aq)}$ ✓✓

(b) The conductivity of a saturated solution of silver phosphate at 25°c is $2.661 \times 10^{-6} scm^{-1}$ and that of pure water is $1.519 \times 10^{-6} scm^{-1}$. Calculate the solubility of silver phosphate at 25°c. (The molar ionic conductivities of silver ions and phosphate ions at infinite dilution at 25°c are 61.9 and $240 Scm^2 mol^{-1}$ respectively) (3 ½ marks)

let Solubility of Ag_3PO_4 = C $moldm^{-3}$ or $moll^{-1}$

$\Lambda = 1000K/C$ ✓ $\Lambda = K/C$; $K_{Ag_3PO_4} = (2.661 - 1.519) \times 10^{-6}$

$K_{Ag_3PO_4} = 1.142 \times 10^{-6} Scm^{-1}$ ✓

$\Lambda_{Ag_3PO_4} = 3(61.9) + 240 = 425.7 Scm^2 mol^{-1}$ ✓

$\therefore C = \frac{1000 \times 1.142 \times 10^{-6}}{425.7}$ ✓

$= 2.683 \times 10^{-6} moll^{-1}$ ✓

8. Although Boron is in group III of the periodic table, it resembles silicon which is in group IV in some of its properties.

(a) (i) State three properties in which boron resembles silicon. (3 marks)

Both elements;

- Burn readily in oxygen when heated to form covalent acidic oxides B_2O_3 whereas Silicon forms SiO_2 ✓
- Form volatile fluorides BF_3, SiF_4, and chlorides BCl_3 and $SiCl_4$ which are hydrolysed by water ✓
- React with Magnesium when heated to form Silicides and Borides, Mg_2Si ; Mg_3B_2 ✓

(ii) Give one reason for anomalous behavior of boron. (1 mark)

- Boron has nearly the same (similar) atomic radius as Silicon or B^{3+} and Si^{4+} have nearly same ionic radius
- B^{3+} and Si^{4+} ions have nearly same (similar) charge density
- Boron and Silicon atoms have similar electronegativity values
- Boron and Silicon have nearly the same values of standard reduction electrode potentials

Turn over

(b) State conditions for the reaction between silicon and water. Write equation for the reaction.

Condition (1 mark)

steam, red heat/heated Silicon

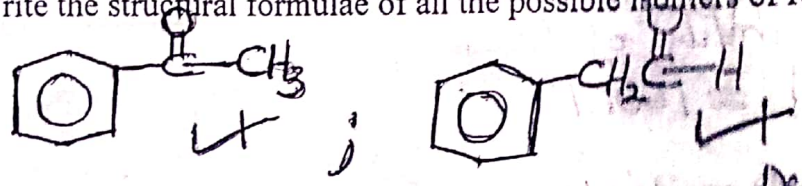
Equation (1 ½ marks)

$Si_{(s)} + 2H_2O_{(g)} \longrightarrow SiO_{2(s)} + 2H_{2(g)}$

Neg eqn with $H_2O_{(l)}$

9. The molecular formula of compound R, is C_8H_8O. R burns with a luminous flame and forms a yellow precipitate with 2,4-dinitrophenylhydrazine solution.

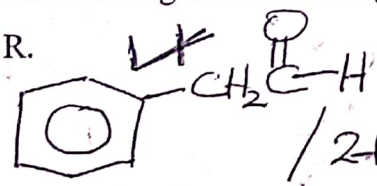
(a) Write the structural formulae of all the possible isomers of R. (1 mark)



Deny names.

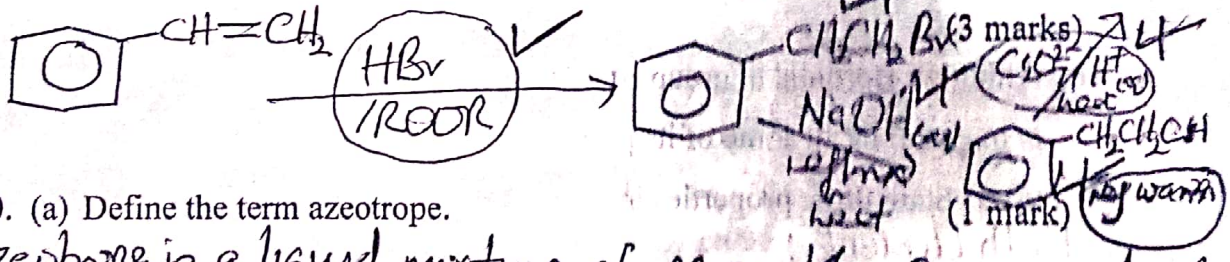
(b) R reacted with tollen's reagent on warming to form a silver mirror.

