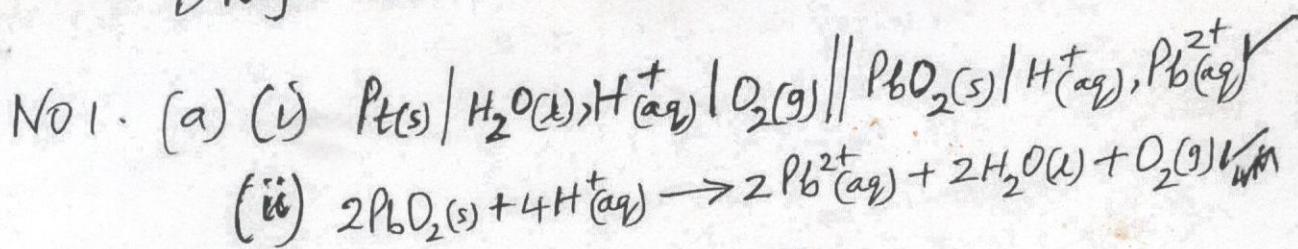


# BUGANDA MCKS 2023

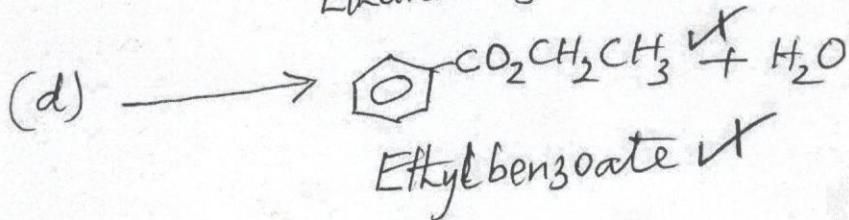
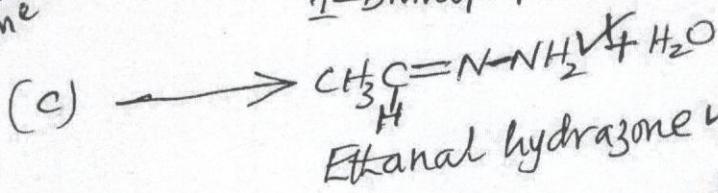
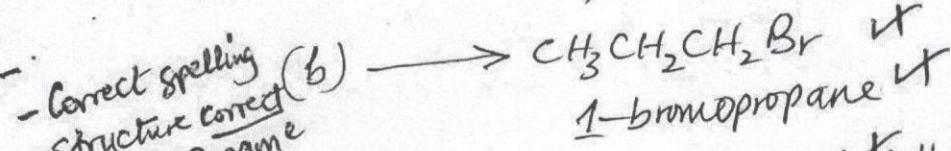
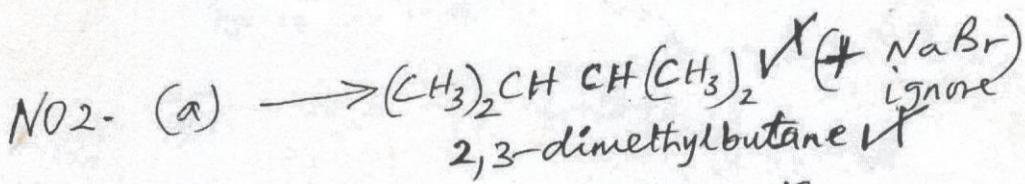
## Draft Guide CHEMISTRY PS25 | 1



(b) (i) Emf of the cell =  $E_r - E_l$   
 $= 1.46 - 1.23 \text{ V}$   
 $= \pm 0.23 \text{ V}$  (both +ve and -ve must be indicated)

(ii) Feasible ✓  
Positive ✓ since emf of the cell is

Q4

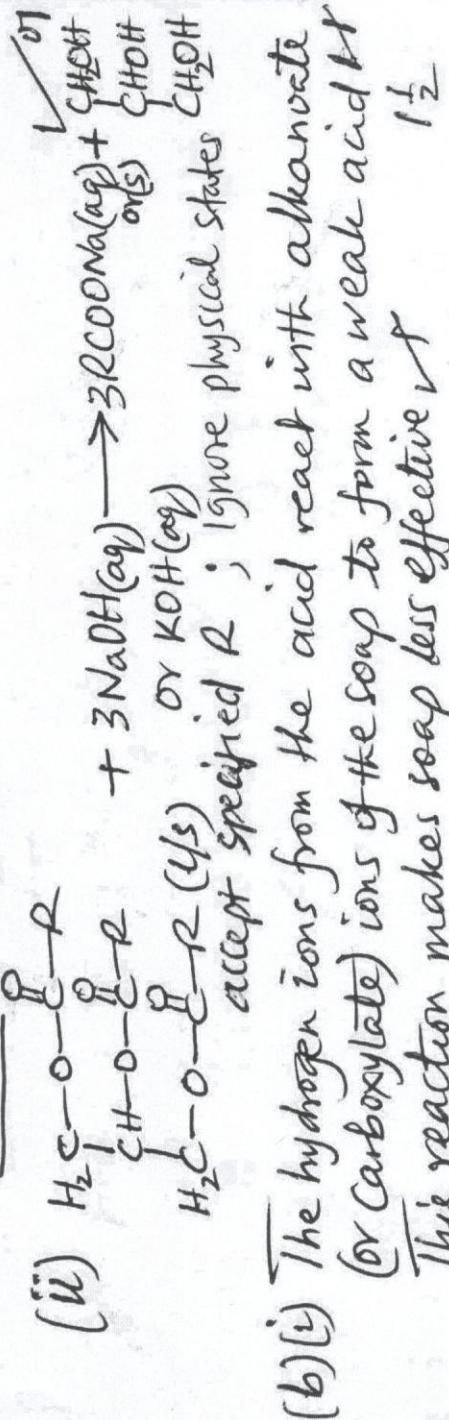


Q4

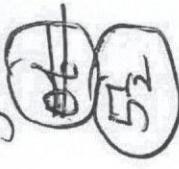
- NO 3 (a) (i) A positively charged or negatively charged ion in which an atom or group of atoms with a negative charge or lone pair of electrons form coordinate/dative bonds with the central metal ion
- (ii) Availability of empty orbitals of suitable (or low) energy. If the cation has low charge on the cation if the cation has small radius of the cation

- (b) Hexacyanoferrate(III) ion  $\text{Fe}^{3+}(\text{CN})_6^{4-}$  in aqueous solution
- (c) (i) Bubbles of a colourless gas and above solid
- (i)  $2\text{Fe}^{3+}(\text{aq}) + 3\text{H}_2\text{O}(\ell) \rightarrow 2\text{Fe}(\text{OH})_3(\text{s}) + 3\text{H}_2\text{O}(\ell)$
- (ii)  $2\text{Fe}^{3+}(\text{aq}) + 3\text{H}_2\text{O}(\ell) \rightarrow 2\text{Fe}(\text{OH})_3(\text{H}_2\text{O})_3^{3-} + 3\text{H}_2\text{O}(\ell)$   
or  $2\text{Fe}^{3+}(\text{aq}) + 3\text{H}_2\text{O}(\ell)^{3-} + 3\text{CO}_3^{2-}(\text{aq}) \rightarrow 2\text{Fe}(\text{OH})_3(\text{H}_2\text{O})_3^{3-} + 3\text{H}_2\text{O}(\ell)$

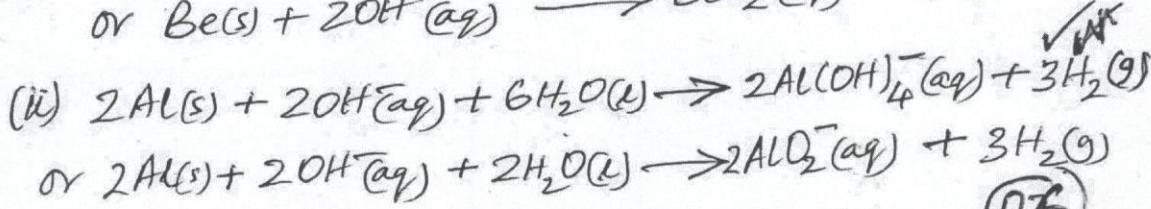
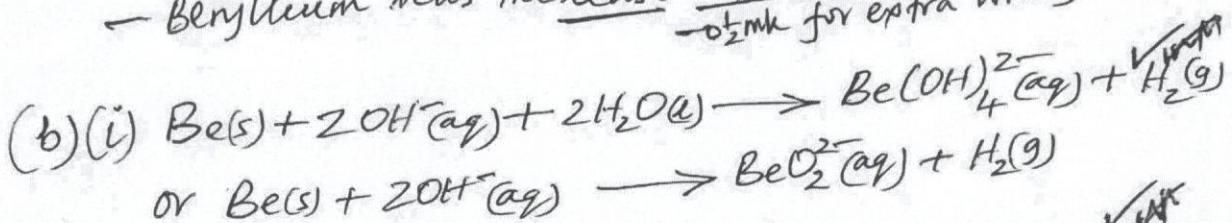
4. (a) (i) The oil/fat is heated and boiled with excess concentrated sodium hydroxide solution while stirring until the oil/fat completely dissolves. 2½  
 The solution is cooled and concentrated sodium chloride solution (brine) is added to precipitate the soap which floats and is skinned off/removed, washed and dried.



- (ii) - Doesn't cause water pollution 1½  
 - cheaper  
reject cheap

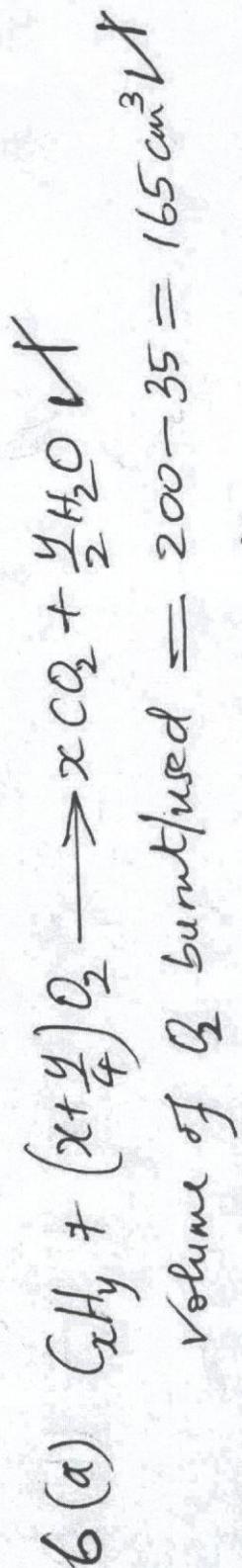


- 5(a) (i) - Both elements are made passive by concentrated nitric acid ✓ 03
- Their oxides/hydroxides are amphoteric ✓
  - Their carbides hydrolyse in water to give methane and corresponding hydroxide ✓
  - Their chlorides are covalent polymeric solids when anhydrous.
  - Their chlorides exist as dimers in vapour phase  
-0.1mk for extra wrong
- (ii) - Forms a cation with the highest charge density (or polarising power). ✓
- Beryllium atom has the smallest atomic radius (or is the most electronegative) ✓
  - Beryllium has the least negative value of SEP  
-0.2mk for extra wrong



Allow other correct alternative equations including molecular equations

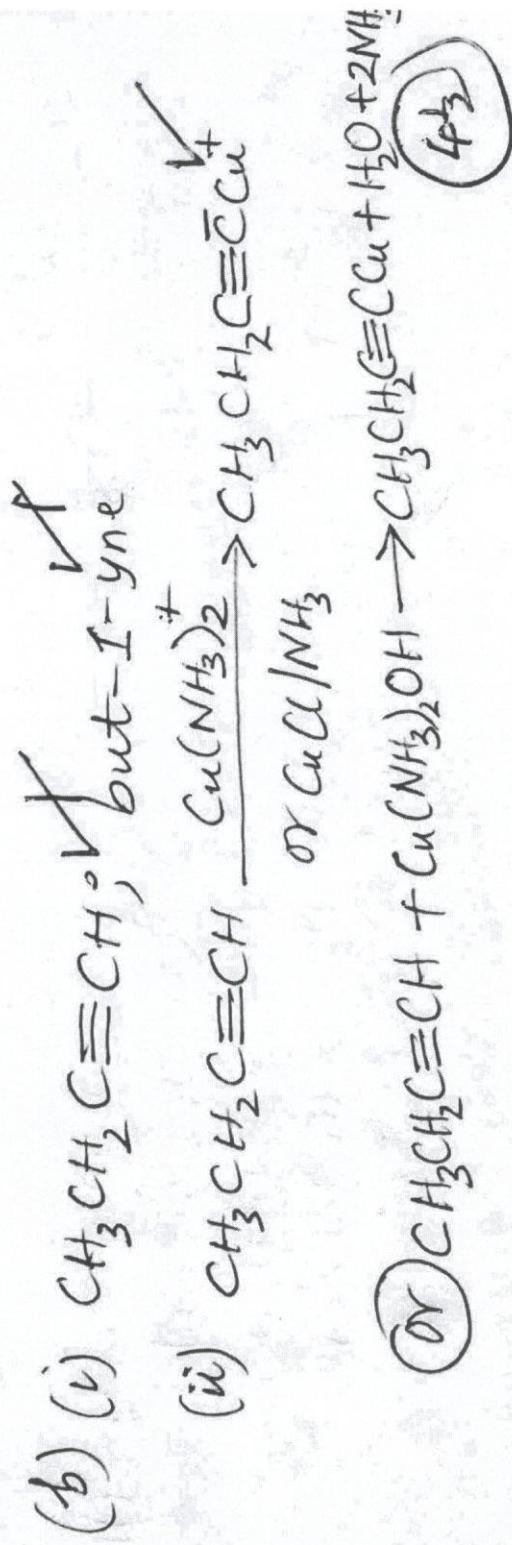
DB



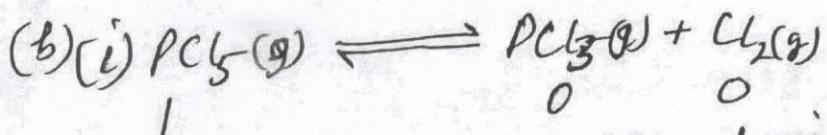
$$30x = 120 \Rightarrow x = 4$$
 ✓

$$30\left(4 + \frac{y}{4}\right) = 165 \Rightarrow y = 6$$
 ✓

$Q$  is  $C_4H_6$  ✓



$$7. (a) K_c = \frac{[PCl_3][Cl_2]}{[PCl_5]} \quad \checkmark \quad 0\frac{1}{2}$$



