FORM FOUR, TERM 1 2016

233/3 CHEMISTRY PAPER 3 MARKING SCHEME

Table

CT – award 1MK for three titrations
award $\frac{1}{2}$MK for only two titrations done
award 0MK for only one titration done.

D.P – 1MK.

ACCURACY – 1MK.

$\pm 0.2 cm^3$ award $\frac{1}{2}$MK.

$\pm 0.1 cm^3$ award 1MK.

Total 3mks

(a) Average volume of solution Q = $20.0 cm^3$ (1MK)

(b) (i) moles of solution Q used

$$\frac{20 \times 0.125}{1000} = 0.0025 \text{ moles}$$
(1MK) (1MK)

(ii) $Na_2CO_3(s) + 2HCl(aq) \rightarrow 2NaCl(aq) + CO_2(g) + H_2O(l)$ (1MK)

(iii) moles of Na_2CO_3 in $25 cm^3$ of solution T

$$\frac{1}{2} \times 0.0025 = 0.00125 \text{ moles}$$
(1MK) (1MK)

(iv) moles of Na_2CO_3 in $100 cm^3$ of solution T

$25 cm^3 \rightarrow 0.00125$ moles

Then $100 cm^3 = \frac{0.00125 \times 100}{25} = 0.005$ moles
(1MK) (1MK)

(v) Moles of Na_2CO_3 in 50 cm^3 of the original solution P.

0·005 moles → 100 cm^3 of T
→ 250 cm^3

$\frac{250 \times 0.005}{50}$ = 0·025 moles (1mk)
(1mk)

(c) (i) Mass of Na_2CO_3, N grammes

= 0·025 × 106g
= 2·65g (1mk)

(ii) Concentration of Na_2CO_3 in solution P

2·65g → 250 cm^3
? → 1000 cm^3

$\frac{2.65 \times 1000}{250}$ = 10·6g/Litre. (1mk)

Molarity = $\frac{10.6}{106}$ = 0·1M. (1mk)

Qn2.

Total Volume of solution A added(cm^3)	0	10	20	30	40	50	60	70	80
Temperature of the mixture (°C)	24·0	30·0	33·0	36·0	37·0	35·0	34·0	33·0	31·0

CT – 1mk

D.P – 1mk.

Temperature at 0 volume of solution Δ ± 20 (1mk)

(a) Graph of temperature against volume of Sulphuric(VI) acid added during neutralisation reaction.

Labelled axis with units – 1mk

Plotting – 1mk

Shape – 1mk

Total – 3 mks

(b) Temperature Change ≃ 13.0°C ($\frac{1}{2}$mk)

(c) Volume of H_2SO_4 required for neutralisation

40 cm^3 ($\frac{1}{2}$mk)

(d) Molar heat of neutralisation

Heat change = MCΘ

$= (50+40) \times 4.2 \times 13$ J ($\frac{1}{2}$mk)

$= -90 \times 4.2 \times 13$ J

$= -4914$ J (1mk)

Moles of $H_2SO_4 = \frac{1 \times 40}{1000} = 0.04$ moles ($\frac{1}{2}$mk)

