NYANDARUA WEST CLUSTER EXAMINATION

233/2

MARKING SCHEME
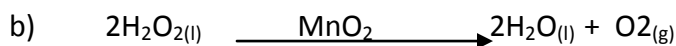
CHEMISTRY

PAPER 2

THEORY

July/AUGUST 2018
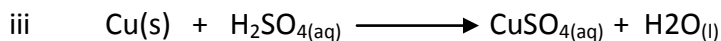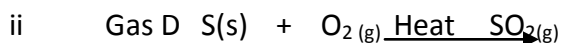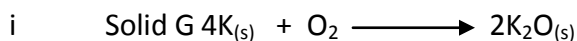
1. a) i. Solid A Sulphur/ $S_{(s)}$

ii.　　Gas D　　　　Sulphur (IV) oxide/ $SO_{2(g)}$

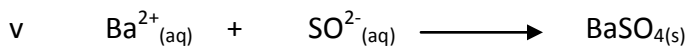iii. Solid Q　　Barium sulphate/ $BaSO_{4(s)}$

iv. Solution M　　　Copper (II) nitrate/ $CO(NO_3)_{2(aq)}$

b)　　$2H_2O_{2(l)}$ _____ $\xrightarrow{MnO_2}$ $2H_2O_{(l)}$ + $O2_{(g)}$

c)

i　　Solid G $4K_{(s)}$ + O_2 $\longrightarrow$ $2K_2O_{(s)}$

ii　　Gas D　$S(s)$ + $O_{2\ (g)}$ $\xrightarrow{Heat}$ $SO_{2(g)}$

iii　　$Cu(s)$ + $H_2SO_{4(aq)}$ $\longrightarrow$ $CuSO_{4(aq)}$ + $H2O_{(l)}$

iv　　Relights a glowing splint

v　　$Ba^{2+}_{(aq)}$ + $SO^{2-}_{(aq)}$ $\longrightarrow$ $BaSO_{4(s)}$

vi　　-Oxy- acetylene flame used in welding.

-Oxygen enriched air is used in hospitals by patients with breathing difficulties.

-When mixed with heliumit is used by mountain climbers and deep-sea divers.

-Remove iron impurities during steel making

　　　- To burn fuelssuch as those used to for propelling rocket.

2. (a)　(i)　　W and Z

　　　　　Belong to the same chemical family.
　　(ii)　　X_2O_7

　　(i)　　X

Its ionic radius is larger than its atomic radius or has 1 electron in the outermost energy that can easily be lost.

(iv)　Atomic radius of Z is smaller than that of Y because Z has a greater nuclear charge(more protons) that tends to pull its outer electrons more strongly inwardly reducing the size of the atom.

(b)　　(i)　$2NaOH_{(aq)} + H_2SO_{4(aq)} \longrightarrow Na_2SO_{4(aq)} + H2O_{(l)}$
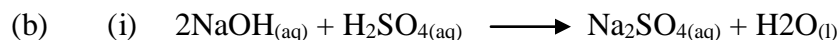
　　　　(ii)　(I)　　No. of moles of acid used $= \left(\dfrac{40 \times 0.5}{100}\right)$　　mole $=0.02$ (½mk)

　　　　　　　　　Mole ratio　　Base: Acid $= 2:1$
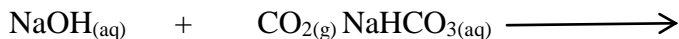　　　　　　　　　No. of moles of base reacted $= \dfrac{(2 \times 0.02)}{1}$　　$= 0.04$ mole. (½mk)

　　　　　　　(II)　0.04mol in $100cm^3$　　$=$　　$\dfrac{1000 \times 0.04}{100}$　$= 0.4$mol.
　　　　　　　　　?--------------$1000cm^3$

　　　　　　　(III)　Mass of NaOH in 1 litre of solution　$=$　　(0.4×40)
　　　　　　　　　　　　　　　　　　　　　　　$=$　　1.6g　(½mk)
　　　　　　　Mass of unreacted substance　　$=$　　$(17.6-1.6)_g$ (½mk) $= 16g$ (½mk)