Let  $x$  moles of  $PCl_5$  dissociate  
 $x$                      $x \sqrt{t} \text{ (all)}$

Eqn mol:  $1-x$

$$\text{but } \frac{x}{1+x} \times 100 = 38.4$$

$$\frac{x}{x} = 0.623 \quad \checkmark \quad 0.623 \text{ L} \text{ (all)}$$

Eqn concn  $0.377$

$$K_c = \frac{(0.623)(0.623)}{0.377} = 1.03 \text{ mol}^{-1} \text{ L}^{-1} \text{ (with units)}$$

allow (ii) The forward reaction is exothermic,  $\Delta H < 0$   
 Consequently, increase in temperature  $\Delta T$  increases  $K_c$   
 error marking

(c) Concentration of  $Cl_2$  increases  $\checkmark$   
 Decrease in pressure shifts equilibrium position from left to right, since forward reaction proceeds with increase in volume  
 Thus more  $PCl_5$  decomposes to form more chlorine and  $1\frac{1}{2}$   
 $PCl_3 \cdot \checkmark$

53

8(a) Reagent: Fehling's solution ✓ (or heat)  $\xrightarrow{\text{mobile}}$   
 $\text{C}_6\text{H}_5\text{CHO}$ ; No observable change  $\checkmark$  even on heating  
 $\text{CH}_3\text{CH}_2\text{CHO}$ ; Reddish-brown ppt/solid on warming  
reject without heat  
reject Ammoniacal silver nitrate solution.

(b) Ice-cold mixture of sodium nitrite and concentrated hydrochloric acid ✓  $\xrightarrow{\text{reject accept}} \begin{matrix} 0^\circ\text{C} / 0-10^\circ\text{C} / 21^\circ\text{C} \\ \text{for ice-cold} \end{matrix}$

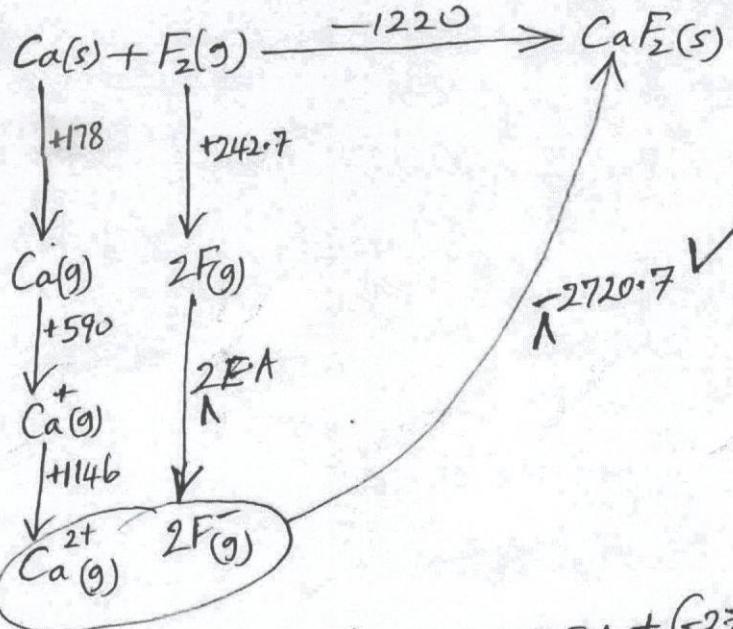
$(\text{CH}_3)_2\text{CHNH}_2$ ; colourless solution ✓ and bubbles of a colourless gas ✓

$(\text{CH}_3)_2\text{NH}$ ; yellow oil ✓

05



9. (a)



- energy terms included
- physical states are correct
- eqns balanced

$$(+178) + (+590) + (+1146) + (+242.7) + 2E.A + (-2720.7) = -1220$$

$$2E.A = -648$$

$$E.A = -324 \text{ kJ mol}^{-1}$$

✓ ignore with no (or)  
wrong units

$$\begin{aligned} (b) \Delta H_{\text{solution of}} &= \Delta H_{\text{hydration of CaF}_2} + \text{lattice energy of CaF}_2 \\ &= (-1587) + (2 \times -515) + 2720.7 \quad \checkmark \\ &= +103.7 \text{ kJ mol}^{-1} \quad \checkmark \text{ ignore with no (or)} \\ &\quad \text{wrong units} \end{aligned}$$

- (c) (i) Increase in temperature increases the solubility of  $\text{CaF}_2$  ✓ reject if (b) is -ve or sign not indicated
- award even if (b) is a wrong +ve*
- (ii) Heat of solution is positive endothermic

55

~~reject brown, solution is hot~~

10. (a) Effervescence occurs and ~~purple vapours evolved~~ <sup>total</sup> ~~solutions~~ <sup>is hot</sup> ~~is hot~~

~~or~~  $2\text{NaI}(s) + 3\text{H}_2\text{SO}_4(l) \rightarrow 2\text{NaHSO}_4(l) + 2\text{H}_2\text{O}(l) + \text{SO}_2(g) + \text{I}_2(g)$

$2\text{NaI}(s) + 2\text{H}_2\text{SO}_4(l) \rightarrow \text{Na}_2\text{SO}_4(l) + 2\text{H}_2\text{O}(l) + \text{SO}_2(g) + \text{I}_2(g)$

1½

(b) Reddish-brown ppt/solid or red ppt.

$\text{CH}_3\text{CH}_2\text{CHO}$  Fehling's solution <sup>boil</sup>  $\rightarrow \text{CH}_3\text{CH}_2\text{COO}^- + \text{CuO}^+$

1½

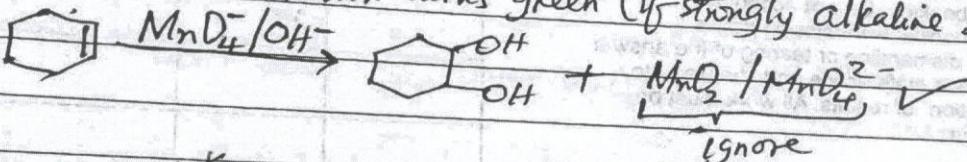
(c) Solution turns brown/yellow/reddish-brown

$\text{Cl}_2(g) + 2\text{Fe}^{2+}(aq) \rightarrow 2\text{Fe}^{3+}(aq) + 2\text{Cl}^-(aq)$

02

(d) Purple solution turns colourless  
allow: Purple solution forms a brown/black ppt (in neutral or mildly alkaline solution)

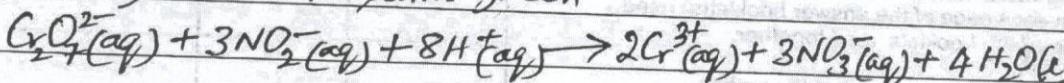
Purple solution turns green (if strongly alkaline solution)



02

(09)

(e) Orange solution turns green



02



11. (a)  $ns^2 np^2$  ✓  $O_2$

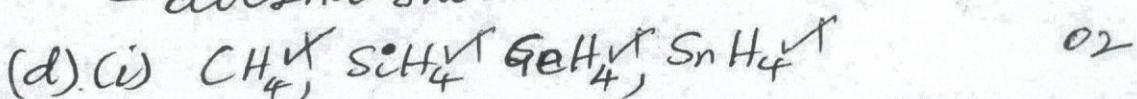
(b) Metallic character increases down the group  
(or from C to Sn)

From C  $\rightarrow$  Sn, atomic radius increases. Effective nuclear charge of the nucleus decreases and the nuclear attraction for the outermost electrons decreases. Thus, the tendency for the atoms to lose outermost electrons increases from C  $\rightarrow$  Sn.

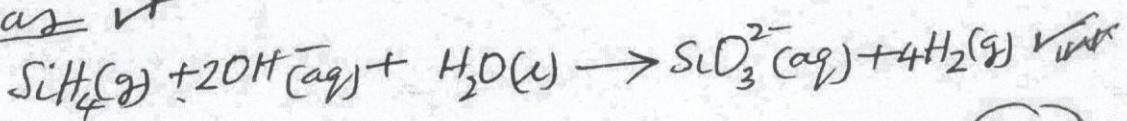
(c) (i) - Carbon atom has the smallest atomic radius / highest any two electronegativity / very high first ionisation energy  
correct - Carbon atom lacks easily accessible d-orbitals

(ii) - Has a maximum covalency of 4 while the others can expand their octets to a maximum valency of 6  
- catenates unlike the other elements  
- forms stable multiple bonds with itself and with other elements.

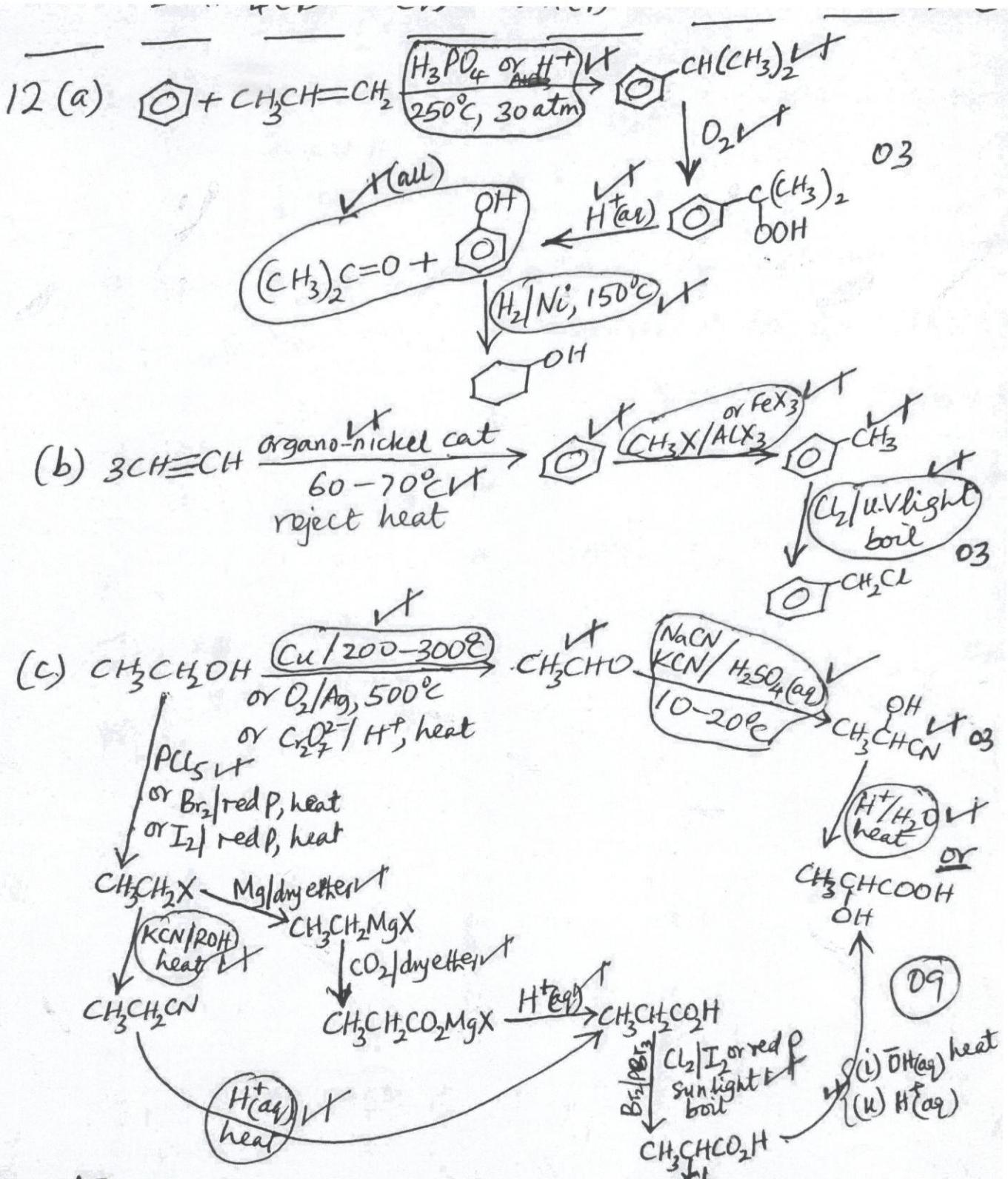
any two correct  
- forms gaseous oxides unlike the other elements which form solid oxides  
- forms Cpd's which are relatively inert unlike the others  
- does not show inert pair effect unlike the others



(ii) Only  $SiH_4$  reacts with cold water in presence of an alkali to form silicate ions and hydrogen gas ✓



09 1/2  
max 09



NB: Stop marking if reagent/condition/intermediate is wrong

(3)

(a)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$  (or)  $- - - 4s^2 3d^5$

01

- (b) (i) Potassium manganate(VII) is a powerful oxidising agent  
- It does not require an indicator  
- Has fairly high relatively formula mass  
- It is readily available reject stable in air  
(ii) Iron(II) ammonium sulphate - 6-water ✓ OI  
or Anhydrous ammonium oxalate or ethanedioate

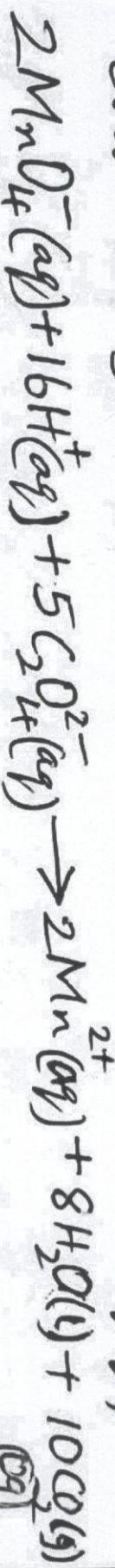
(c) (i) Purple solution turns brown ✓

2 $\frac{1}{2}$



(ii) Purple solution turns colourless and bubbles of a  
colourless gas. ✓

2 $\frac{1}{2}$



14

(or decrease in solubility or removal)

Ques) Is the precipitation of a sparingly soluble ionic compound (or electrolyte) from its saturated solution by adding (or adding electrolyte) a soluble ionic compound containing one of the ions contained by the sparingly soluble ionic compound at a given temperature.

