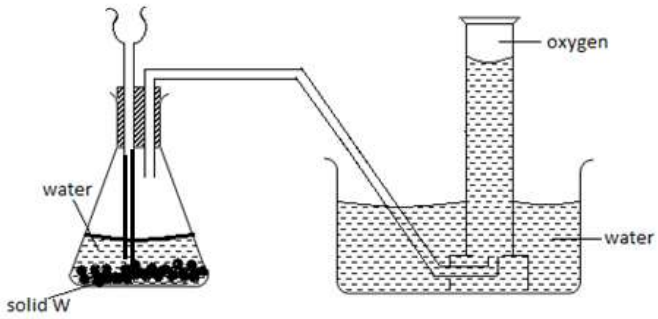
CHEM PP2

LANJET MARKING SCHEME

1. (a) (i)



The thistle funnel has to dip inside the solution so that the gas does not escape through it.

(ii) Sodium peroxide Na_2O_2

(b) (i) $4P(s) + 5O_2(g) \rightarrow 2P_2O_5(g)$

(ii) Phosphorous (V) oxide dissolves in water to form an acid (Phosphoric acid)

(c) A firm oxide (aluminium Oxide) is formed on the surface of the metal. This oxide protect aluminium from further attack

(d) (i) A reaction which proceeds by production of heat i.e heat is lost to the surroundings.

(ii) The yield will be lowered: through the Le- Chateliers principle, the yield is expected to increase. But lower temperatures will result into fewer particles attaining activation energy.

(iii) RMM of $SO_3 = 32 + 48 = 80$

Moles of SO_3 used = $\frac{350}{80} = 4.38$ moles

Moles of $H_2S_2O_7 = 4.38$ moles

RMM of $H_2S_2O_7 = 2 + 64 + 112 = 178$

Mass of $H_2S_2O_7$ = 4.38 x 178 = 779.6 kg

2. (i) $C_2 H_4 O_2$ it melting point is higher than 10^0 C

(ii) CH_{14} and $C_5 H_{12}$

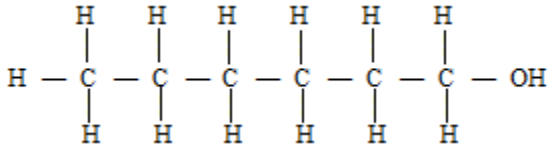
$C_6 H_{14}$ has a higher melting point since it is more bulky compared to $C_5 H_{12}$; hence the vanderwaals force between the molecules of $C_6 H_{14}$ is abit stronger.

iii) C_3H_8O is more soluble in water than $C_5H_{12:}$ because it formshydrogen bonds with water molecules i.e it is polar due to the presence of ($^-$OH) group.

b) i) C_4H_8

ii) $C_4H_{8(g)} + 6O_{2(g)} \rightarrow 4O_{2(g)} + 4\ H_2O_{(l)}$

c) i)



Reagents

ii). – Concentrated sulphuric acid

- Al_2O_3 or phosphoric acid (Catalyst)

Conditions

Heat (160-180^{0}C)

d) i) Saponification/Hydrolysis

ii) Fats/ ester

e) i) Polymerisation

ii) Substitution

3. a) - potassium manganate (vii)

- Lead (IV) oxide

- Manganese (IV) oxide

- Calcium chlorate ($CaOCl_2$)

b) i) to remove all the oxygen which would form iron (iii) oxide instead of iron (iii) chloride.

ii) CaO can absorb both Cl_2 and moisture, $CaCl_2$ can only absorb moisture.

iii) RMM $FeCl_3$ = 162.5

Moles of $FeCl_3$ = $\frac{0.5}{162.5}$ = 0.003

Moles of Cl_2 = 3 x 0.003 = 0.0045

Vol of Cl_2= 0.0045 x 24000 = 110.8cm^3

c) Fe^{3+} is reduced to Fe^{2+}; H_2S is oxidized to sulphur

d) Turns, red then white because chlorine is acidic and a bleaching agent inpresence of water.

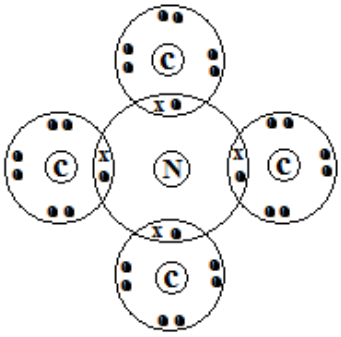
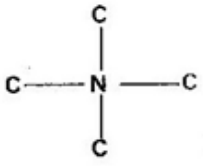
e) i) M 2:8

C 2:8:8

ii) Ionic bond

iii) Group one, Period 4

iv) "R" has a large atomic radius that "L". The outermost electrons in "R" are not held tightly its nucleus.