3.(a)　　(i) Sodium hydroxide/potassium hydroxide

$NaOH_{(aq)}$　　$+$　　$CO_{2(g)} NaHCO_{3(aq)} \longrightarrow$

　　(ii)Oxygen

　(ii)　　Argon, Neon

(b)　　　(i)From mole ratio NH_3 : NO : HNO_3

　　　　　　　　　　4　:　4　:　4

　　　　　　　　　　1　:　1　:　1

　　RFM of $HNO_3 = 1+14+48 = 63$

　　Moles of $NH_3 = \dfrac{3200}{24000} = 0.1333\ldots\ldots$

　　Moles of $HNO_3 = 0.1333\ldots\ldots$
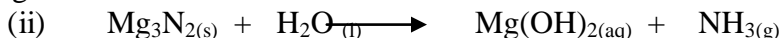
　　Mass of $HNO_3 = 0.1333 \times 63 = 9.3979. = 8.4$

ii) % of nitrogen in urea $=\dfrac{28}{60} \times 100 = 46.67\ \%$

% of nitrogen in $NH_4NO_3 = \dfrac{28}{80} \times 100 = 35\%$

Urea is the best because it has higher % of nitrogen

(i) Magnesium oxide

-Magnesium nitride

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

Production of ammonia which is basic hence litmus paper turns blue

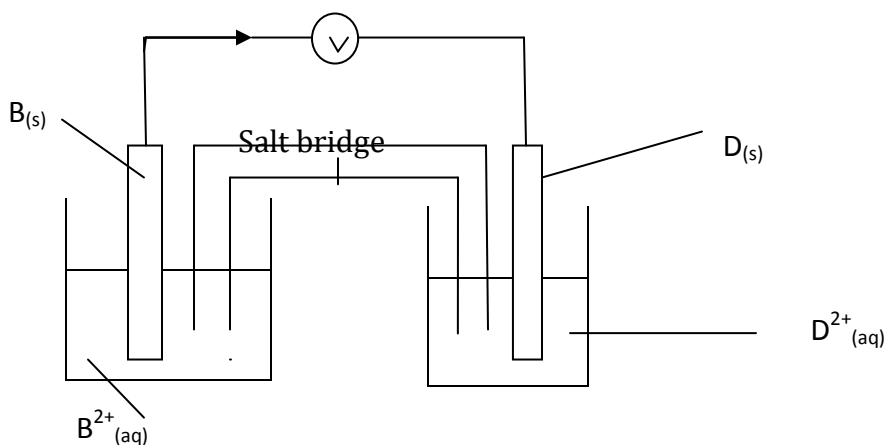(iii) Nitrogen(IV)oxide

(iv) When used as anesthesia patients recovering from it laugh hysterically

4. a)C – has an E.M.F of 0.00_V and is used as the reference electrode   (2marks)

b)F⁻ - has the highest positive $E^{\ominus}$ value and is used as the reference electrode.

(2marks)

c) neat diagram

B dipped in $B^{2+}_{(aq)}$ 1/2mk
D sipped in $D^{2+}_{(aq)}$ 1/2mk
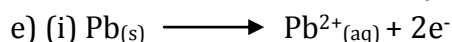Salt bridge   1/2mk
Voltmeter present   1/2mk
Workability   1mk

d)overall potential $= E^{\ominus} – E^{\ominus}$ oxides
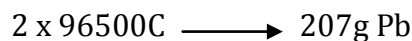
$= {}^{+}0.\,340 – (-2.38v)$ $E^{\ominus} = 12.72v$

e) (i) $Pb_{(s)} \longrightarrow Pb^{2+}_{(aq)} + 2e^{-}$ (1mark)

(ii) Q   = It   (3marks)

= 4 x (18 x 60 + 15)

= 4380c

2F ———— 1mole pb

2 x 96500C ——→ 207g Pb

4380C   x——→

$X = \dfrac{4380\ x\ 207}{2\ x\ 96500} = 4.6977$
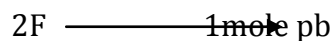
5(a) (i) S -   Sodium propanoate

T -Polypropene

   H-   propene/ prop-1-ene

K -propylethanoate

(ii)   – As a dehydrating agent

_ As a catalyst
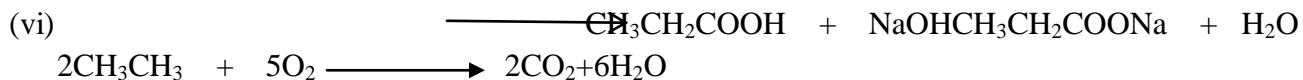
(iii)

Step	Condition	reagents
I	warming	Ethanoic acid; conc H_2SO_4
II	Room temperature	Sodium metal

(iv)   _Esterification

_Neutralisation

(v) Making crates; carpet; plastic bottles; chairs; ropes

(vi)   ~~CH~~$_3CH_2COOH$ + $NaOHCH_3CH_2COONa$ + H_2O

   $2CH_3CH_3$ + $5O_2$ ⟶ $2CO_2 + 6H_2O$

b)   2-methylbut-1,3-diene

6   (a)

Pressure (atmospheres)	10	8	5	2	1
Volume (cm^3)	160	200	320	800	1600
Reciprocal of pressure ($^1/_p$)	0.10	0.23	0.20	0.50	1.00

(b)   Graph   Total 4 marks

Scale   1 mark

Plotting   - If more than 4 values are plotted, award 2 marks (max)
           -If 3 values are plotted, award 1 mark
           - If less than 3 values are plotted, award 0 mark

Line graph from the origin   1 mark

Volume against reciprocal of pressure

Graph: Volume (cm³) on y-axis (200 to 1600) against Reciprocal of pressure (¹/ₚ) (1 × 10⁻¹) on x-axis (2 to 14).