Block  
(main)

-- on addition of an electrolyte solution which has an ion in common with the solute containing a similar cation/anion (or one of the ions)

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0.0233M Page 5

UACE

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Candidate's Name .....

Signature .....

Subject .....

$$\frac{1}{2} \text{NaOH} = \text{NaOH}^-$$

*Argon Cd*

Random No.		
Personal Number	.	.

(b)  $K_{sp} = [\text{Zn}^{2+}][\text{OH}^-]^2$  ✓ reject if eqn is given

(c)(i) No of moles of acid = No of moles of  $\text{OH}^- = \frac{5.6 \times 0.1}{1000} = 5.6 \times 10^{-4}$  ✓

$$[\text{OH}^-] = \frac{5.6 \times 10^{-4} \times 1000}{24.0} = 0.0233 \text{M}$$

$$[\text{Zn}^{2+}] = \frac{0.0233}{2} = 0.01165 \text{M} \text{ or } 0.0117 \text{ M}$$

$$K_{sp} = (0.01165)(0.0233)^2 = 6.32 \times 10^{-6} \text{ mol}^3 \text{ dm}^{-9}$$

(ii) At eqm;  $[\text{Zn}(\text{OH})_2] = [\text{Zn}^{2+}] = 0.01165 \text{M}$

$$\text{Rfm of } \text{Zn}(\text{OH})_2 = 65.7 + 2(17) = 99.7 \text{ g/mol}$$

$$\text{Mass of } \text{Zn}(\text{OH})_2 \text{ dissolved} = 99.7 \times 0.01165 = 1.161505 \text{ g}$$

$$\% \text{ of } \text{Zn}(\text{OH})_2 \text{ dissolved} = \frac{1.161505}{5.0} \times 100 = 23.2301\% \text{ or } 23.23\%$$

(d)(i) Solubility would reduce/decrease

~~Concentration of zinc ion increases due to common ion effect. This leads to the reaction between excess zinc ions and hydroxide ions to form solid zinc hydroxide (or precipitate zinc hydroxide)~~

(ii) Solubility would increase

~~Addition of ammonia leads to the reaction between zinc ions and ammonia molecules to form a soluble complex ion. The concentration of zinc ions in solution reduces and thus more solid zinc hydroxide dissolves to restore the equilibrium and keep  $K_{sp}$  constant.~~

~~Not all complexes are soluble ??~~

~~Solution reduces and thus more solid zinc hydroxide dissolves to restore the equilibrium and keep  $K_{sp}$  constant.~~

reject without ~~soluble~~ complex ion

HLC 43

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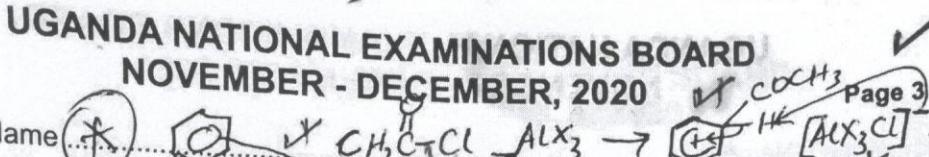
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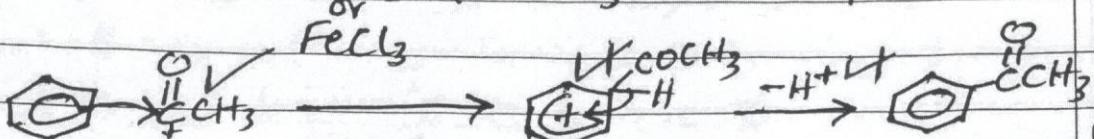
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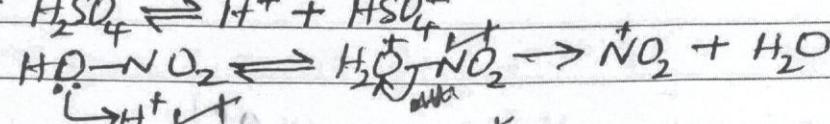
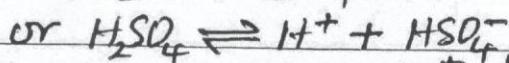
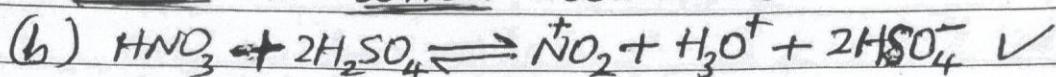
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details  
in mechanism  
=

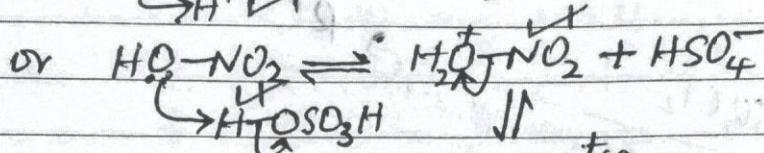


03

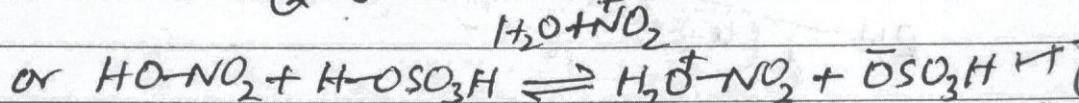
allow other correct alternatives



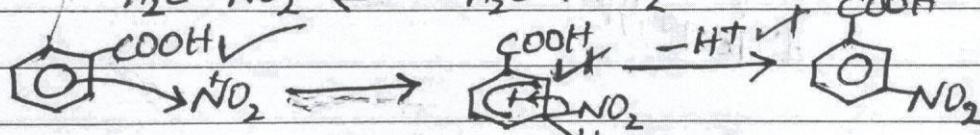
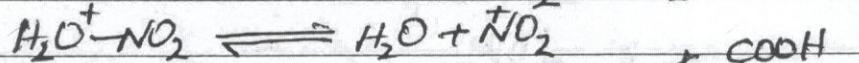
*brace with*  
*cancel arrows*



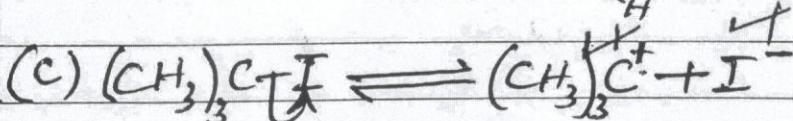
03



*NO*  
*emphasis*  
*on arrows*

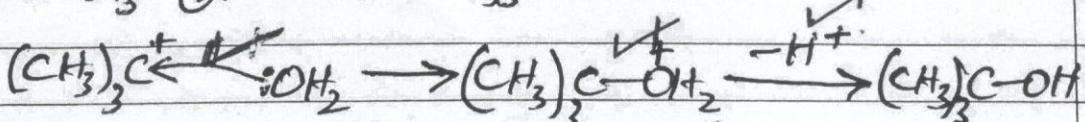


*KOH(aq)*  
*NaOH(aq)*



*reject use of*

03



16(a)(i) Relative lowering of the vapour pressure of a pure solvent is directly proportional to the mole fraction of the non-volatile solute dissolved in it to make a dilute solution at a given temperature. ✓ 01

or The <sup>partial</sup> V.P of any volatile component in a solution is equal to the V.P of pure component multiplied by mole fraction of that component in solution (over the whole concentration range) at all temperatures.

or  $P_A = x_A P_A^0$  at a given temperature

where  $P_A$  is the <sup>partial</sup> V.P of the component A

$x_A$  " " mole fraction of the component A

$P_A^0$  " " V.P of the pure component A or SVP of A.

- (ii)-The intermolecular forces between like and unlike molecules are equal in strength/magnitude  
 - formed without change in heat fenthalpy ✓  
 - formed without change in total volume, ✓ 1½  
 - obeys Raoult's law of vapour pressure

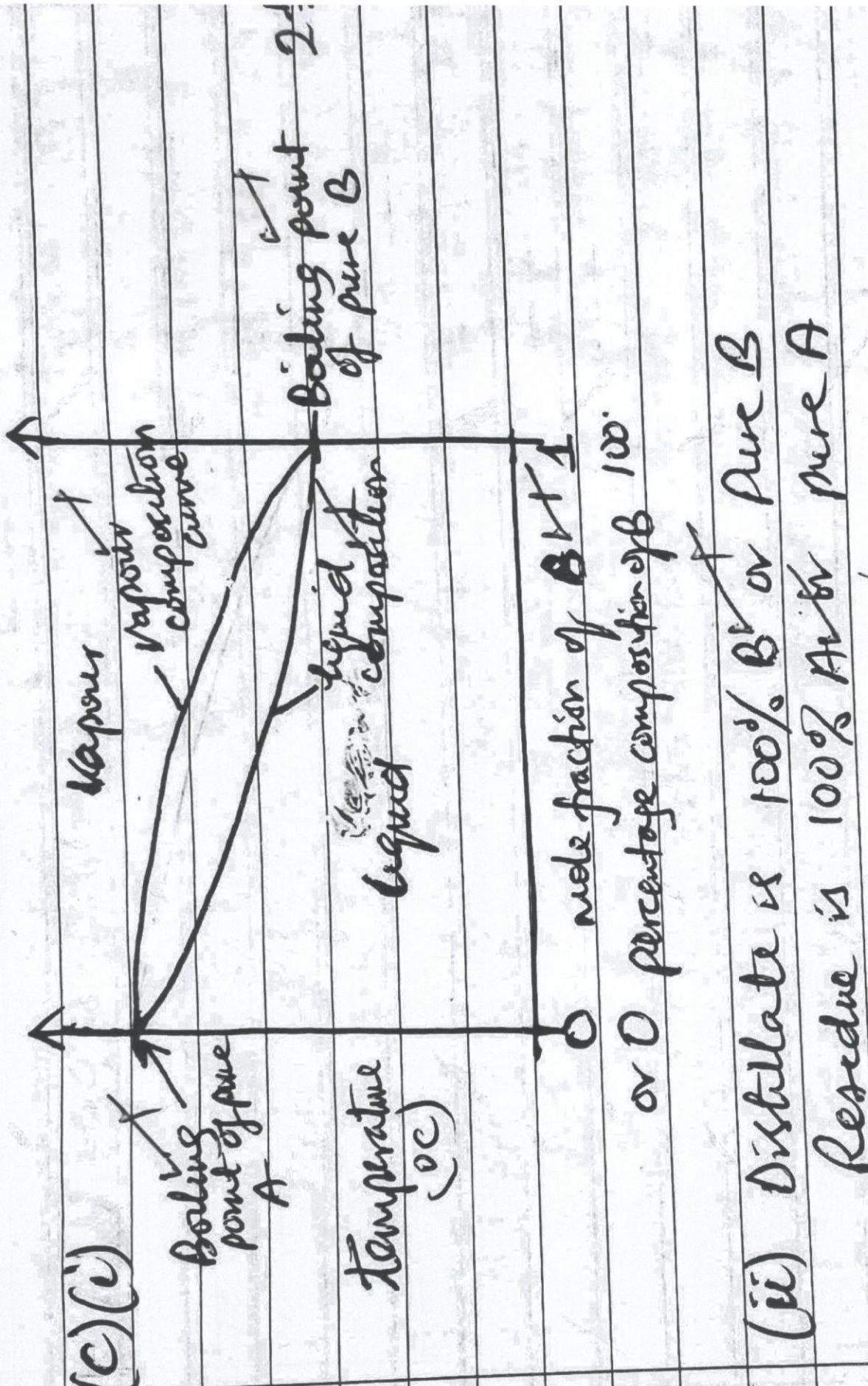
$$(b) P_A = x_A \cdot P_A^0 = (0.25 \times 8.000) \text{ kPa} = 2.000 \text{ kPa} \checkmark$$

$$P_B = (1-0.25)(13.332) \text{ kPa} = 9.999 \text{ kPa} \checkmark$$

$$P_T = P_A + P_B = (2.000 + 9.999) \text{ kPa} = 11.999 \text{ kPa} \checkmark \quad 0.5$$

$$\text{Composition of A in vapour} = \frac{P_A}{P_T} = \frac{2}{11.999} = 0.1667 \checkmark \quad \text{or } 16.67\%$$