e)  or 

4. a) i) ΔH_1 & ΔH_2

ii) ΔH_3 & ΔH_4

iii) ΔH_1 – Atomisation

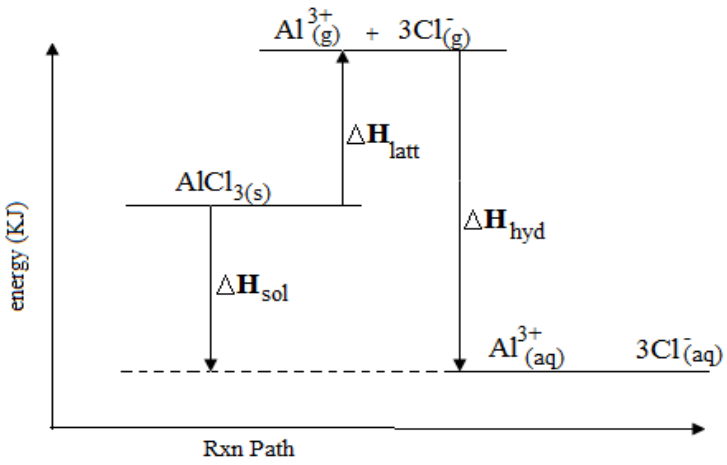
ΔH_4 – Condensation

b) i) ΔH latt + -4690 + (3x -364) = 332

ΔH latt – 5782 = -332

ΔH latt - = 5450kJmol^{-1}

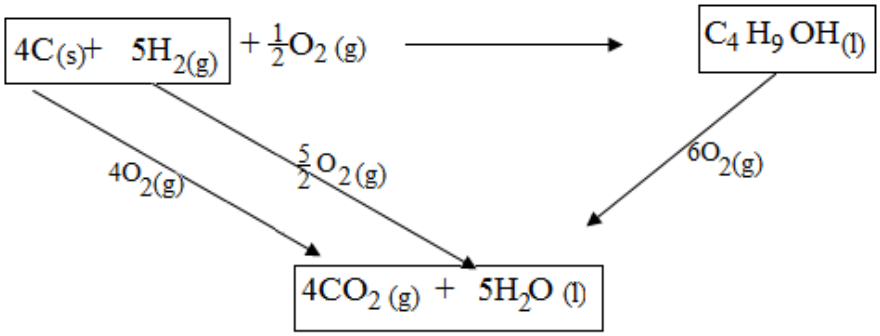
ii) draw



c) i) $2C_4H_9OH_{(l)} + H_3O_{2(g)} \rightarrow O_{2(g)} + HOH_2O_{(l)}$

2.

ii) Draw



iii) $\Delta H_f + -2676 = (4 \times -393) + (5 \times -286)$
$\Delta H_f = -1572 + -1430 + 2676 = -326 kJ\ mol^{-1}$

5. a) i) $G_{(s)} + H^{2+}_{(aq)} \longrightarrow G^{2+}_{(aq)} + H_{(s)}$

iii) EMF = $E^0_{red} - E_{oxi}$

$+ 0.34 + 0.44 = + 0.78v$

b) i. K …. Cathode

J …… Anode

ii. $M - 4H^+_{(aq)} + 4e^- \longrightarrow 2H_{2(g)}$

$H - 4OH^-_{(aq)} \longrightarrow 2H_2O_{(l)} + O_{2(g)} + 4e^-$

iii. $HCl_{(aq)}$ ions are readily discharged to chlorine gas hence there will be a mixture of two gases as the anode products (oxygen and chlorine gases)

c) 144750 Columbus = $\frac{144750}{96500}$ Faradays = 1.5F

2 faradays gives 64g of copper

1.5 faradays give $\frac{1.5 \times 64}{2}$ = 48g

6. i) I) Carbon (II) Oxide / Carbon (IV) Oxide

II) Dilute Sulphuric acid

Chamber I

ii) $ZnO_{(s)} + C_{(s)} \longrightarrow CO_{(g)} + Zn_{(s)}$

Roaster

$2ZnS_{(s)} + 3O_{2(g)} \longrightarrow SO_{2(s)} + ZnO_{(s)}$

Chamber II

$Zn_{(s)} + H_2SO_{4(aq)} \longrightarrow ZnSO_{4(aq)} + H_{2(g)}$

iii) I: Mass of ZnS $= \frac{45 \times 250}{100} = 112.5g$

II: $22\ ZnS_{(s)} + 3O_{2(g)} \longrightarrow 2SO_{2(g)} + 2ZnO_{(s)}$

Moles of ZnS $= \frac{112.5}{97.4} = 1.16$ moles

Volume of $SO_2 \equiv$ 1.16 Moles

Volume of $SO_2 = 1.16 \times 24 = 24.72\ dm^3$

III $\frac{65.4 \times 112.5}{97.4} = 75.54g$ of Zn

b) - Cause acidic rain
- SO_2 is poisonous

c) Contact process: SO_2 (by product) can be used to manufacture sulphuric

7. a)