(i) Identify R. (½ mark)



/2-Phenylethanal

(ii) Write equations to show how R can be synthesized from an alkene. (3 marks)



10. (a) Define the term azeotrope.

Azeotrope is a liquid mixture of Miscible Components which have fixed Composition which on heating at a Constant pressure boils at Constant temperature giving off Vapour with the same Composition as liquid mixture.

(b) (i) State three reasons why azeotrope is a mixture and not a compound. (1 ½ marks)

- Composition of azeotrope Varies with pressure
- An azeotrope is heterogenous
- An azeotrope can be Separated into pure Components by physical or chemical methods

(ii) Name two methods for separating azeotropic mixtures into pure components. (1 mark)

- Solvent extraction
- Adsorption / chromatography
- Fractional distillation in presence of benzene as a third component
- Chemical method (adding conc H_2SO_4, Silica gel)

(c) The total vapour pressures of a mixture of propanone and trichloromethane and the mole fraction of trichloromethane at constant temperature are given in the table below.

Mole fraction of $HCCl_3$	0.0	0.2	0.4	0.6	0.8	1.0
Total vapour pressure of mixture (mmHg)	347	305	267	244	256	293

(i) Plot a graph of total vapour pressure of the mixture against the mole fractions of trichloromethane. (3 marks)

See graph Overleaf

- axes & mark @ labelled with Units = 01
- Plotting Correct points accurately = 01
- Shape (Correctness and Smoothness) = 01

03

(ii) Use the graph you have drawn to determine the composition of the azeotrope. (1 mark)

From the graph, the azeotrope Contains 0.65 mole fraction $CHCl_3$ and 0.35 mole fraction propanone ✓ Accept ±0.01

(d) State how the mixture in (c) deviates from raoults law.

Give a reason for your answer. (1 ½ marks)

The mixture exhibits a negative deviation from Raoults' law.
This is because the mixture exerts a low Vapour pressure than for an ideal mixture at composition of 0.65 mole fraction of $CHCl_3$. This suggest that the intermolecular forces $CH_3COCH_3 \leftrightarrow CHCl_3$ in solution > Compared to Pure

Escaping tendency of molecules in Solution to Vapour state is reduced ✓

11. Beryllium and magnesium are some of the elements in group II of the periodic table.

(a) Write the equation for reaction between water and the carbide of;

(i) Beryllium (1 ½ marks)

$$Be_2C_{(s)} + 4H_2O_{(l)} \longrightarrow Be(OH)_{2(s)} + CH_{4(g)}$$

(ii) Magnesium (1 ½ marks)

$$Mg_2C_{3(s)} + 4H_2O_{(l)} \longrightarrow 2Mg(OH)_{2(s)} + CH_3C{\equiv}CH_{(g)}$$

(b) A sample of nitrogen gas completely reacted with heated magnesium to product E. E reacted with water and all the ammonia gas produced was absorbed in 50cm3 of 0.05M sulphuric acid. 12.5cm3 of 0.1M sodium

hydroxide solution was required to completely neutralize the remaining acid. Write equation for the reaction between;

(i) Nitrogen gas and magnesium. (1 mark)

$$3Mg_{(s)} + N_{2(g)} \longrightarrow Mg_3N_{2(s)}$$

(ii) E and water. (1 ½ marks)

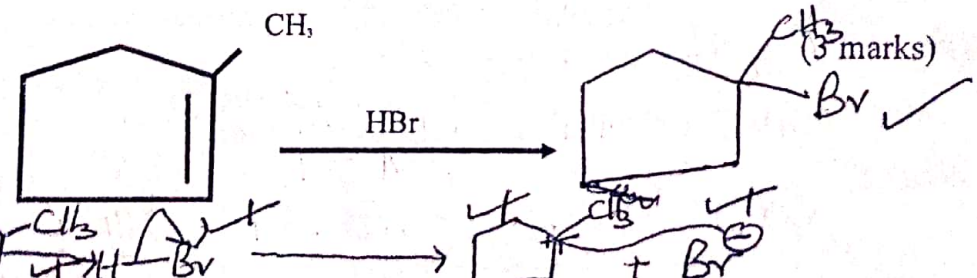
$$Mg_3N_{2(s)} + 6H_2O_{(l)} \longrightarrow 3Mg(OH)_{2(s)} + 2NH_{3(g)}$$

(c) Calculate the volume of nitrogen gas at s.t.p that reacted with magnesium. (4 ½ marks)