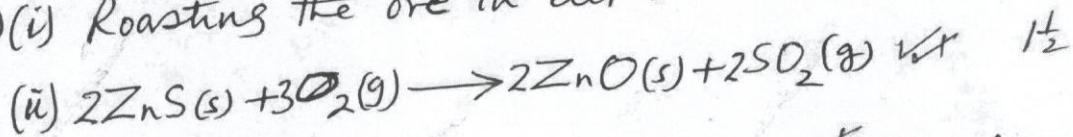
$$\text{Composition of B in vapour} = 1 - 0.1667 = 0.8333 \checkmark \\ \text{mole fraction of} \quad \text{or } 83.33\%$$



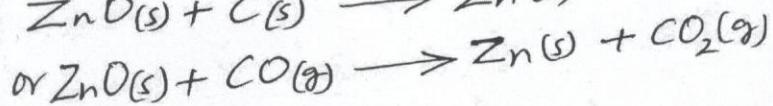
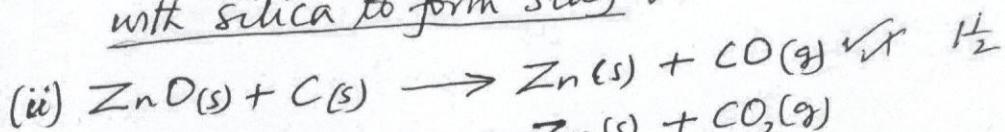
17 (a) (i) Zinc blende,  $ZnS$  ✓ 01  
or Zinc carbonate,  $ZnCO_3$

(ii) froth flotation ✓ 0½ or floatation

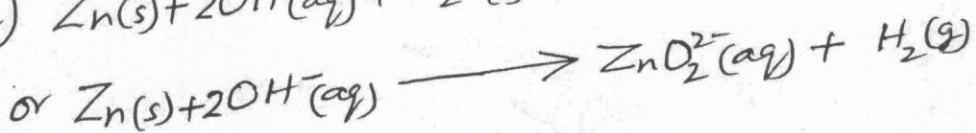
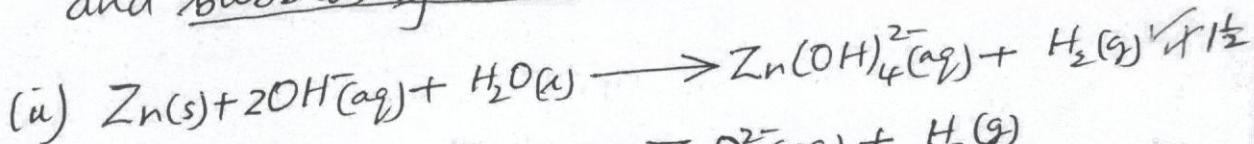
(b) (i) Roasting the ore in air ✓ 0½



(c) (i) Decomposes to form calcium oxide✓ which then reacts with silica to form slag. ✓ 01



(d) (i) Grey solid dissolves✓ to form a colourless solution✓ and bubbles of a colourless gas✓



09

# BUGANDA MOCKS 2023

## Draft Guide - 2023 CHEMISTRY P525/2

- 1(a)(i) The number of times the <sup>average</sup> mass of a naturally occurring atoms of an element is heavier than a twelfth of the mass of an atom of carbon-12 isotope of carbon.
- (ii) Half-life is the time taken by a reactant to reduce to half its original amount. ✓ or time taken for half the original mass of a radioactive substance to decay.
- (b) The vapourised sample is introduced into the ionisation chamber where it is bombarded by fast moving and high energy electrons to form positive ions. ✓  
 The positive ions are accelerated to high and <sup>constant</sup> same velocity (or speed) by the electric field into the magnetic field which deflects them into circular paths according to the mass to charge ratio <sup>✓</sup> on to the ion collector.  
 The strengths of both the electric and magnetic fields are varied so that ions of a given mass are received at the detector. ✓  
 The collected charges are amplified into a sizeable current which operates a pen and draws the mass spectrum of copper. The number of peaks/lines depends on the number of isotopes in the sample and the heights of peaks/lines depend on the abundances of the isotopes. ✓  

$$RAM = \frac{\sum (\text{Isotopic mass} \times \text{relative abundance})}{\sum (\text{relative abundance})}$$

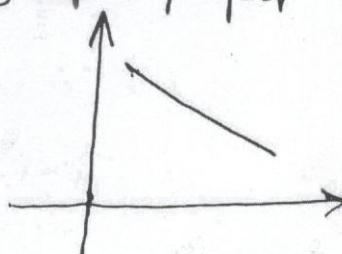
(c) Let the relative abundance of Cu-62.93 be  $x$   
 $\Rightarrow 11 \quad 11 \quad 11 \quad 11 \quad \text{Cu-64.93} = (100-x)$  ✓  
 $\Rightarrow 63.5 = \left(\frac{x}{100} \times 62.93\right) + \left(\frac{100-x}{100} \times 64.93\right)$  ✓  
 $63.5 = 62.93x + 64.93 - 64.93x$  ✓  
 $x = 71.5$  ✓  
 $\therefore \text{Cu-62.93 is } 71.5\% \text{ and Cu-64.93 is } 28.5\%$  ✓

(1)

(d)

time (minutes)	20	40	60	80	100	120
log(mass)	1.683	1.585	1.498	1.415	1.322	1.236

Refer to graph paper



axes ✓  
plots ✓ (x)  
shape ✓  
Title it

all  
3 d.p.s  
reject 1 d.p.  
or 2 d.p.s

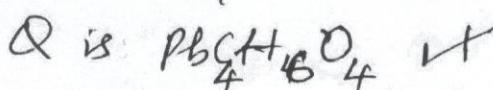
(e)(i) At  $t=0$ ;  $\log m_0 = \frac{1.8}{1.6-1.9} \checkmark \Rightarrow m_0 = 10^{1.7672} = 58.5 \text{ g with units}$   
allow  $(58.5 \rightarrow 63.1 \text{ g})$

(ii) From  $\log_{10} a_t = -\frac{k}{2.303} t + \log_{10} a_0$  (ignore)  
Slope =  $-0.0044 \text{ minute}^{-1}$  ✓ + expression  
 $\Rightarrow -\frac{k}{2.303} = -0.0044 \checkmark \Rightarrow k = 1.01332 \times 10^{-2} \text{ minute}^{-1}$  ✓ + answer + units 2½

(iii)  $t_{\frac{1}{2}} = \frac{\ln 2}{k} \checkmark \Rightarrow \frac{\ln 2}{1.01322 \times 10^{-2}} = 68.4 \text{ minutes } 1\frac{1}{2}$   
allow  $(67 \rightarrow 69)$

$$2(a)(i) \% \text{ of O} = 100 - (63.0 + 14.8 + 1.8) = 20.4$$

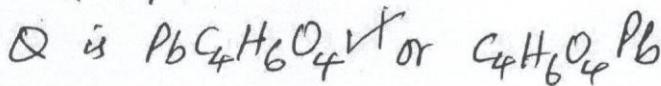
No of moles	Pb : C : H : O
	$\frac{63.0}{207}$ $\frac{14.8}{12}$ $\frac{1.8}{1}$ $\frac{20.4}{16}$
	0.304 1.233 1.8 1.275 ✓
Atomic ratio	$\frac{0.304}{0.304}$ $\frac{1.233}{0.304}$ $\frac{1.8}{0.304}$ $\frac{1.275}{0.304}$
	1 4 6 4 ✓



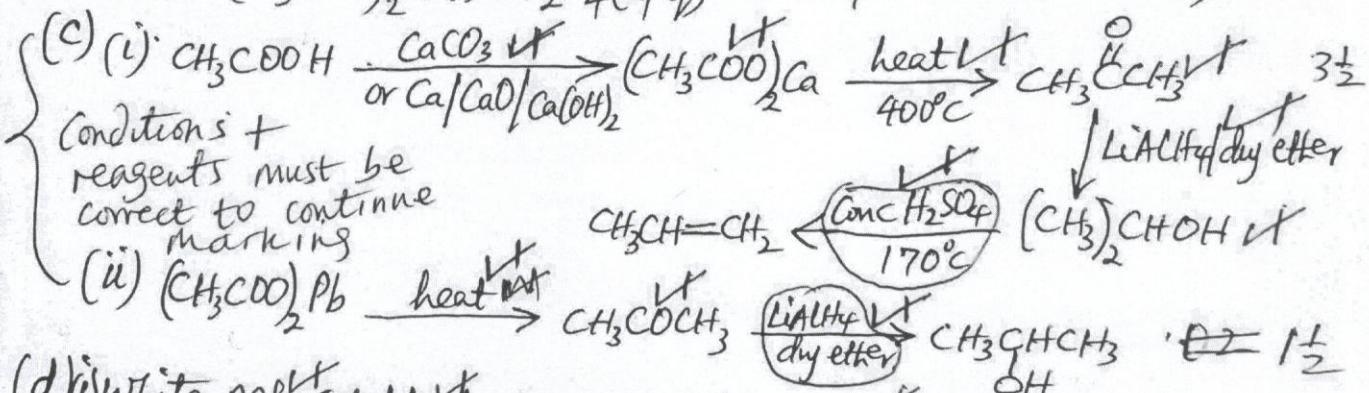
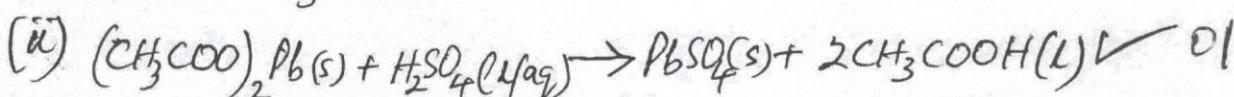
$$(ii) (PbC_4H_6O_4)_n = 325$$

$$[207 + (12 \times 4) + 6 + (4 \times 6)]n = 325 \quad 01$$

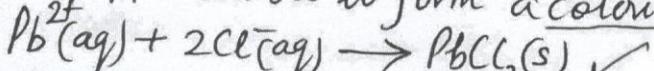
$$n = 1 \checkmark$$



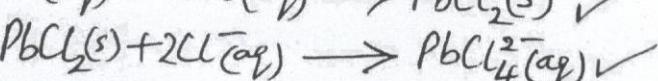
(b) (i) T is  $PbSO_4$  for lead(II) sulphate 01  
N is  $CH_3COOH$  for ethanoic acid



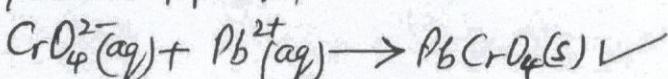
(d) (i) White ppt ✓ soluble ✓ to form a colourless solution



3½

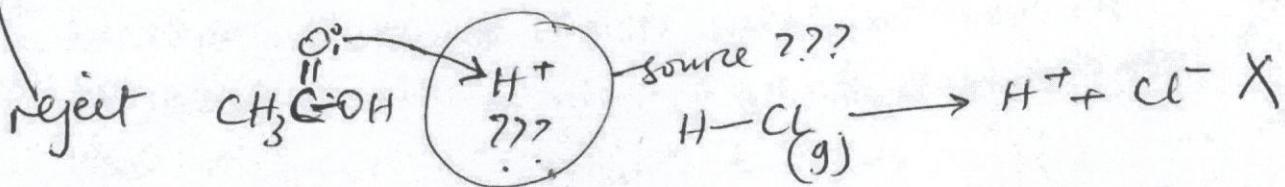
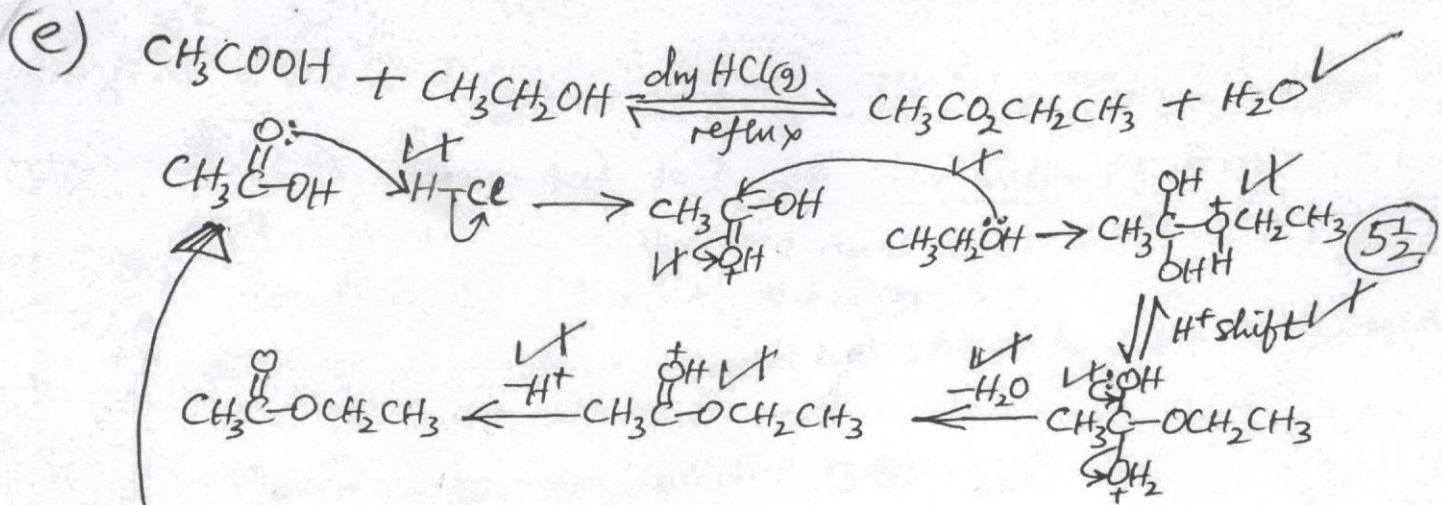