(d)   Correct value from the graph = 1 mark $500 \pm 10 cm^3$
        Plotted line on the graph = 1 mark
   (e) Volume and the reciprocal of pressure are directly proportional

(e)   R.M.M (Mr) of CO = 12 + 16 = 28
       R.M.M (Mr) of CO_2 = 12 + 32 = 44

$$\frac{RCO}{RCO_2} = \frac{\sqrt{MrCO_2}}{MrCO} \quad \sqrt{½}$$

$$\frac{RCO}{RCO_2} = \sqrt{\frac{44}{28}} \quad \sqrt{½}$$

$$\frac{RCO}{RCO_2} = 1.254 \quad \sqrt{½}$$

CO diffuses 1.254 times faster than CO_2

7.(a) Crush the one powder and react with HNO_3(aq) free the ions; filter to obtain a filtrate, the filtrate in a test tube, add drops of HCl/NaCl/KI; A white precipitate /yellow precipitate formed confirms present

(b) i) gas K is   Sulphur (IV) oxide

ii) $2CuFeS_{2(s)} + 4O_{2(g)} Cu_2S_{(s)} + 3SO_{2(g)} + 2FeO_{(s)}$
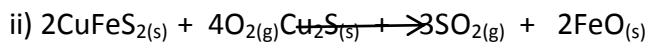
Fe^{2+}
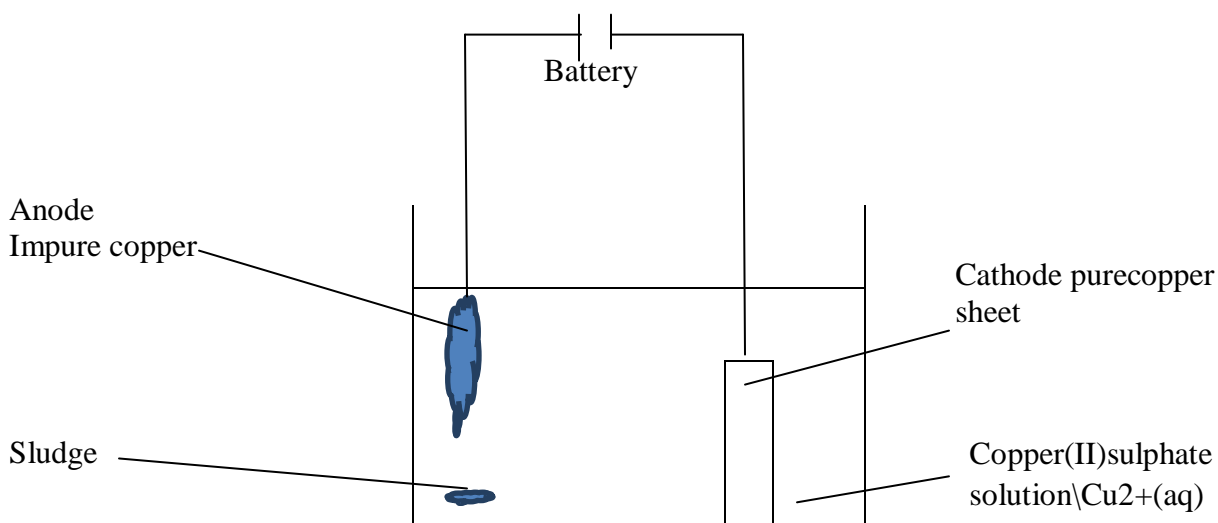
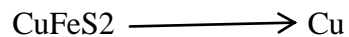CO_2/CO (1 mark)

Reducton//Redox

Cu^{2+} reduced to Cu if coke oxidesed to Co/Co2

C)

d) Rfm for $CuFeS_2 = 63.5 + 56 + 64 = 183.5$

$$CuFeS2 \longrightarrow Cu$$

$$183.5 \longrightarrow 63.5$$

$$810Kg \longrightarrow \frac{810 \times 63.5}{183.5} = 280.3Kg$$

$$\%Purity = \frac{210 \times 100}{280.3} = 74.92\%$$