MARKING SCHEME
CONFIDENTIAL

Question 1

PROCEDURE A

TABLE 1 ------ 5mks distributed as follows

A: COMPLETE TABLE ------ 1mk

CONDITIONS

i) Complete table with 3 titrations done -- 1mk

ii) Incomplete table with 2 titrations done -- ½mk

iii) Incomplete table with 1 titration done -- 0mk

PENALTIES

i) Wrong arithmetic (subtraction)

ii) Inverted table

iii) Burette readings > 50cm³

iv) Unrealistic titre values (less than 1cm³ or hundreds)

NB Penalise ½mk each to a maximum of ½mk ie penalise ONCE

B) USE OF DECIMALS --- 1mk (Tied to 1st and 2nd rows only)

CONDITIONS AND PENALTIES

i) Accept 1 or two decimal places used consistently otherwise penalise fully (ie award 0mks)

ii) If two decimal places are used the 2nd decimal place MUST be a '0' or a '5', otherwise penalise fully

iii) Accept INCONSISTENCY in the use of zeros as initial burette readings eg 0, 0.0 0.00

c) ACCURACY ------ 1mk

Compare the candidate's correct titre values with the school value (SV) ie the teacher's correct average titre and award as follows

i) If at least one is within ±0.1 of SV award - 1mk

ii) If none is within ±0.1 of SV but at least one is within ±0.2 of SV award -- ½ mk

iii) If no value is within ±0.2 of S.V award -- 0mk

iv) If there was wrong arithmetic or no subtraction done in the table compare correctly worked out value(s) with S.V and award accordingly

D) PRINCIPLES OF AVERAGING - - - 1mk

CONDITIONS

i) 3 Consistent titrations done and averaged - - 1mk

ii) 3 done but 2 are consistent and averaged - - 1mk

iii) Only 2 done are consistent and averaged - - 1mk

iv) 3 done, are inconsistent and averaged - - 0mk

v) 2 done, are inconsistent and averaged - - 0mk

vi) 3 Consistent done but only 2 averaged - - 0mk

vii) Only 2 done are inconsistent and averaged - 0mk

viii) Only one titration done - - 0mk

PENALTIES

i) Penalise ½mk for wrong arithmetic if error is outside 2 units in the 2nd decimal place

ii) Penalise ½mk for no working shown even if answer is correct

iii) Correct answer from wrong working - 0

eg $\frac{20+20+20}{2} = 20$, $20+20+20 = \frac{60}{3} = 20$

NB

a) Accept rounding off / truncation of ~~ans~~ answer to 2 d.p. places eg 21.666 as 21.66 or 21.67 otherwise penalise ½mk for rounding off to 1 d.p. place or whole number

b) Accept answer if it works out exactly to 1 d.p. place or a whole number.

E) FINAL ACCURACY --- 1mk (Tied to correct average titre)

Compare the candidates correct average titre with the school value (S.V) and award as follows

i) If within ±0.1 of S.V award -- 1mk

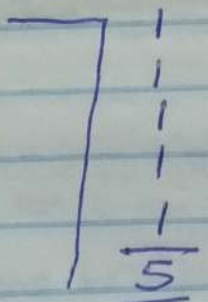
ii) If not within ±0.1 of SV but within ±0.2 -- ½mk

iii) If not within ±0.2 -- 0mk.

NB

i) If there are two possible correct values for average titre from the candidate's table use the one closest to the S.V and credit accordingly.