(ii) Yellow ppt ✓



1½

③



Intermediates must correct to continue marking

3

(a)(i) The partial vapour pressure of a (volatile) component in an ideal liquid mixture (or ideal solution) is the product of its vapour pressure when pure and its mole fraction in the solution at a given temperature ✓  
*ignore*

accept: The relative lowering of the vapour pressure of a pure solvent (or of the solution) is equal to the mole fraction of the non-volatile solute dissolved in it at a given temperature ✓

(ii) A liquid mixture in which the cohesive forces are equal in strength to adhesive forces. It is formed with no change in temperature (or heat) and total volume. The liquid mixture obeys Raoult's law ✓

$$(b) (i) P_p = x_p P_p^0 = 1521 \times \frac{0.2}{0.8} = 380.25 \text{ mmHg}$$

$$P_Q = x_Q P_Q^0 = 570 \times \frac{0.6}{0.8} = 427.5 \text{ mmHg}$$

$$\text{V.P. of mixture} = 427.5 + 380.25 = 807.75 \text{ mmHg}$$

$$(ii) x_p = \frac{P_p}{P_{\text{Total}}} = \frac{380.25}{807.75} = 0.4708 \text{ (or } 47.08\%)$$

$$x_Q = \frac{P_Q}{P_{\text{Total}}} = \frac{427.5}{807.75} = 0.5292 \text{ (or } 52.92\%)$$

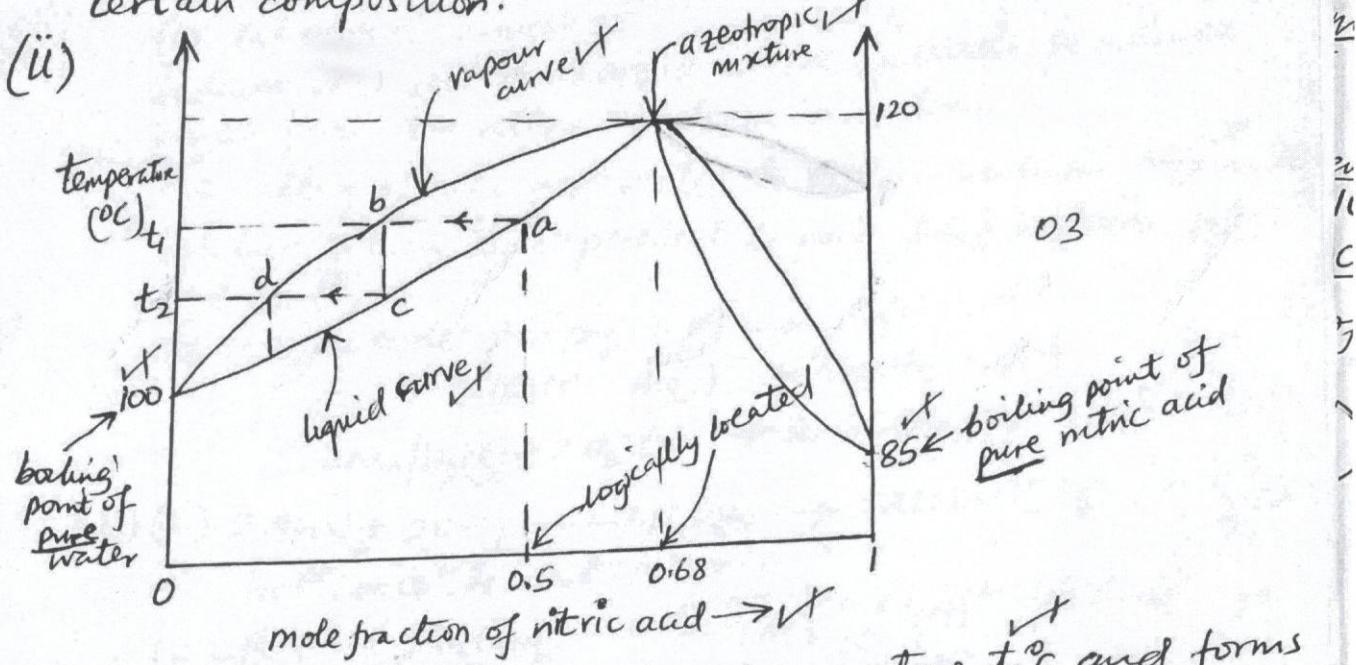
$$\text{(or } x_Q = 1 - 0.4708 = 0.5292)$$

(c)(i) The forces of attraction between molecules of nitric acid and water are stronger than those that exist between molecules of nitric acid and water molecules in separate pure states.

This leads to less escaping tendency of molecules of each kind <sup>from the liquid mixture</sup> into vapour than from the pure liquids ✓  
*or if it was ideal* ✓

①

The vapour pressure of the solution is lower than that of an ideal solution leading to a maximum boiling point at a certain composition.



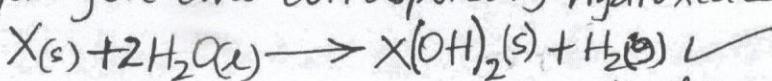
When heated, it boils at 'a' at temperature,  $t_1$  °C and forms a vapour<sup>of composition</sup> 'b' which is richer in water, the more volatile component. The vapour cools to form a liquid 'c' which has the same composition as the vapour. The liquid mixture again boils at a lower temperature,  $t_2$  °C to form a vapour which is still richer in water! When the process of boiling and condensing is repeated times, pure water is formed as a distillate. The azeotropic mixture is formed as a residue.

- (iii)  $1\text{ cm}^3$  of mixture (or solution) contains  $1.42\text{ g}$  of acid  
 $1000\text{ cm}^3$  of mixture contain  $(1.42 \times 1000)\text{ g}$  of acid  
 $= 1420\text{ g}$  of acid  
 Mass of acid in 1 litre of solution  $= \left(\frac{68}{100} \times 1420\right)_g = 9.656\text{ g}$  03  
 Rfm of  $\text{HNO}_3 = 1 + 14 + (16 \times 3) = 63$   
 Molarity of stock  $\text{HNO}_3 = \frac{9.656}{63}\text{ M} = 15.327\text{ M}$   
 Volume of acid  $= \frac{2 \times 1000}{15.327} = 130.9\text{ cm}^3$

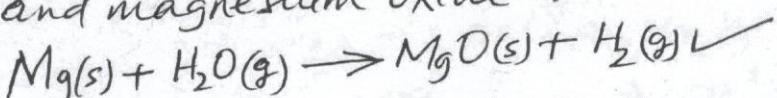
②

4(a)(i) Beryllium doesn't react with water at all conditions

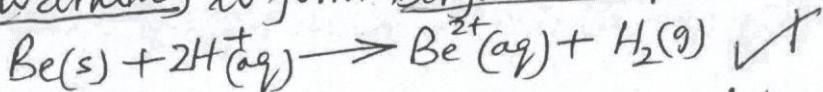
The rest ( $Mg, Ca, Ba$ ) react with cold water to form hydrogen and corresponding hydroxides ✓



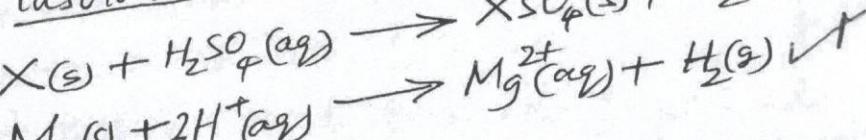
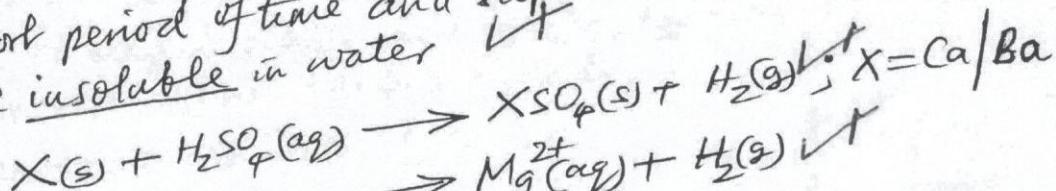
Heated magnesium reacts with steam to form hydrogen and magnesium oxide ✓



(ii) Beryllium reacts with dilute sulphuric acid on warming to form beryllium sulphate and hydrogen ✓



The rest react with cold dilute sulphuric acid to form the corresponding sulphate and hydrogen. ✓  
The reaction with  $Ca$  and  $Ba$  takes place for a short period of time and stops since their sulphates are insoluble in water ✓ 03



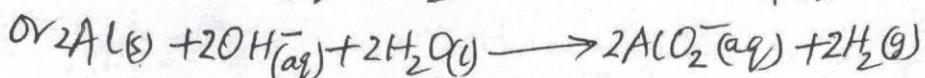
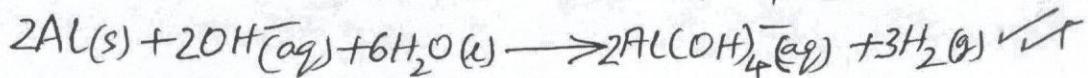
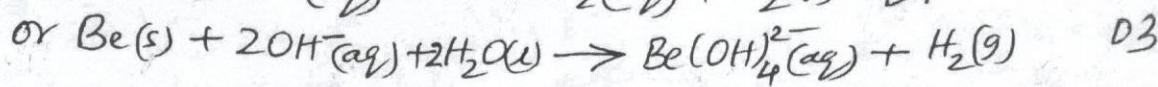
(b)(i) - Both elements are made passive by nitric acid. ✓

- Their oxides (or hydroxides) are amphoteric. ✓ 03

- Their carbides hydrolyse in water to give methane and the corresponding hydroxide. ✓

any correct 3 points - Their chlorides are covalent polymeric solids when anhydrous.  
- Their chlorides exist as dimers in vapour phase

- (ii) - The atom has the smallest atomic radius / highest electronegativity (or least electropositivity)
- The cation has the highest charge density (or polarising power)
  - The element has the least negative value of SEP



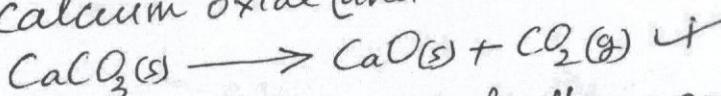
(c) (i) Dry process and wet process  $\checkmark \checkmark$

01

(ii) Limestone & clay and gypsum  $\checkmark \checkmark$

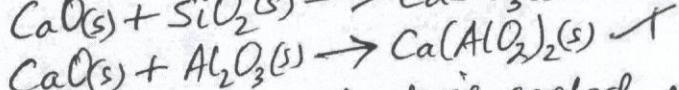
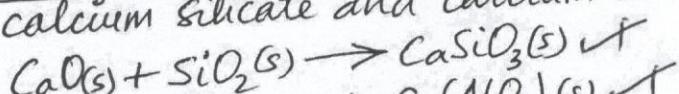
$1\frac{1}{2}$

(b) A mixture of limestone and clay is powdered and strongly heated to expel water and decompose limestone to calcium oxide (and carbon dioxide)

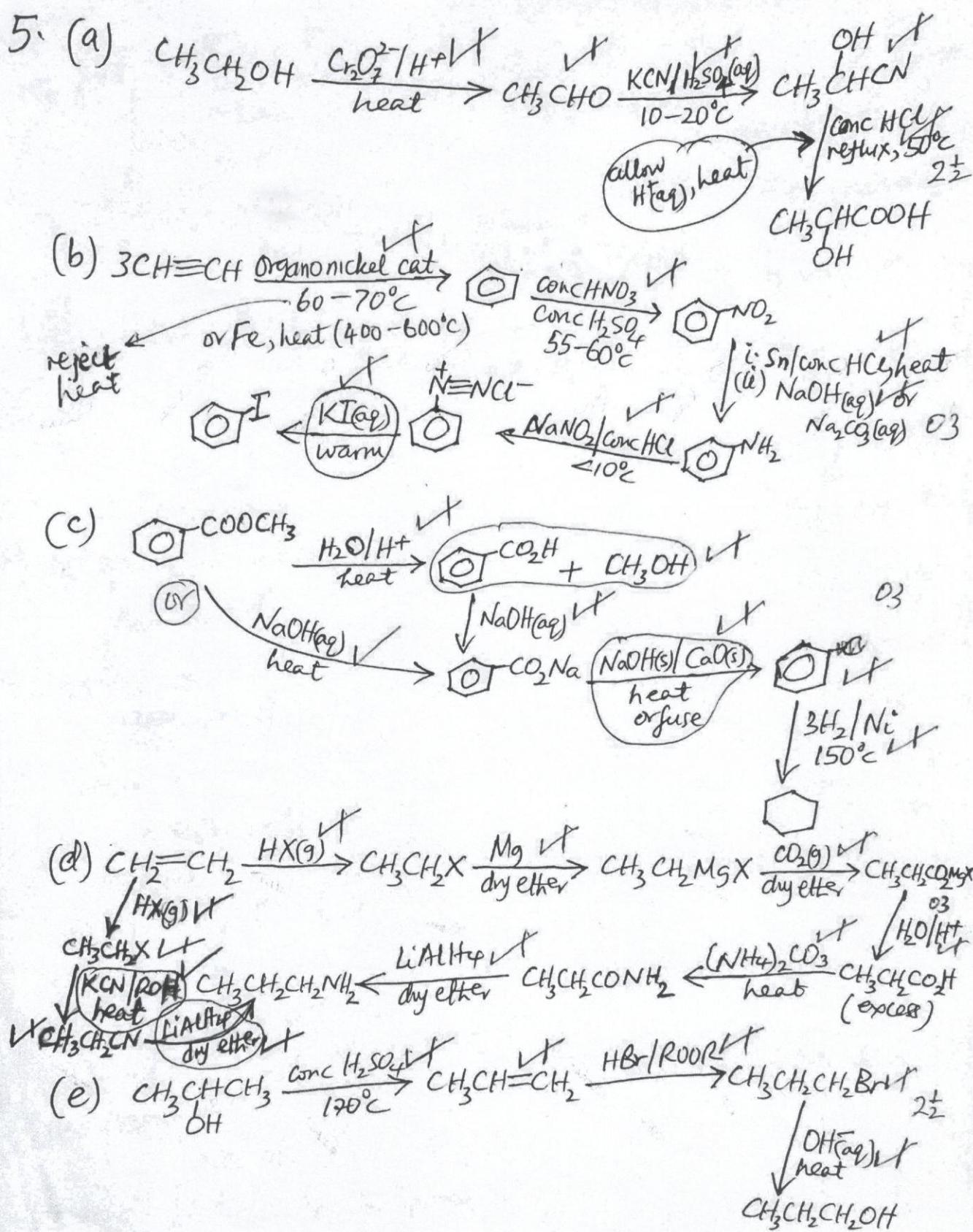


03  $\frac{1}{2}$

The basic calcium oxide then reacts with aluminium oxide and silicon(IV) oxide in clay to form a mixture of calcium silicate and calcium aluminato

