Confidential

In addition to the apparatus and fittings found in a chemistry ~~laboratory~~ laboratory, each candidate will require the following.

1. About $75cm^3$ of solution M
2. About $100cm^3$ of solution N
3. A burette
4. A Pipette.
5. Two conical flasks
6. About 1.5g of metal P
7. About 1.6g of metal Q
8. About $40cm^3$ of solution S
9. About $40cm^3$ of solution T
10. A thermometer ($0-110^oC$)
11. 2 plastic beaker 100ml.
12. A measuring cylinder 50ml.
14. About $10cm^3$ of solution U.
15. About 0.5g of solid J

Access to:

1. 2M sodium hydroxide
2. 2M Ammonium hydroxide
3. 1M Lead II Nitrate
4. 0.5M Barium Nitrate
5. 0.5M hydrochloric acid

} Supplied with a dropper.

6.

NOTES:

1. Solution M is prepared by dissolving 3.2g of $KMnO_4$ in $400cm^3$ of sulphuric acid and diluting to one litre of solution using distilled water.
2. Solution N is prepared by dissolving ~~16g~~ 16.7g of $FeSO_4.7H_2O$ in $400cm^3$ of $1M\ H_2SO_4$ and

diluting to one litre of solution using distilled water. The solid should be dissolved in the sulphuric acid immediately after weighing

(3) Metal T is magnesium powder.
(4) Metal Q is Iron powder.
(5) Solution S is 0.5M $FeSO_4$
(6) Solution U is 0.5M $AlCl_3$
(7) Solid J is Malleic acid.

~~Marst~~ Marking Skeme.

Table 1.

(b) Depending on the school value.

(c) Determine the:

(i) Concentration of ~~Kmno~~ $KMnO_4$ in moles per litre

$K = 39, Mn = 55, O = 16$

$3.16/158 = 0.02$ moles per litre.

(ii) Number of moles of $KMnO_4$ use = $\frac{\text{Molarity} \times \text{Volume}}{1000cm^3}$

$= \frac{0.02 \times 15}{1000}$

$= 0.0003$ moles

(d) Concentration of solution N in g/litre.

$4.17g \rightarrow 250cm^3$

$? \rightarrow 1000cm^3$

$= \frac{1000 \times 4.17}{250}$

$= 16.68$ g/litre

e. ~~Ration~~ Ratio of MnO^- : Fe^{2+} is 1:5

(i) Number ~~of~~ of moles present in $25cm^3$ of N is

$= 5 \times 0.003 = 0.0015$ moles.

(ii) Number of moles of present in $1000cm^3$ of N

If 0.0015 moles are in $25cm^3$

? ? in $1000cm^3$

$\frac{1000 \times 0.0015}{25}$

$= 0.06M$

Procedure 1

(a) Table II

final temp (X)	48
Initial temp (X)	24

(b) $\Delta T_1 = 48 - 24 = 24°C$

(c) (i) $\Delta H = 25g \times 4.2 J/g K = 2520 J$ or $2.52 kJ$.

(ii) Moles reacted $= \frac{2.5 \times 0.5}{1000}$

$= 0.0125$ moles

0.0125 moles = 2.52 kJ

∴ 1 mole —— ?

$= \frac{1 \text{ mole} \times 2.52 kJ}{0.0125 \text{ moles}}$

$= 201.6$ kJ/mol.

(d) $Mg_{(s)} + Fe^{2+} \rightarrow Mg^{2+}_{(aq)} + Fe_{(s)}$ $\Delta H = -201.6$ kJ/mol

(e) $Mg_{(s)} + Cu^{2+}_{(aq)} \rightarrow Mg^{2+}_{(aq)} + Cu_{(s)}$ ~~ΔH = -33~~

-344.4 kJ

$\Delta H = -344.4$ kJ/mol

(5) ~~Dat~~ Qualitative analysis.

Observations	inferences
(a) A white precipitate observed and dissolves in excess	Al^{3+}, Zn^{2+}, Pb^{2+} present
(b) White precipitate observed and insoluble in excess	Al^{3+}, Pb^{2+} present or Zn^{2+} absent.
(c) No white precipitate observed	Al^{3+} present
(d) No white precipitate observed	SO_3^{2-}, SO_4^{2-}, CO_3^{2-} ions Absent
(e) White precipitate observed ~~an~~ but dissolves on warming	Cl^- ions confirmed present

Procedure II

Table II

(a) final temp °C 41
Initial temp °C 24

(b) $\Delta T_2 = 41 - 24 = 17°C$

(c) (i) $\Delta H = 25g \times 4.2J/g \times K \times 17K$
$= 1785J$ or $1.785KJ$

(ii) 0.0125 moles = 1.785 kJ
~~1 mole = ?~~
$= \frac{1 mole \times 1.785}{0.0125}$
$= 142.8 KJ/mol$

(d) $Fe_{(s)} + Cu^{2+}_{(aq)} \longrightarrow Fe^{2+}_{(aq)} + Cu_{(s)}$ $\Delta H = -142.8 KJ/mol$

Organic

Observations	Inferences
(a). Dissolves to form a colourless solution ($\frac{1}{2}$ mk)	- Soluble salt - polar substance ($\frac{1}{2}$ mk)
(b) Bromine water decolourised ($\frac{1}{2}$ mk)	~~pre~~ unsaturated hydrocarbons present or $-C=C-$, $-C\equiv C-$ present
(c) Effervescence observed or bubbles of a gas evolves	~~pre~~ presence of R-COOH ions or H^+