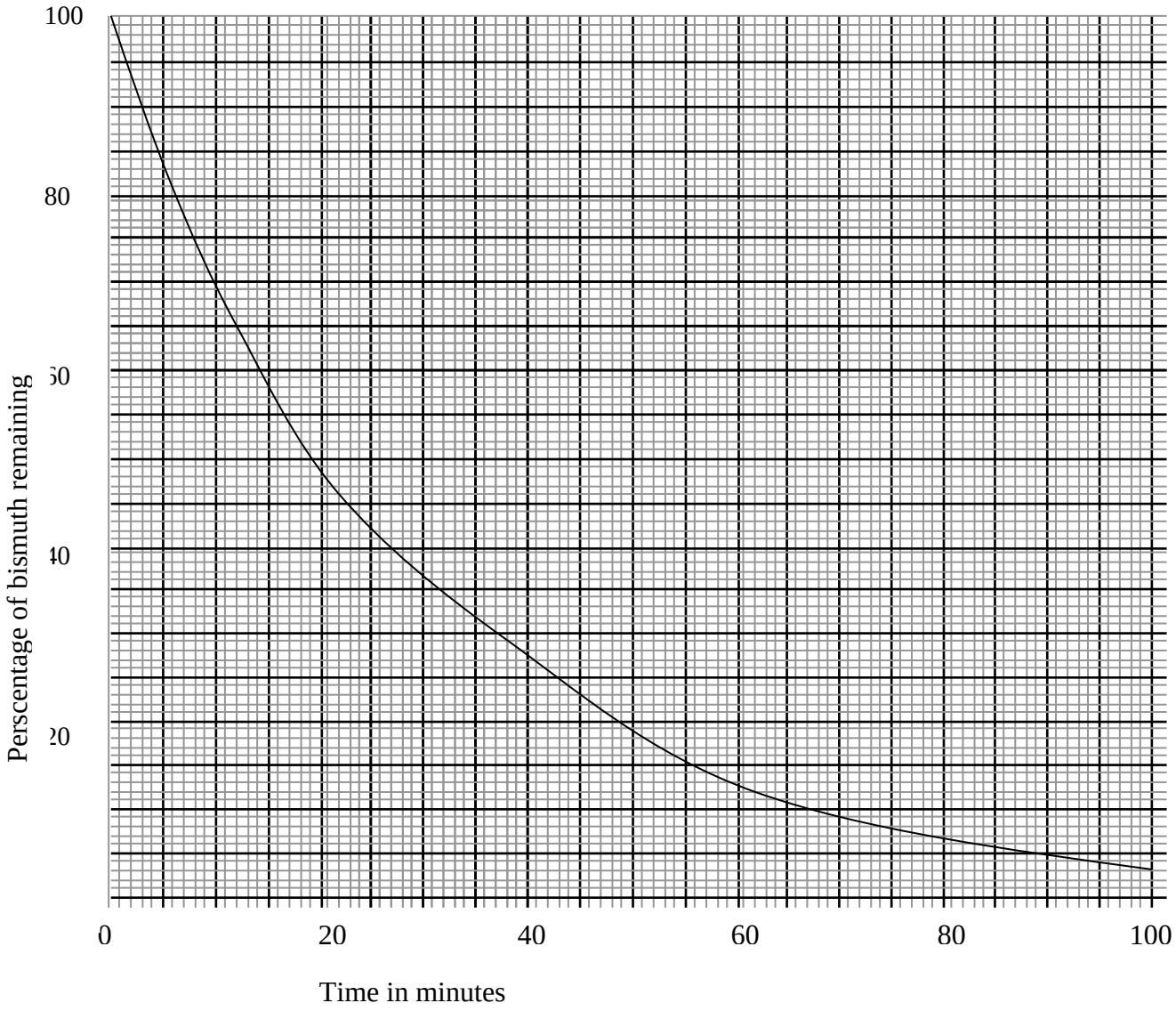
Nuclear reactions	Chemical reactions
Inolves protons and neutrons	Involve valency electrons
Reaction rate not affected by element changes	Reaction rate is influenced by element changes
Involve huge amount of energy	Involve little amount of energy
There is change in mass	No change in mass

Any pair

b) i) 1: Alpha II: beta

ii) $^{210}_{84}Po \longrightarrow {}^{206}_{82}Pb + {}^{4}_{2}He$

c) i)



ii) I 120 minutes

II % value at 70 minutes = 9% ± 2

Mass = $\frac{0.16 \times 100}{9\pm}$ = 1.778(g)

d) - Treatment of cancer
- Sterlization of surgical equipment
- Treatment of leation of goiter
- Regulate heat pace makerAny one
- Detection of blood circulation disorders
- Measure of uptake of iodine.