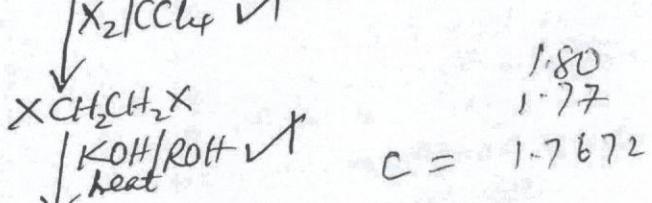
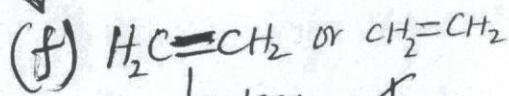
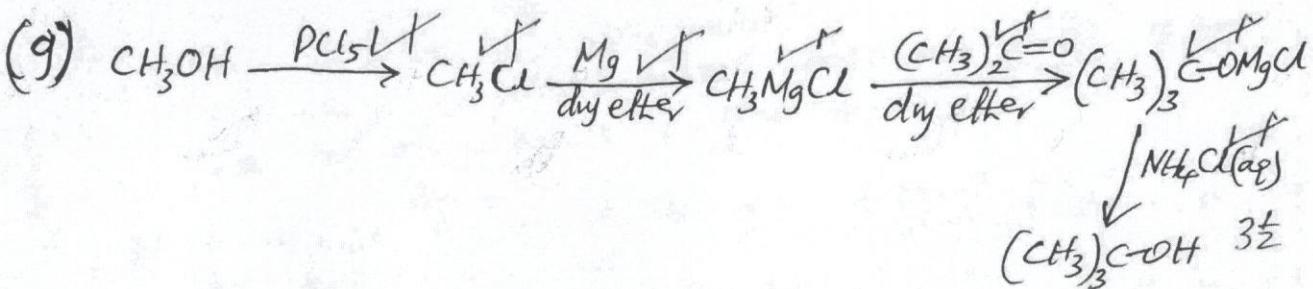
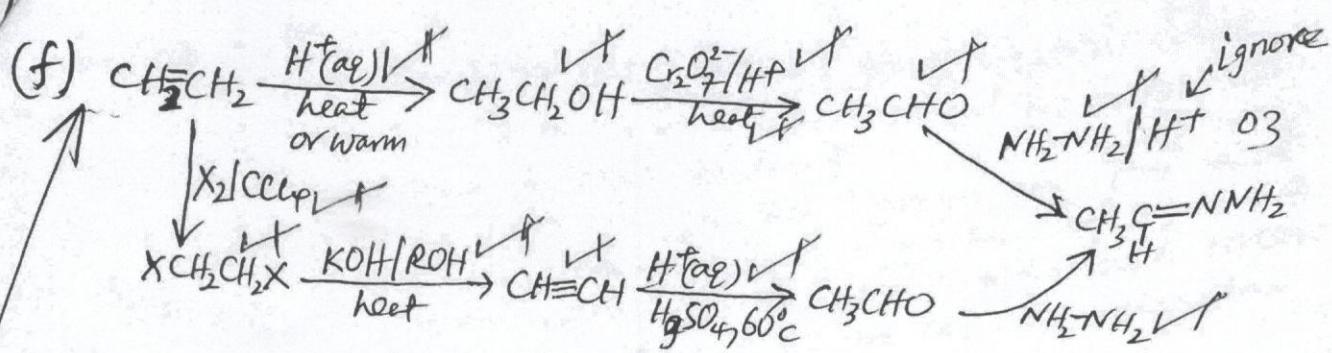


The roasted product is cooled, powdered and mixed with some gypsum and other materials to form cement



(P)

(i) T

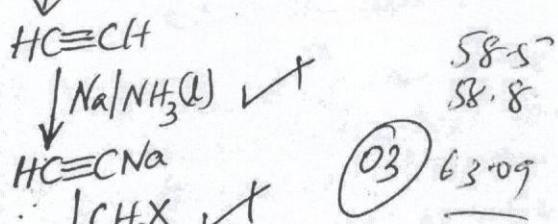


$$C = 1.7672$$

$$\begin{array}{r} 1.80 \\ 1.77 \end{array}$$

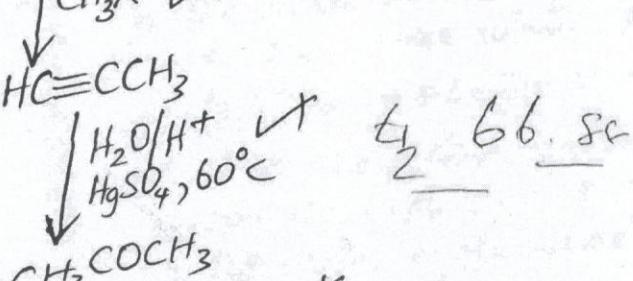
$$\text{slope} = -0.0044$$

$$4.5 \times 10^{-3}$$

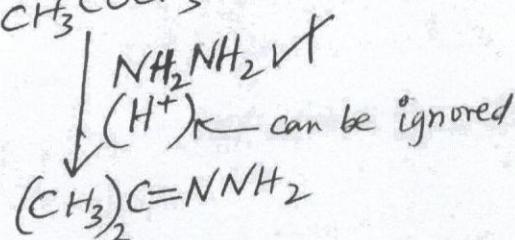
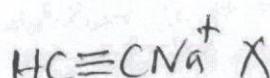


$$\begin{array}{r} 58.5 \\ 58.8 \\ 63.09 \end{array}$$

$$k = 0.0103635$$



$$t_2 = 66.8^\circ$$



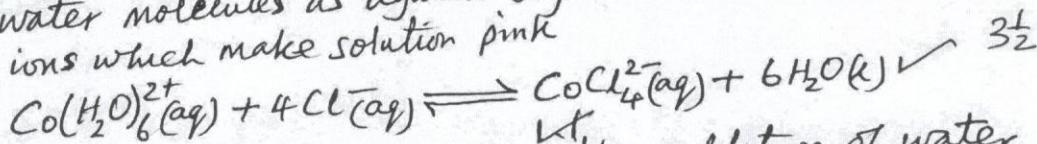
NB: In (a)  $\rightarrow$  (f); accept after correct alternative routes. All reagents and conditions must be correct to continue marking

8

6. (a) In <sup>4-</sup>nitrophenol, the two functional groups are wide apart and as a result, molecules of 4-nitrophenol associate via intermolecular hydrogen bonds ✓  
 In 2-nitrophenol, the two functional groups are close and this results into intramolecular hydrogen bonding. Hence, O<sub>3</sub> molecules of 2-nitrophenol associate via van der Waals forces of attraction. (allow: Hence, there are less intermolecular hydrogen bonds in 2-nitrophenol).  
 Hydro: Intermolecular hydrogen bonds are stronger than van der Waals forces of attraction.

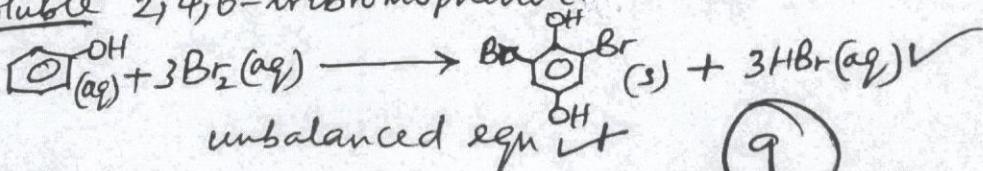
(b) The hydrogen bonded to the carbonyl group <sup>atom</sup> in methanoic acid has no inductive effect. oxygen-hydrogen bond is relatively weaker whereas in ethanoic acid, the methyl group which is bonded to the carbonyl group has a positive inductive effect. The O<sub>3</sub> methyl group pushes electrons towards the oxygen-hydrogen bond and this reduces the partial positive charge on the hydrogen atom and thus, strengthens the oxygen-hydrogen in ethanoic acid.  
 Therefore, methanoic acid ionises more easily than ethanoic acid does

(c) The pink colour of the aqueous solution of cobalt(II) chloride is due to the hexaqua cobalt(II) ions. On addition of concentrated hydrochloric acid, the chloride ions displace water molecules as ligands to form tetrachloro cobaltate(II) ions which make solution pink

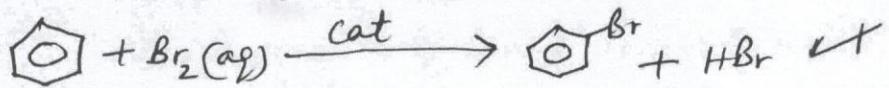


Since the reaction is reversible, addition of water causes the displacement of chloride ions as the ligands by the water molecules to form hexaqua cobalt(II) ions again ✓

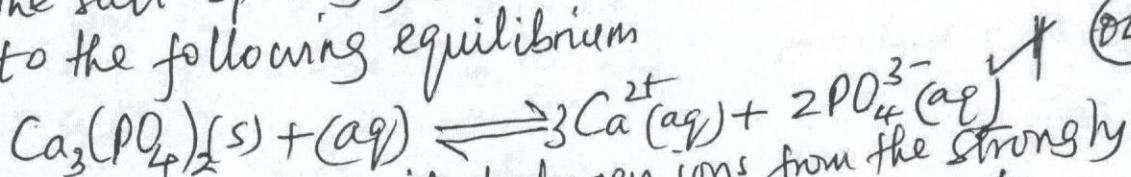
(d) In phenol, the lone pairs of electrons on the oxygen atom interacts with the delocalised electrons of the benzene ring. This increases the electron density in the ring and makes it more reactive! Thus, phenol readily undergoes electrophilic substitution with bromine water to form ~~an~~ an insoluble 2,4,6-tribromophenol.



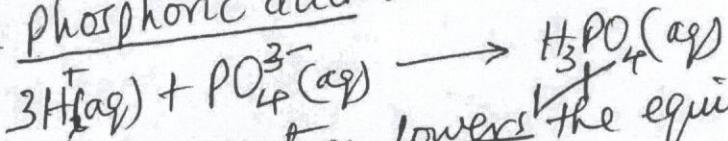
Benzene molecule lacks an electron donating group and this makes delocalised electrons in the ring not readily available for the electrophilic substitution in the ring. Thus, for the reaction to occur, a catalyst is added



(e) In Calcium phosphate, both ions are highly charged. This makes the salt have a high lattice energy that cannot be offset by the hydration energy released by the ions in aqueous solution. The salt sparingly dissolves in water according to the following equilibrium



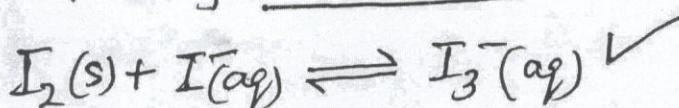
In dilute nitric acid, hydrogen ions from the strongly ionised acid reacts with the phosphate ions to form phosphoric acid which is a weak acid



The above reaction lowers the equilibrium concentration of phosphate ions and causes more solid calcium phosphate to dissolve.