Table 1 post marks as



4(ii) $Na_2CO_3 = 46+12+48 = 106$ ½ 1

Conc. $= \frac{8}{106} = 0.075$ ½

OR

Conc. $= \frac{8}{106}$ ½ 1

$= 0.075$ ½

NOTES

i) Answer tied to correct arithmetic, accept rounding to 3rd or 4th decimal place if not exact.

ii) Accept arithmetic error if within ±2 units in the 3rd decimal place, otherwise penalise ½mk

iii) Units may not be shown, but if shown must be correct, otherwise penalise ½mk for wrong units

iv) If a candidate works beyond the expected answer penalise FULLY

b(iii) Moles of Na_2CO_3 = $\frac{Pipette \times 0.075}{1000}$ ½

= ans (I)

Moles of H_2SO_4 in titre = ans (I) R : I ½ 2

Conc. H_2SO_4 = $\frac{ans(I) \times 1000}{Titre}$ ½

= ans b(iii) ½

OR Formula Method

$M_aV_a = M_bV_b$ ½

$Ma = \frac{M_bV_b}{V_a}$ 2

Conc. of H_2SO_4 = $\frac{Ans\ b(ii) \times Pipette}{Titre}$ 1

= Ans b(ii) ½

NOTES

i) Answer tied to correct arithmetic, accept rounding to 3rd or 4th decimal place

ii) Accept arithmetic error within ~~±02~~ ±2 units in the 3rd decimal place

Refer to note under b(ii)

b(iv)

Moles of A in $1000cm^3$ $\frac{\text{Ans b(iii)} \times 250 \times 1000}{1000 \quad 25}$ ½ I

= Final ans ½

OR

Moles of A in $1000cm^3$ = Ans b(iii) × $\frac{250}{25}$ (dilution factor) ½ I

= Final ans ½

NOTES as in b(ii) and b(iii)

TABLE II ——— 6 MARKS

a) Complete table ——— 3 mks

i) Award ½ mk for each experiment done completely

ii) Penalise ½ mk for wrong arithmetic ONCE

iii) Treat values >40°C or <10°C for initial temperature as unrealistic and penalise 1mk overall

iv) If $\Delta T = 0$ or ΔT = Constant value or $\Delta T > 10°C$ throughout award ½ mk for complete table otherwise penalise FULLY (if table had 5 or less complete readings)

v) Variations in initial temperature should only be within ±2°C of the initial 1st reading otherwise penalise ½ mk for complete table once

vi) Penalise ½ mk once for any case of inverted table

b) DECIMALS ——— 1mk

Tied to 4th and 5th rows only (Final and Initial temperatures)

i) Accept temperatures readings recorded to 1 diplace (·0 or ·5) consistently.

c) ACCURACY ——— 1mk

Compare the candidate's 1st initial temperature reading with the teachers value (1st room temp) If within ±2°C - award

1mark, otherwise penalise fully (award zero)

d TREND ___ 1mk

~~Accce~~ Accept arise in ΔT for ½ mk, followed by a continuous drop in ΔT for other ½ (Ignore the constancy)

T3
D-1
AC-1
Tr-1
6

PROCEDURE II (a) GRAPH

a) LABELLING OF AXES ___ ½mk

i) Penalise ½mk for wrong units used
ii) Penalise ½ mk for inverted axes
iii) Accept labelling with no units shown (ΔT vs Volume)
iv) Reject and penalise fully if the word temperature alone is used on y-axis in place of change in temperature (ΔT)

b SCALE ___ ½mk

i) Area covered by the plots should be at least 4½ big squares (x-axis) by 5 big squares (y-axis)
ii) Scale intervals must be consistent

c) PLOTTING ___ 1MK

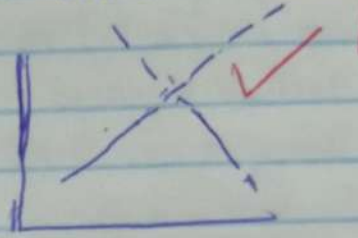
1 i) Accept 5 or 6 points correctly plotted for __ 1mk
ii) Accept 3 or 4 points correctly plotted for __ ½mk
iii) Less than 3 points correctly plotted ___ 0mk

