4.7.3 Chemistry Practical Paper 3 (233/3)

1 a) (i)**Table 1**

Maximum temperature reached (°C)	43.5
Initial temperature (°C)	25.0
Change in temperature, ΔT_1(°C)	18.5

(3 marks)

(i) Complete Table----------1 mark
Penalize ½ mark for:
- incorrect subtraction;
- maximum temperature less than initial temperature;
- Initial temperature < 10°C or > 40°C.

(ii) Use of decimal ----------1 mark
- Accept whole numbers or 1 decimal to .0 or .5;
- Accept 2 decimal places for .00, .25 .50, .75.

(iii) Accuracy ----------1 mark
Award 1 mark if candidate's initial temperature is within ± 2 °C of the school value.

(ii) I. Moles = $\frac{25 \times 0.5}{1000}$ √½ - penalize fully if any other values apart from 25 and 0.5 are used.

= **0.0125**√½ -If units are used, accept moles/mol not mols. **(1 mark)**

II. Enthalpy change = $\frac{-25 \times 4.2 \times 18.5}{0.0125}$ $Jmol^{-1}$√½

= **-155,400 $Jmol^{-1}$**√½

OR

= **-155.4 $kJmol^{-1}$**-

Penalize ½ mark if sign or correct units $Jmol^{-}$/ $kJmol^{-}$ **(1 mark)**

b) **Table 2**

Maximum temperature reached (°C)	37.5
Initial temperature (°C)	24.0
Change in temperature, ΔT_2(°C)	13.5

(3 marks)

(i) Complete table ----------1 mark

Penalize ½ mark for:

- incorrect subtraction;
- maximum temperature less than initial temperature;
- Initial temperature < 10°C or > 40°C.

(iii) Use of decimal ----------1 mark

- Accept whole numbers or 1 decimal to .0 or .5;
- Accept 2 decimal places for .00, .25 .50, .75.

(iv) Accuracy ----------1 mark

Award 1 mark if candidate's initial temperature is within ± 2 °C of the school value.

c) ΔT_1 is larger/greater than ΔT_2 √1

Metal B_1 is more reactive than metal B_2 hence greater temperature change. √1

(2 marks)

d) **Table 3**

	I	II	III
Final burette reading	22.50	12.20	24.50
Initial burette reading	10.00	0.00	12.20
Volume of Solution C used, cm^3	12.50	12.20	12.30

(4 marks)

(i) Complete table----------1 mark

- 3 titration done----------1mark;
- 2 titrations done----------½ mark;
- 1 titration done ----------0 mark.

(ii) Use of decimal ----------1mark

Accept 1or 2 decimal displaces used consistently for 1mark otherwise penalize ½ mark.

(iii) Accuracy compared to the school value----------1mark

Award I mark if any value is within ±0.1 of school value if not award ½ mark if any within ± 0.2 otherwise award 0 mark.

(iv) Principles of averaging----------1mark

Values averaged must be within ± 0.2 of each other otherwise award o mark.

(v) Final answer ---------- 1mark

- Compare candidate' average volume to school value

	and award as in accuracy. • If values were wrongly subtracted, compare the corrected ones with school value and award accordingly.	
e)	Average volume = $\frac{12.20+12.30}{2}$ √½ = 12.25 cm^3 √½ $\frac{12.30+12.50}{2}$ √½ = 12.40 cm^3 √½	**(1 mark)**
f)	i) Moles of potassium manganate(VII) = $\frac{12.25\times0.02}{1000}$ √½ = $\underline{2.45\times10^{-4}}$ √½ • penalize ½ mark for wrong units used in each case; • number of moles given to at least 4 decimal places unless it works out exactly to less than 4 decimal places otherwise penalize ½ mark for round off to less than 4 decimal places. ii) Moles of Fe^{2+} = $5\times2.45\times10^{-4}$ √½ = $\underline{1.225\times10^{-3}}$ √½ iii) Moles of Fe^{2+} that reacted with Cu^{2+} = $1.225\times10^{-3}\times\frac{250}{25}$ √½ = **$\underline{1.225\times10^{-2}}$ √½**	**(1 mark)** **(1 mark)** **(1 mark)**
g)	Mass of iron that reacted = $1.225\times10^{-2}\times55.8g$ √½ = **$\underline{0.68g}$** √½ • penalize ½ mark for wrong units or missing units. • penalize ½ mark if mass of iron reacted is greater than 1.5g (because 1.5g of iron was used); • penalize ½ mark if average value is used for R.A.M apart from 55.8.	**(1 mark)**

2. (a)

i.	**Test 1**	**Expected Observations**
	To solid K in a boiling tube, add about $10cm^3$ dilute nitric(V) acid. Retain mixture for tests 2 & 3. $\surd^{1/2}$ Test any gas produced using a burning splint.$\surd^{1/2}$	Effervescence / bubbles of gas or fizzing. $\surd^{1/2}$ colourless gas extinguishes a burning splint.$\surd^{1/2}$ Reject : Fizzling, sizzling/hissing
	(1 mark)	**(1 mark)**
ii.	**Test 2**	**Expected Observations**
	To about $2cm^3$ of mixture, add aqueous ammonia dropwise until in excess	White precipitate insoluble in excess.
	(1 mark)	**(1 mark)**
iii.	**Test 3**	**Expected Observations**
	To about $2cm^3$ of mixture add 2 drops of aqueous sodium sulphate.	White precipitate.
	(1 mark)	**(1 mark)**

For tests 2 and 3 reject: (i) White / clear solution;

(ii) White precipitate soluble in excess.

NOTE: The order is important $HNO_{3\,(aq)}$ followed by $NH_{3\,(aq)}$ and lastly $Na_2SO_{4\,(aq)}$. If Na_2SO_4 done before OH^- then it will suggest Ba^{2+}.

General Note on 2(a)

1) The order in the note above is very important hence mark the first order and reject fully (award 0 mark) where the tests follow any other order.
2) If tests 2 & 3 are interchanged the 2(b) can only be marked put 2b (ii), there being no need for 2b (ii) because absence of Pb^{2+} will already have been identified at 2b (ii).

2. (b)

i.	**Test 1**	
	Observations	**Inferences**
	Effervescence, colourless gas extinguishes burning splint.	CO_3^{2-} present. • Accept CO_3^{2-} written in words; • Award o mark if contradicting ion is mentioned.
	(½ mark)	**(½mark)**
ii.	**Test 2**	
	Observations	**Inferences**
	White precipitate insoluble in excess.	Mg^{2+}, Pb^{2+} present. • ammonia is not expected to precipitate Ca^{2+} ions (weak base) • If K was a carbonate aluminium carbonate does not exist.
	(1 mark)	**(2 marks)**
iii.	**Test 3**	
	Observations	**Inferences**
	No white precipitate.	Pb^{2+} absent **OR** Mg^{2+} present
	(1 mark)	**(1 mark)**

3. (a)

	Observations	**Inferences**
	Dissolves to form a colourless solution.	Soluble salt / polar compound.
	(1 mark)	**(1 mark)**

(b)

i.	**Observations**	**Inferences**
	Dissolves, NO effervescence/ No gas bubbles/ No fizzing	–COOH absent RCOOH **OR** H^+ /H_3O^+ for (½mark)
	(1 mark)	**(1 mark)**
ii.	**Observations**	**Inferences**
	Purple potassium manganate(VII) is decolourised / turns colourless.	$\rangle C = C \langle$ – C ≡ C – , R–OH present.
	(1 mark)	**(2 marks)**
iii.	**Observations**	**Inferences**
	Colour changes from orange to green.	R–OH present.
	(1 mark)	**(1 mark)**