(f) Iodine is non-polar whereas water molecules are polar

Iodine reacts with iodide ions to form a soluble complex of triiodide ions



abv

NO7. (a)

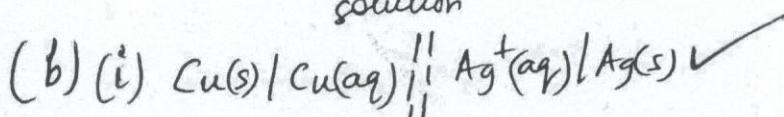
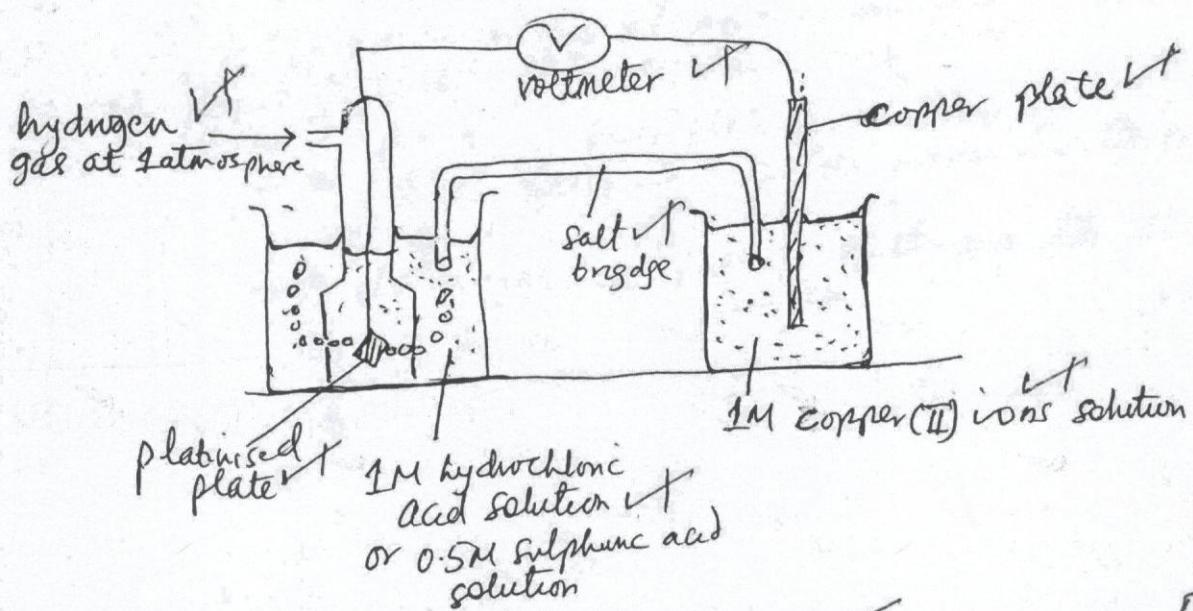
Copper plate is dipped in a 1.0M solution of copper(II) ions (or copper(II) sulphate solution) to form a half cell.

The half cell is connected internally to the SHE via a salt bridge and externally to the SHE by use of a copper wire carrying a high resistance voltmeter or a potentiometer in series with two half cells.

The cell is allowed to stand at constant temperature of 25°C (or 298°C).

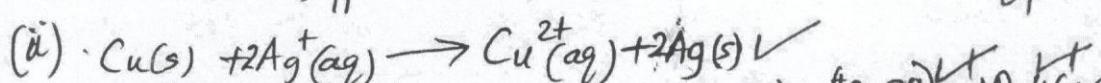
The emf of the cell is measured using a potentiometer. Since the SHE has a potential of 0.00 Volts, the reading of the potentiometer is the SEP of Copper and it is positive.

(D7)



01

01

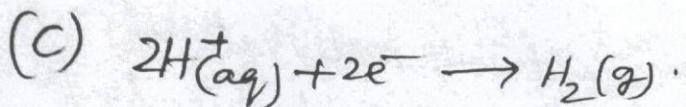


$$\begin{aligned} (\text{iii}) \quad \Delta G^\theta &= -nFE^\theta \\ &= -2 \times 96500 \times (+0.46) \quad E^\theta_{\text{cell}} = (+0.80) - (+0.34) = +0.46 \text{ V} \\ &= -88780 \text{ J mol}^{-1} \\ \text{or} &= -88.78 \text{ kJ mol}^{-1} \end{aligned}$$

03

(iv) The reaction is feasible since the  $\Delta G^\theta$  is negative

(11)



$$Q = 2.0 \times 30 \times 60 = 3600 \text{ C} \quad \checkmark$$

$$\text{No of moles of } H_2 \text{ evolved} = \frac{3600}{2 \times 96500} \quad \checkmark$$

$$V = \frac{nRT}{P} \quad \checkmark \quad \frac{3600 \times 8.31 \times (23+273)}{2 \times 96500 \times 100 \times 1000}$$

$$= 4.588 \times 10^{-4} \text{ m}^3$$

$$= 458.8 \text{ cm}^3 \quad \checkmark$$

03

- (d) (i) Electrochemical cells generate electricity from the electrode reactions; electrolytic cells need an external source of direct current  $O_2$
- In electrolytic cells, reduction occurs at the negative pole while in the electrochemical cells, oxidation occurs at the negative pole

- (ii)
- To predict feasibility of reactions  $\checkmark$
  - To select the best suitable reducing (or oxidising) agents  $O_3$
  - To determine end-point in acid-base titrations

8(a) A d-block element is one in which the outermost electrons are filled in the d-subshell/sub-energy level / orbitals ✓

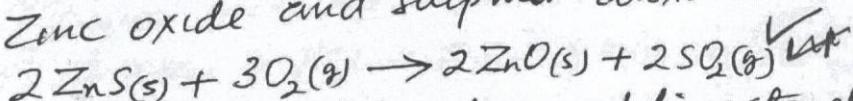
Transition element is one which forms at least one ion with a partially filled 3d orbitals / sub energy level ✓

(or) An element with a partially filled 3d sub energy level in any of the stable oxidation states including the atomic state

(b) - forms complexes (or complex ions) ✓ { Ignore qn has  
- Its cpds can be used as a catalyst ✓ } an error

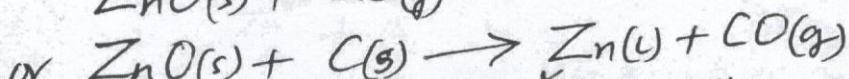
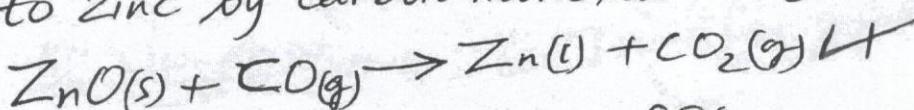
(c)(i) ZnS ✓ D1

(ii) The ore is crushed and mixed with water and a frothing agent. ✓ Air is blown through the mixture to agitate it; sink to the bottom while the ore with frothing agent floats on top of the mixture from where they are skinned off and dilute acid is added to break it down. The mixture is filtered to remove the froth. The concentrated ore is filtered and dried. The purified ore is roasted in air to form Zinc oxide and sulphur dioxide



D71  
D72

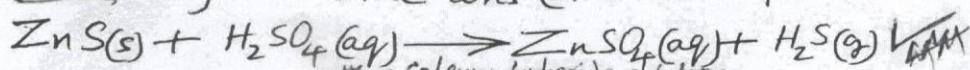
Zinc oxide formed, coke and limestone are dropped into a blast furnace. Hot air is blown into the furnace. (to heat the mixture where) Zinc oxide is reduced to zinc by carbon monoxide or carbon



Zinc vapour distills off from the vapour and is cooled (or condensed) by a spray of molten lead. Zinc is purified by redistillation ✓

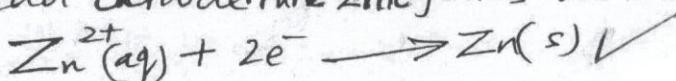
## Alternatively

The ore is crushed and dissolved in excess dilute sulphuric acid to form zinc ions (or zinc sulphate solution)

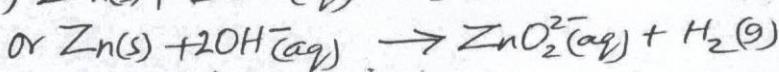
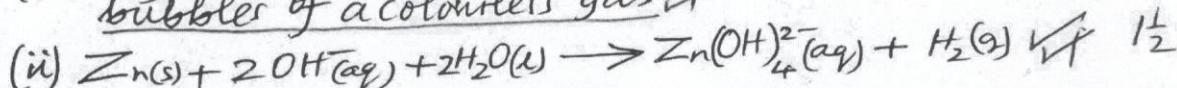


Milk of lime or calcium hydroxide solution is added to the mixture to precipitate the hydroxides of other elements (e.g. Al, Fe etc) and mixture filtered.

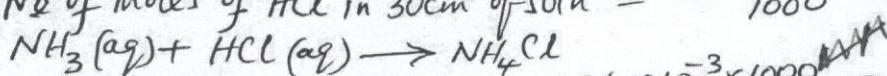
The filtrate is acidified and using zinc sulphuric acid and electrolysed using aluminium cathode and lead anode. Pure Zinc forms at the cathode.



(d) (i) Grey solid dissolves to form a colourless solution and 0.1<sub>2</sub> bubbles of a colourless gas is



$$(\text{e}) \text{No of moles of HCl in } 30\text{cm}^3 \text{ of soln} = \frac{0.062 \times 30}{1000} = 1.86 \times 10^{-3}$$



$$[\text{NH}_3] \text{ in organic layer} = \frac{1.86 \times 10^{-3} \times 1000}{50} = 0.0372 \text{M}$$

$$K_D = \frac{[\text{NH}_3] \text{ free in aqueous layer}}{[\text{NH}_3] \text{ free in organic layer}}$$

06

$$\Rightarrow [\text{NH}_3] \text{ free in aq. layer} = 25.0 \times 0.0372 = 0.93 \text{M}$$

$$\text{No of moles of HCl in } 40\text{cm}^3 \text{ of soln} = \frac{0.5 \times 40}{1000} = 2 \times 10^{-2}$$

$$[\text{NH}_3] \text{ total in aq. layer} = \frac{2 \times 10^{-2} \times 1000}{20} = 1 \text{M}$$

$$[\text{NH}_3]_{\text{complexed}} = 1 - 0.93 = 0.07 \text{M}$$

$$\frac{[\text{NH}_3]_{\text{complexed}}}{[\text{Zn}^{2+}]} = 4 ; [\text{Zn}^{2+}] = \frac{0.07}{4} = 0.0175 \text{M}$$

$$\text{Mass of Zn in ore} = (0.0175 \times 65.7) = 1.1498 \text{g}$$

$$\% \text{ of Zn in ore} = \left( \frac{1.1498}{1.5} \times 100 \right) \% = 76.65 \%$$

01/2

- (f) - To galvanise iron  
- To make alloys

# BUGANDA MOCKS 2023

## DRAFT GUIDE CHEMISTRY PS25/3

1. You are provided with the following;

FA1; which is a solution containing  $11.2\text{ g l}^{-1}$  of thiosulphate ions,  $\text{S}_2\text{O}_3^{2-}$

FA2; which is a solution containing approximately 0.02M Manganate (VII) ions

Solid T; which is a salt containing iron (II) ions.

1M sulphuric acid

Starch indicator

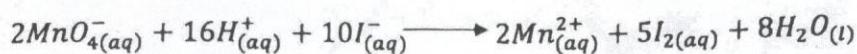
0.5M potassium iodide solution

You are required to;

(i) Standardise FA2 using FA1

(ii) Determine the percentage by mass of iron in T

In acidic medium, Manganate (VII) ions react with iodide ions to liberate iodine according to the equation



The iodine liberated reacts with thiosulphate ions according to the following equation



Manganate (VII) ions react with Iron (II) ions according to the following equation.



### Procedure; PART A

(a) Pipette  $25.0\text{ cm}^3$  (Or  $20\text{ cm}^3$ ) of FA2 into a conical flask and add an equal volume of 1M sulphuric acid using a measuring cylinder, followed by  $10\text{ cm}^3$  of 0.5M potassium iodide solution.

Titrate the iodine liberated with FA1 using starch indicator. Repeat the titration until you obtain consistent results.