2 If scale interval changes mark the plots within the first correct scale interval and award accordingly as above

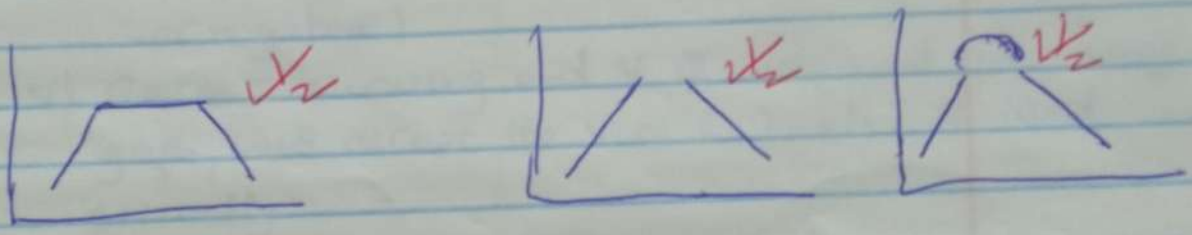
3 Accept the correct plots even if the axes are interchanged and award accordingly.

d The LINES - - - 1mk

i) Accept two straight lines intersecting on extrapolation for 1mk as



ii) Accept the other versions shown for ½ mk



3
1
1
1
6

B (ii)

I (i) Showing on the graph the value of ΔT on an extrapolated graph, award ½mk

ii) For correct value of ΔT award ½mk

CONDITION

For the value of ΔT to be accepted, extrapolation must be shown CORRECTLY

NB Indicate the showing of ΔT by ✓ or ✗

II Volume of solution A = V cm^3

Note i) Accept correct reading of V with or without showing for ✓1 mk

ii) If shown correctly on the graph, but reading is wrong / absent award ½ mk for correct showing.

iii) Penalise ½ mk for wrong units, otherwise ignore if units are not shown/given

iv) If value of V >16 cm^3, Reject and award 0 mk (It implies volume of solution C base may be zero or negative)

v) REJECT showing and V if obtained from wrong graph, but accept the V in (II) below if used correctly

(III)(I)

Moles of H_2SO_4 = $\frac{\text{Ans (II)} \times \text{Ans (IV)}}{1000}$ ✓½

= Ans(III)(I) ✓½ — I

(III)(II) Heat evolved = 16 × 4.2 × ΔT

= Ans( ) ✓½

Molar heat

= $\frac{\text{Ans( )}}{\text{Ans(III) I}}$ ✓½

= Ans (III)(II) ✓½ — 2

- Penalise ½ mk for wrong units / sign
- Answer expressed in Kilojoules / mole

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Q2

OBSERVATIONS	INFERENCES
a) A colourless liquid formed on ~~cold~~ ~~Cold~~ cooler parts/ colourless gas/vapour ✓1 Condenses on cooler parts - gas produced forms white fumes with HCl ✓1 - solid sublimes ✓1 any 2 for 2mks	Hydrated salt ✓½ /contains water of crystallisation NH_4^+ present ✓½ ignore $NH_3(g)$ 3

OBSERVATIONS	INFERENCES
b) White ppt insoluble ✓1 award 0mk if ppt dissolves	Pb^{2+}, Al^{3+} present ✓½ ✓½ 2 Ignore Mg^{2+} mentioned present

OBSERVATIONS ✓½	INFERENCES ✓1
b(ii) No white ppt formed No effervescence ✓½	Al^{3+} present or Pb^{2+} ✓½ absent 2

OBSERVATIONS	INFERENCES ✓1
b(iii) white ppt formed ✓1	SO_4^{2-} present 2 penalise fully. If CO_3^{2-} and SO_3^{2-} mentioned present

09

Q3

OBSERVATIONS	INFERENCES	
a) Liquid burns with a blue flame ✓1	Saturated organic compound / Low C:H ratio ✓1	2
b) Forms a unrform mixture / miscible ✓1	polar compound ✓1	2
c) Purple $KMnO_4$ turns colourless / purple $KMnO_4$ is decolourised ✓1	-OH present ✓1 penalise fully if $-\overset{|}{C}=\overset{|}{C}-$ and $-C\equiv C-$ present.	2
orange/yellow dichromate turns to green ✓1	-OH ✓1 confirmed	2