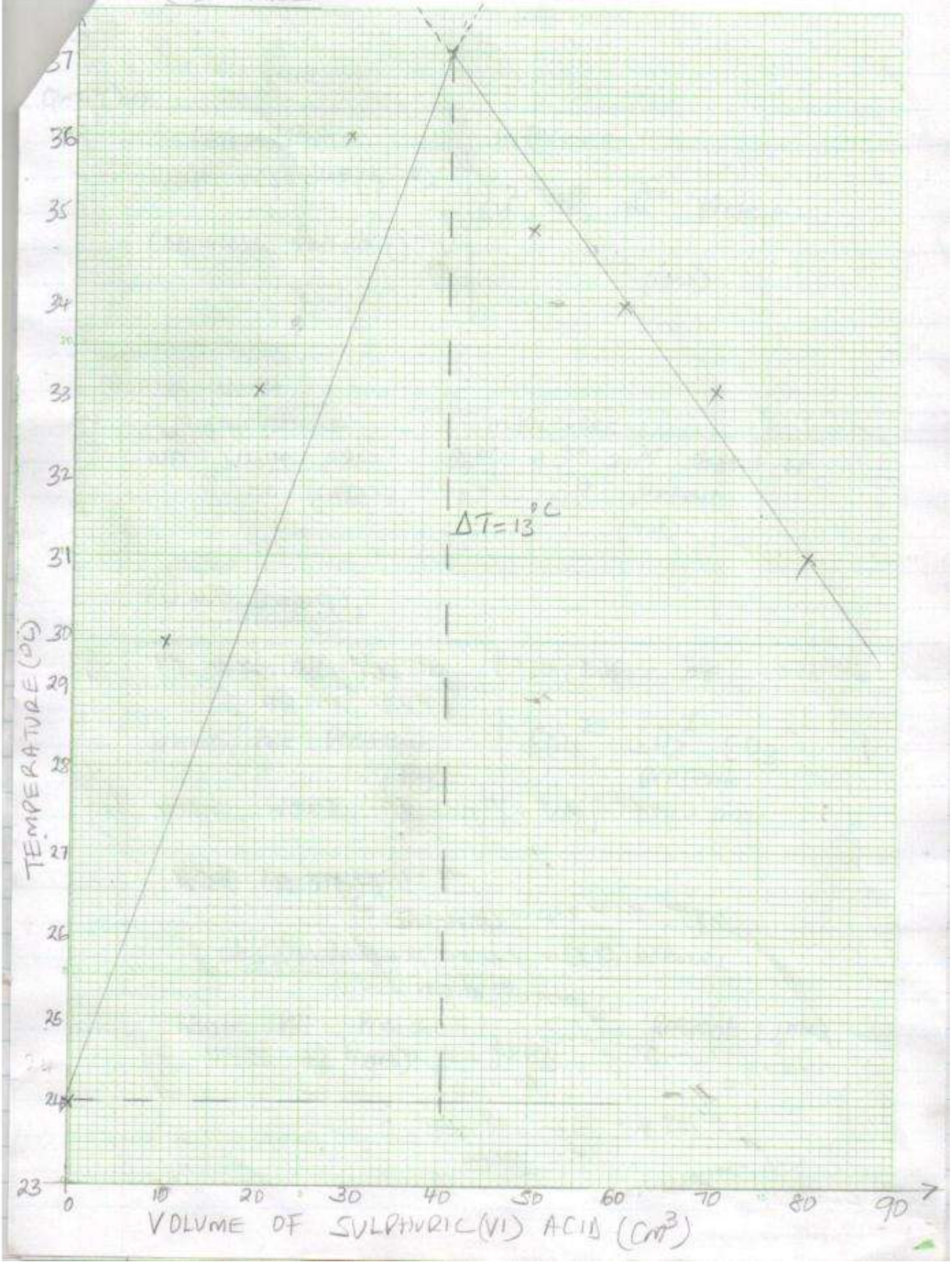
0.04 moles → −4914 J

1 mole → ($\frac{1}{2}$mk)

$\frac{-4.914}{0.04} = 122.85$ KJ/mol

($\frac{1}{2}$mk)

GRAPH OF TEMPERATURE AGAINST VOLUME OF SULPHURIC (VI) ACID



Qn3(I)(a)

Observations	Inferences
White residue ($\frac{1}{2}$mk) Colourless filtrate ($\frac{1}{2}$mk)	Cu^{2+}, Fe^{2+}, Fe^{3+} present (1mk)

(i) With NaOH

Observations	Inferences
NO White ppt (1mk)	Pb^{2+}, Al^{3+} Zn^{2+} absent or K^{+} or NH_4^{+} present (1mk)

With $Ba(NO_3)_2$

Observations	Inferences
White ppt present (1mk)	SO_4^{2-}, SO_3^{2-}, CO_3^{2-} present. any TWO - 1mk.

With $Pb(NO_3)_2$.

Observations	Inferences
White ppt present. ($\frac{1}{2}$mk)	SO_4^{2-} present ($\frac{1}{2}$mk)

(b)

observations	inferences
Effervescence with production of a colourless gas ($\frac{1}{2}$ mk)	CO_3^{2-} present ($\frac{1}{2}$ mk)

(i) With NaOH

observations	inferences
White ppt which dissolve in excess (1mk)	Pb^{2+}, Al^{3+}, Zn^{2+} present. (1mk)

(ii) With $NH_4OH_{(aq)}$

observations	inferences
White ppt that dissolves in excess (1mk)	Zn^{2+} present. (1mk)

II (a)

observations	inferences
Blue litmus turns to red ($\frac{1}{2}$), red remains red ($\frac{1}{2}$)	H^+ present ($\frac{1}{2}$mk)

Observations	Inferences
(b) Purple acidified Potassium Manganate (VII) is decolourised ($\frac{1}{2}$mk)	$-\overset{|}{\underset{|}{C}}=\overset{|}{\underset{|}{C}}-$ $-C\equiv C-$ or R–OH present ($\frac{1}{2}$mk)

Observations	Inferences
Effervescence present ($\frac{1}{2}$mk)	H^+ present ($\frac{1}{2}$mk)