- Moles of NaOH reacted with excess $H_2SO_4 = \frac{12.5 \times 0.1}{1000} = 0.00125$
- NaOH : H_2SO_4 is 2 : 1
- moles of H_2SO_4 reacted $= \frac{1}{2} \times 0.00125 = 0.000625$
- Initial moles of $H_2SO_4 = \frac{50 \times 0.05}{1000} = 0.0025$
- moles of H_2SO_4 reacted with $NH_3 = 0.0025 - 0.000625$
- moles of $NH_3 = 2 \times 0.001875 = 0.00375$
- $\Rightarrow$ moles Mg_3N_2 = moles of $N_2 = \frac{1}{3} \times 0.00375 = 1.875 \times 10^{-3}$

12. Complete the following equations and in each case, outline the mechanism for the reaction leading to formation of major product.

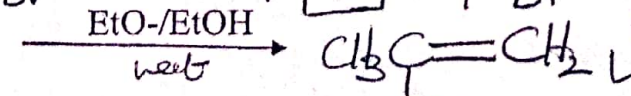
(a)



(3 marks)

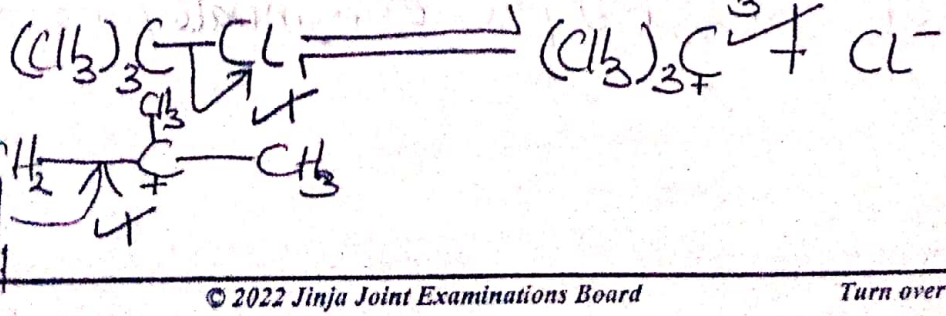
Mech:

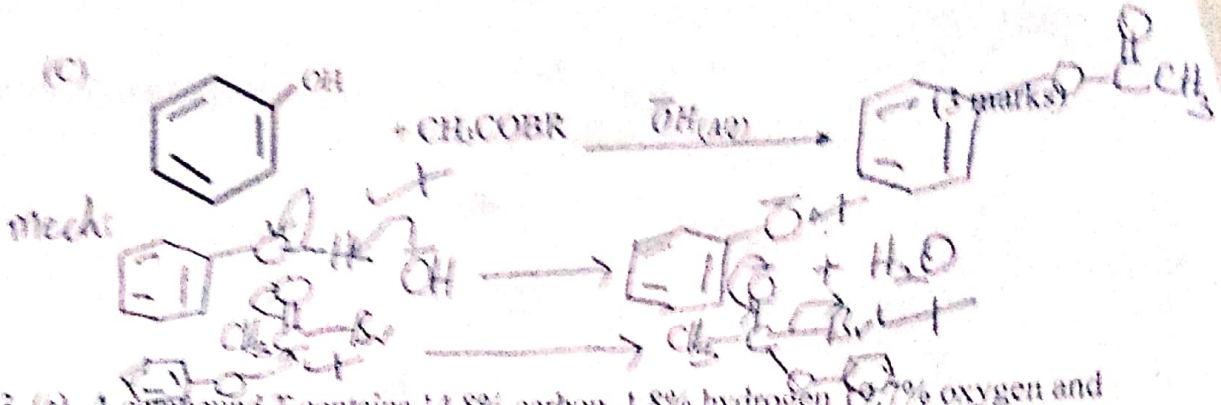
(b) $(CH_3)_3CCl$



(3 marks)

meth:



(c) 

13. (a) A compound T contains 14.8% carbon, 1.8% hydrogen, 19.7% oxygen and the rest being lead.

(i) Calculate the empirical formula of T. (2 ½ marks)

% of lead = 100 − (14.8 + 1.8 + 19.7) = 63.7

	C	H	O	Pb
no of moles	$\frac{14.8}{12}$	$\frac{1.8}{1}$	$\frac{19.7}{16}$	$\frac{63.7}{207}$ ✓
	1.23	1.8	1.23	0.308 ✓
Mole ratio	$\frac{1.23}{0.308}$:	$\frac{1.8}{0.308}$:	$\frac{1.23}{0.308}$:	$\frac{0.308}{0.308}$ ✓
	4 :	6 :	4 :	1 ✓

Empirical formula of T is $C_4H_6O_4Pb$ ✓

(ii) Determine the molecular formula of T.