Record your results in table I below

Volume of pipette used ..... 25.00/25.0/25 .....  $\checkmark$  must be indicated cm $^3$  ( $\frac{1}{2}$  mk)

OK

Table 1

Final burette reading (cm $^3$ )	27.00	25.80	26.80
Initial burette reading (cm $^3$ )	2.00	1.00	2.00
Volume of FA1 used (cm $^3$ )	25.00 $\checkmark$	24.80 $\checkmark$	24.80 $\checkmark$

04L

$$\text{CR/TR} = \pm 5 (29.80 - 29.80)$$

$\checkmark$  Deny  $1\frac{1}{2}$  mks for any column out of the centre range (GR)

$\checkmark$  All entries must be 2 dps and 0-50

$\checkmark$  FBR > IBR

State the volumes of FA1 used to calculate the average volume  
24.80 and 24.80 agree  $\pm 0.1$  and within the CR (1/2 mks)  
 Calculate the average volume of FA1 (3 1/2 mks)

$$\frac{24.80 + 24.80}{2} = 24.80 \pm 0.1 \quad \left\{ \begin{array}{l} \text{should be} \\ \text{within the CR} \end{array} \right.$$

$\pm 0.2$   
 $\pm 0.3$   
 $\pm 0.4$   
 $\pm 0.5$

### Questions

(a) Rfm of  $S_2O_3^{2-}$  =  $2(32) + 3(16) = 112$   
 112 g of  $S_2O_3^{2-}$  weigh contain 1 mole ✓  
 11.2 g of  $S_2O_3^{2-}$  contain  $\frac{11.2}{112}$  moles ✓  
 $= 0.1 M$  ✓

1000 cm<sup>3</sup> of solution contain 0.1 moles of  $S_2O_3^{2-}$  const ✓  
 24.80 cm<sup>3</sup> of II      II       $\frac{(0.1 \times 24.80)}{1000}$  moles of  $S_2O_3^{2-}$  const  
 $= 2.48 \times 10^{-3}$  moles

(b) 2 moles of  $S_2O_3^{2-}$  react with 1 mole of  $I_2$  liberated  
 2.48  $\times 10^{-3}$  moles of  $S_2O_3^{2-}$  react with  $\frac{(2.48 \times 10^{-3})}{2}$  moles of  $I_2$  liberated.  
 $= 1.24 \times 10^{-3}$  moles

5 moles of  $I_2$  are liberated by 2 moles of  $MnO_4^-$  ions Q3  
 1.24  $\times 10^{-3}$  moles of  $I_2$  are liberated by  $\frac{(2 \times 1.24 \times 10^{-3})}{5}$  moles of  $MnO_4^-$  ions

25.00 cm<sup>3</sup> of solution contain  $4.96 \times 10^{-4}$  moles of  $MnO_4^-$  ions  
 1000 cm<sup>3</sup> of II      II       $\frac{(4.96 \times 10^{-4} \times 1000)}{25.00}$  moles of  $MnO_4^-$  ions  
 $= 0.0198 M$  ✓

alternatively:

5 moles of  $S_2O_3^{2-}$  react with 1 mole of  $MnO_4^-$   
 2.48  $\times 10^{-3}$  moles of  $S_2O_3^{2-}$  react with  $\frac{(2.48 \times 10^{-3})}{5}$  moles of  $MnO_4^-$   
 $= 4.96 \times 10^{-4}$  moles

25.0 cm<sup>3</sup> of solution contain  $4.96 \times 10^{-4}$  moles of  $MnO_4^-$  ions  
 1000 cm<sup>3</sup> of II      II       $\frac{(4.96 \times 10^{-4} \times 1000)}{25.0}$  moles of  $MnO_4^-$  ions  
 $= 0.0198 M$  ✓



### Procedure; PART B

- (a) Weigh accurately 5.0g of T. Dissolve it in a minimum amount of distilled water and transfer the solution into a  $250 \text{ cm}^3$  volumetric flask. Make the solution up to the mark with distilled waste and label it FA3.
- (b) Pipette  $25.0\text{cm}^3$  (Or  $20.0\text{cm}^3$ ) of FA3 into a conical flask and add an equal volume of 1M sulphuric acid. Titrate the solution with FA2 from the burette. Repeat the titration until you obtain consistent results.

Record your results in table II below

#### RESULTS;

Mass of weighing bottle + T = ..... 6.00 g (½ mk)  
 Mass of empty weighing bottle = ..... 1.00 g (½ mk)  
 Mass of T used = ..... 5.00 g (½ mk)  
 Volume of pipette used = .....  $25.00/25.0$   $\text{cm}^3$  (½ mk)

as in part I

(62)

TABLE II

Final burette reading ( $\text{cm}^3$ )	14.90	27.60	40.30
Initial burette reading ( $\text{cm}^3$ )	2.00	14.90	27.60
Volume of FA2 used ( $\text{cm}^3$ )	12.90	12.70	12.70

(04)

State volumes of FA2 used to calculate the average volume;  
12.70 and 12.70 (agree  $\pm 0.1$ ) ✓

(4 ½ mks)

(½ mk)

(01)

Calculate the average volume of FA2

(2 ½ mks)

$$\frac{12.70 + 12.70}{2} = 12.70 \pm 0.1$$

$\pm 0.2$   
 $\pm 0.3$   
 $\pm 0.4$   
 $\pm 0.5$

(03)

weighing

- ✓ At least 1dp or else deny marks
- ✓ mass of T + empty bottle > mass of empty bottle
- ✓ Deny marks for mass of empty bottle equal to zero
- ✓ Range of weighed mass of T; can be from ~~best~~  $(4.9 - 5.1)$  g

C(i)  $1000\text{cm}^3$  of FA2 contain  $0.0198$  moles of  $\text{MnO}_4^-$  ions from Part I/  
 $12.70\text{cm}^3$  of FA2 contain  $(0.0198 \times 12.70) / 1000$  moles of  $\text{MnO}_4^-$  ions  
 $= 2.5146 \times 10^{-4}$  moles of  $\text{MnO}_4^-$

1 mole of  $\text{MnO}_4^-$  ions reacts with 5 moles of  $\text{Fe}^{2+}$  ions  
 $2.5146 \times 10^{-4}$  moles of  $\text{MnO}_4^-$  ions react with  $(5 \times 2.5146 \times 10^{-4})$  moles of  $\text{Fe}^{2+}$   
 $= 1.2573 \times 10^{-3}$  moles of  $\text{Fe}^{2+}$  ions

$25\text{cm}^3$  of FA3 contain  $1.2573 \times 10^{-3}$  moles of  $\text{Fe}^{2+}$  ions  
 $1000\text{cm}^3$  of FA3 contain  $(1.2573 \times 10^{-3} \times 1000)$  moles of  $\text{Fe}^{2+}$  ions  
 $= 0.050292 \text{ mol l}^{-1}$

or  $= 0.05 \text{ mol l}^{-1}$   
 (rounding off must be done at the last step)

(ii)  $1000\text{cm}^3$  of FA3 contain  $0.05$  moles of  $\text{Fe}^{2+}$  ions  
 $250\text{cm}^3$  of FA3 "  $(0.05 \times 250) / 1000$  moles of  $\text{Fe}^{2+}$  ions  
 $= 0.0125$  moles of  $\text{Fe}^{2+}$  ions

$\therefore$  No of moles of Fe in T =  $0.0125$

1 mole of Fe weighs  $56\text{g}$

$0.0125$  moles of Fe weighs  $(56 \times 0.0125)\text{g}$

$$= 0.7$$

% of Fe in T =  $\left( \frac{0.7}{5.0} \times 100 \right)\% = 14\%$

accept:  $250\text{cm}^3$  of solution contain  $5\text{g}$  of T

$1000\text{cm}^3$  of " "  $\left( \frac{5 \times 1000}{250} \right)\text{g} = 20\text{g}$  of T

No of moles of Fe in 1 litre of T =  $0.05$

1 mole of Fe weighs  $56\text{g}$

$0.05$  moles of Fe weighs  $(56 \times 0.05)\text{g} = 2.8\text{g}$

% of Fe in T =  $\left( \frac{2.8}{20} \times 100 \right)\% = 14\%$

QN 2

(a)	<ul style="list-style-type: none"> <li>• Colourless condensate/liquid turns white anhydrous <math>\text{CuSO}_4</math> blue ✓</li> <li>• Colourless gas turns moist blue litmus paper red and limewater milky. ✓</li> <li>• Colourless gas/vapour with a sweet smell, forms a yellow ppt. with Brady's reagent. ✓</li> <li>• Yellow solid residue when hot and white on cooling ✓</li> </ul>	hydrated salt or water of crystalisation $\text{CO}_2(\text{g})$ , $\text{CO}_3^{2-}/\text{HCO}_3^-$ $\text{C}_2\text{O}_4^{2-}/\text{CH}_3\text{COO}^-$ $(\text{CH}_3)_2\text{CO}(\text{g})$ ; $\text{CH}_3\text{CO}_2^-$ <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">15 max</span>
(b)	<ul style="list-style-type: none"> <li>• Effervescence occurs</li> <li>• Misty fumes with a vinegar smell turns moist blue litmus red. ✓</li> </ul>	$\text{CH}_3\text{COOH}(\text{g})$ $\text{CH}_3\text{COO}^-$ <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">12 max</span>
(c)	Colourless solution ✓	$\text{Ca}^{2+}$ , $\text{Mg}^{2+}$ , $\text{Ba}^{2+}$ , $\text{Al}^{3+}$ , $\text{NH}_4^+$ , $\text{Pb}^{2+}$ , $\text{Zn}^{2+}$ present <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">12</span>
(d)	Reddish-brown (or brown) ppt on boiling	$\text{CH}_3\text{COO}^-$ ✓ 01
(e)	Sweet fruity smell evolved /detected	Esterification $\text{CH}_3\text{COO}^-$ 1½
(f)	White ppt insoluble turns brown Dirty white/brown residue colourless filtrate ✓	Probably $\text{Mn}^{2+}$ $\text{Mn}^{2+}$ in residue $\text{Al}^{3+}$ , $\text{Zn}^{2+}$ , $\text{Pb}^{2+}$ in filtrate <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">3½</span>

(g) To the filtrate from (f), add dilute nitric acid to acidify. Then divide the acidified filtrate into five parts.	White ppt Soluble in acid.	Probably $\text{Al}^{3+}$ or $\text{Zn}^{2+}$ or $\text{Pb}^{2+}$ or $\text{Sn}^{2+}$ or $\text{Sn}^{4+}$
(i) to the first part of the acidified filtrate, add sodium hydroxide dropwise until in excess	White ppt Soluble in excess giving a colourless solution	Probably $\text{Al}^{3+}$ or $\text{Zn}^{2+}$ or $\text{Pb}^{2+}$ or $\text{Sn}^{2+}$ or $\text{Sn}^{4+}$
(ii) To the second part of the acidified filtrate add dilute ammonia solution dropwise until in excess.	White ppt Soluble in excess giving a colourless solution	Probably $\text{Zn}^{2+}$ present
(iii) Use the third part of the acidified filtrate to carry out a test of your own to confirm one of the cations in Q. Record test and Observations.	White ppt Soluble in excess.	$\text{Zn}^{2+}$ present.
Test: $\text{NH}_4\text{Cl}_{(\text{excess})} + \text{Na}_2\text{HPO}_4_{(\text{excess})} + \text{NH}_3_{(\text{excess})}$		02 $\frac{1}{2}$
(iv) To the fourth part of the acidified filtrate, add 4 – 5 drops of Lead (II) nitrate solution and heat gently.	White ppt insoluble on heating	$\text{SO}_4^{2-}$ present.
(v) Use the fifth part of the acidified filtrate to carry out a test of your own choice to confirm the second ion in Q. Record test and observations.	White ppt	$\text{SO}_4^{2-}$ present
Test: Add $\text{Ba}(\text{NO}_3)_2$ or $\text{BaCl}_2$	Colourless Solution answ: Pale brown	Probably $\text{Mn}^{2+}$ present.
(h) Wash the residue from (f) and dissolve it into dilute nitric acid. Divide the acid solution into three parts.		01

10½

(i) To the first part of the acidic solution, add dilute sodium hydroxide dropwise until in excess.	White ppt insoluble in excess turns brown on standing or Dirty white ppt insoluble in excess	Probably $Mn^{2+}$ 02
(ii) To the second part of the acidic solution, add dilute ammonia solution dropwise until in excess.	White ppt insoluble in excess turns brown on standing or Dirty white ppt insoluble in excess	Probably $Mn^{2+}$ 02
(iii) Use the third part of the acidic solution to carry out a test of your own to confirm. One of the cations in Q. Record test and observations.	Purple/pink coloration (solution)	$Mn^{2+}$ ✓ 1/2

Record test and observations.  
Test: Add 2-3 drops Conc  $HNO_3$  +  
Solid sodium bismuthate  
or Conc  $HNO_3$  +  $PbO_2$  + heat

- (j) Identify the
- (i) Cations in Q .....  $Zn^{2+}$  ✓  $g(III)$  ..... and .....  $Mn^{2+}$   $p$   $w(IV)$  .....  $g(V)$
- (ii) Anion in Q .....  $CH_3COO^-$  (d) or (e) ..... and .....  $SO_4^{2-}$   $g(V)$

7½

3. You are provided with substance W which is an organic compound. You are required to determine the nature and functional group in W. Carry out the following tests on W and record your observations and deductions in the table below.

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Burn a small amount of W on a spatula end	Colourless liquid Burns with a yellow sooty flame	Aromatic Cpd (or) Aliphatic Unsaturated Cpd with a high carbon content
(b) To $0.5\text{cm}^3$ of W in a test tube add $1\text{cm}^3$ of water, shake and leave to stand. Test with litmus paper	Immiscible Mixture No effect on both blue and red litmus	Non-polar Cpd of high molecular mass Neutral Cpd Probably alcohol, Carbonyl ester
(c) To $1\text{cm}^3$ of W, add an equal volume of methanol. Shake and divide the resultant mixture into two parts.	Soluble in methanol	Ignare
(i) To the first part of the mixture in (c), add 4 - 5 drops of sodium carbonate solution	No effervescence / bubbles of gas	Carboxyl gp absent Or Carboxylic acid absent
(ii) To the second part of the mixture in (c), add 5 drops of neutral Iron (III) chloride solution	No purple colouration	Phenol absent
(d) To $1\text{cm}^3$ of W, add 2, 4 - dinitrophenyl hydrazine dropwise until in excess. Shake the mixture.	Yellow (w Orange) ppt	Carbonyl Cpd Result Or Aldehydes and Ketones present

(e) To 1cm <sup>3</sup> of W, add 2cm <sup>3</sup> of acidified potassium dichromate solution and heat the mixture.	No observable change	<del>reducing agent present</del> <del>Aldehyde absent</del> ∴ <del>Aldehyde present</del> reject; reducing agent absent
(f) To 1cm <sup>3</sup> of W, add in about 1cm <sup>3</sup> of methanol. To the solution, add 4cm <sup>3</sup> of iodine solution followed by sodium hydroxide solution dropwise until the solution is pale yellow. Heat the mixture and allow to stand	Yellow ppt	<del>Amidic ketone</del> <del>of C<sub>6</sub>G<sub>5</sub>R structure</del> Present
(g) Comment on the nature of W;	(a) in (a) in (f)	in (f) 16 Amidic ketone with C <sub>6</sub> G <sub>5</sub> R structure present

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