(relative molecular mass of T is 325) (1 ½ marks)

$(C_4H_6O_4Pb)_n = 325$

$48n + 6n + 64n + 207n = 325n = 325$ ✓

$n = 1$ ✓

∴ Molecular formular of T is $C_4H_6O_4Pb$ ✓

(b) When T was heated, a colourless vapour with a vinegar smell was given off. Identify T. (½ mark)

$(CH_3COO)_2Pb$ / lead ethanoate / lead acetate ✓

(c) T was dissolved in water and the resultant solution was divided into two portions.

(i) To the first portion, was added a few drops of neutral iron(III) chloride solution. State what was observed and write the equation for the reaction. (2 marks)

Brown solution/Reddish brown Solution (aq) – Brown ppt

$3CH_3COO^-_{(aq)} + Fe^{3+}_{(aq)} \longrightarrow (CH_3COO)_3Fe_{(aq)}$

(ii) To the second portion was added dilute surphuric acid and mixture warmed. State what was observed and write the equation for the reaction. (2 ½ marks)

White ppt

$Pb^{2+}_{(aq)} + SO^{2-}_{4(aq)} \longrightarrow PbSO_{4(s)}$

(Accept molecular)

14.(a) (i) Write the electronic configuration of chromium. (½ mark)

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$ Accept $3d^5 4s^1$ (aq) $[Ar]4s^1 3d^5$

(ii) State the common oxidation states exhibited by chromium in its compounds. (1 mark)

+3 and +6

(b) An aqueous solution of a chrome alum ($K_2SO_4.Cr_2(SO_4)_3.24H_2O$)) was prepared and divided into two portions.

In each case state what is observed and write equation(s) for the reactions that take place when;

(i) The first portion was reacted with sodium carbonate solution.

green ppt and effervescence of (bubbles) colourless gas (2 ½ marks)

$2Cr(H_2O)_{6(aq)}^{3+} + 3CO_{3(aq)}^{2-} \longrightarrow 2Cr(OH)_{3(s)} + 3CO_{2(g)} + 9H_2O_{(l)}$

or $2Cr_{(aq)}^{3+} + 3H_2O_{(l)} + 3CO_{3(aq)}^{2-} \longrightarrow 2Cr(OH)_{3(s)} + 3CO_{2(g)}$

(ii) To the second portion 2-3 drops of sodium hydroxide solution was added followed by hydrogen peroxide. (2 ½ marks)

green ppt dissolves forming a yellow solution

$Cr_{(aq)}^{3+} + 3\bar{O}H_{(aq)} \longrightarrow Cr(OH)_{3(s)}$

$2Cr(OH)_{3(s)} + 3H_2O_{2(aq)} + 4\bar{O}H_{(aq)} \longrightarrow 2CrO_{4(aq)}^{2-} + 8H_2O_{(l)}$

or $2Cr_{(aq)}^{3+} + 10\bar{O}H_{(aq)} + 3H_2O_{2(aq)} \longrightarrow 2CrO_{4(aq)}^{2-} + 8H_2O_{(l)}$

(c) To the resultant solution in b(ii) was added a few drops of dilute sulphuric acid. State what is observed and write equation for the reaction(s) that takes place. (2 ½ marks)

$Cr_{(aq)}^{3+} + 8OH_{(aq)}^{-} \rightarrow CrO_4^{2-} + 4H_2O + 3e$

$H_2O_2 + 3e^- \rightarrow 2OH$

Yellow solution turns Orange

$2CrO_{4(aq)}^{2-} + 2H_{(aq)}^{+} \rightleftharpoons Cr_2O_{7(aq)}^{2-} + H_2O_{(l)}$

15.(a) State three factors that can affect solubility of salts. (1 ½ mrks0

- Temperature
- Relative Magnitude of Lattice energy and hydration energy of the Salt
- Chemical Nature of Salt and Solvent
- Common ion effect / Complexation (Accept any three)

(b) The solubilities of some of the group (II) metal sulphates are given in the table below.

Sulphate	Solubility at 10°c in g/100g of H_2O
$MgSO_4$	30.9
$CaSO_4$	0.192
$SrSO_4$	0.104
$BaSO_4$	0.00265

(i) State how the solubility of Sulphates vary. (½ marks)

Solubility of the Sulphates decreases from Magnesium Sulphate to Barium Sulphate

Reject; down the group/ except $MgSO_4 \rightarrow BaSO_4$

(ii) Explain your answer in (i) (3 marks)

From $MgSO_4 \longrightarrow BaSO_4$, the charge density of the bonding cations decreases from $Mg^{2+} \rightarrow Ba^{2+}$
This causes both lattice energy and hydration energy of the salts to decrease.
But hydration energy decreases more rapidly than lattice energy
As a result the enthalpy of solution of the salts becomes more endothermic

(c) Lead (II) chloride is sparingly soluble in water and insoluble in ethanol whereas Lead (IV) chloride readily dissolves in ethanol and insoluble in water. Explain the observation. (4 marks)

Pb^{4+} ion in lead(IV) chloride has a higher charge density than Pb^{2+} ion in lead(II) chloride. Pb^{4+} ion can strongly polarise the chloride ion than the Pb^{2+} ion making $PbCl_4$ more covalent and can therefore dissolve in a more covalent solvent (ethanol) than in water which is more polar. $PbCl_2$ is a more ionic compound thus it is sparingly soluble in water than ethanol.

16.(a) State three characteristics of a chemical equilibrium. (1½ marks)

- Established in Isolated/Closed Systems
- Dynamic/reversible
- attained at Constant Temperature

(b) Nitrogen and hydrogen react to form ammonia according to the following equation.

$$3H_{2(g)} + N_{2(g)} \rightleftharpoons 2NH_{3(g)} \quad . \Delta H = -92KJmol^{-1}$$

Contact process
- 450–550°C
- 1–2 atm
- V_2O_5 catalyst
- excess supply of air

Write;

(i) Three industrial optimum conditions used to obtain maximum yield of ammonia. (1½ marks)

Pressure of 350–450 atm (200–500 atm)
Temp of 500°C (450–550 °C)
Iron Catalyst

(ii) Equations for conversion of ammonia to nitric (V) acid. (3 marks)

$$4NH_{3(g)} + 5O_{2(g)} \longrightarrow 4NO_{(g)} + 6H_2O_{(l)}$$

$$2NO_{(g)} + O_{2(g)} \longrightarrow 2NO_{2(g)}$$

$$4NO_{2(g)} + O_{2(g)} + 2H_2O_{(l)} \longrightarrow 4HNO_{3(aq)}$$

OR

$$3NO_{2(g)} + H_2O_{(l)} \longrightarrow 2HNO_{3(aq)} + NO_{(g)}$$

(c) When a mixture of nitrogen and hydrogen in the ratio of 1:3 by volume was reacted at 250°c, the equilibrium mixture was found to contain 30.5% nitrogen.

Calculate the;

(i) Molar concentration of ammonia (1 ½ marks)

$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$

Init: 1 3 —

Rctd: x 3x 2x

Eqm: 1−x 3(1−x) 2x

Total moles = 1−x+3−3x+2x = 4−2x

$\frac{1-x}{4-2x} \times 100 = 30.5$

$100 - 100x = 122 - 61x$

$-100x + 61x = 122 - 100$

$-39x = 22$

$x = \frac{22}{-39} = 0.4671$

(ii) Equilibrium constant, Kc at 250°c for the reaction that takes place. (1 ½ marks)

$K_c = \frac{[NH_3]^2}{[N_2][H_2]^3}$

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

(a) Dilute sulphuric acid is added to potassium maganate (VI) solution. (2 ½ marks)

green solution turns purple

Brown solid (Accept Black)

$3MnO_{4(aq)}^{2-} + 4H_{(aq)}^{+} \longrightarrow 2MnO_{4(aq)}^{-} + MnO_{2(s)} + 2H_2O_{(l)}$

(b) A mixture of ethanol and benedicts solution is heated. (2 marks)

No observable change

$H_2O_{2(aq)} + 2H^+ + 2e \longrightarrow 2H_2O_{(l)}$

$2Fe^{2+} \longrightarrow 2Fe^{3+}_{(aq)} + e$

(c) Hydrogen peroxide is added to acidified ferrous sulphate solution. (2 ½ marks)

green solution turns brown

$2Fe^{2+}_{(aq)} + 2H^+_{(aq)} + H_2O_{2(aq)} \longrightarrow 2Fe^{3+}_{(aq)} + 2H_2O_{(l)}$

(d) Aqueous solution of iodine and sodium hydroxide is warmed with propan-2-ol. (2 marks)

Yellow ppt / Solid

$$CH_3CH(OH)CH_{3(aq)} + 4I_{2(aq)} + 6NaOH_{(aq)} \longrightarrow CHI_{3(s)} + CH_3COONa_{(aq)} +$$