

Unit Test 6246/01A

- 1 Table 1: Both temperatures to 1 d.p. (1)
Both values of k to no more than 3 SIG FIGS (1)

Time: $\pm 7s$ (4)
 $\pm 12s$ (3)
 $\pm 14s$ (2)
 $\pm 16s$ (1) for each experiment

(10 marks)

Evaluation

Experiment Number 2 (1) mark awarded if reasoning flawed. i.e. not stand alone
since a fixed reading error in glassware has a greater % error in smaller volumes (1)

(2 marks)

(Total 12 marks)

2

(a)		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Observations</th> <th style="width: 50%;">Inferences</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;">pale green crystals (1)</td> <td style="vertical-align: top;"> Fe^{2+}; Cu^{2+}; Ni^{2+} Cr^{3+} (any two) (1) OR Transition metal <u>compound</u> /Transition metal <u>ION</u> (1) </td> </tr> </tbody> </table>	Observations	Inferences	pale green crystals (1)	Fe^{2+} ; Cu^{2+} ; Ni^{2+} Cr^{3+} (any two) (1) OR Transition metal <u>compound</u> /Transition metal <u>ION</u> (1)		(2 marks)
Observations	Inferences							
pale green crystals (1)	Fe^{2+} ; Cu^{2+} ; Ni^{2+} Cr^{3+} (any two) (1) OR Transition metal <u>compound</u> /Transition metal <u>ION</u> (1)							
(b)	(i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Observations</th> <th style="width: 50%;">Inferences</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> green ppt (1) browning on surface (1) red litmus \rightarrow blue (1) </td> <td style="vertical-align: top;"> $Fe^{2+}/Fe(OH)_2$ (1) Fe^{3+} (1) ammonia / alkaline gas (1) ammonium cpd (1) </td> </tr> </tbody> </table>	Observations	Inferences	green ppt (1) browning on surface (1) red litmus \rightarrow blue (1)	$Fe^{2+}/Fe(OH)_2$ (1) Fe^{3+} (1) ammonia / alkaline gas (1) ammonium cpd (1)		(7 marks)
Observations	Inferences							
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red colour (1)	b oxidised (1) to Fe^{3+} (1)							

(Total 15 marks)

3

Tests on Compound C

(a) (i)	Observations	Inferences	(3 marks)
	red unchanged (1) blue → red (1)	acidic (1)	
(ii)	Observations	Inferences	(3 marks)
	brown colour discharged (1) white ppt (1)	<u>Phenolic</u> – OH / phenol (1)	
(iii)	Observation		(1 mark)
	Purple/ lilac solution		

Tests on Compound D

(a)	Observations	Inferences	(4 marks)
	D soluble / miscible (1) effervescence (1)	polar (1) carboxylic acid (1)	
(b)	Observations	Inferences	(3 marks)
	fruity smell (1)	ester (1) D contains – COOH (1) <i>do not allow COOH without ref to ester</i>	
(c)	<u>IR spectrum</u>		
	[C=O] str 1710 cm ⁻¹ [O-H] str ~ 3000 cm ⁻¹ (br) (2) bands given <u>must</u> relate to the carboxylic acid.		(2 marks)
(d)	$-\text{COOR} / \begin{array}{c} \text{O} \\ \parallel \\ \text{C} \\ \diagup \quad \diagdown \\ \quad \quad \text{O} \end{array}$		(1 mark)

(Total 17 marks)

- 4
- Prepare solution of known mass of per unit volume (1)
 - (Prepare rack of tubes with) different dilutions of the original solution (1)
 - To a fixed volume of solution of X (1) add fixed vol of KSCN (1)
 - At some stage no colour will be seen (1) Minimum concentration therefore lies between the last two values of concentration of X (1)

(6 marks)

(Total 17 marks)

Apparatus

Each candidate will require:

1. two 50 cm³ burettes with small funnels for filling;
2. two small beakers for draining burettes;
3. 10 cm³ graduated pipette with safety filler;
4. two 100 cm³ beakers;
5. white tile;
6. three boiling tubes in a rack, one with stopper;
7. ten test tubes in a rack, one with stopper;
8. Bunsen burner;
9. Test tube holder;
10. One small filter funnel;
11. Filter paper to fit;
12. Spatula;
13. Glass stirring rod;
14. 10 cm³ measuring cylinder;
15. a supply of dropping pipettes;
16. evaporating basin;
17. a thermometer of range 0-50 °C graduated in 0.5°C steps;
18. stopwatch;
19. wash bottle for distilled water.

Materials

Each candidate will require:

- (a) 100 cm³ of aqueous sodium thiosulphate labelled **Solution L** concentration 0.0050 mol dm⁻³;
- (b) 100 cm³ of aqueous potassium peroxodisulphate labelled **Solution M** concentration 0.010 mol dm⁻³;
- (c) 100 cm³ aqueous potassium iodide labelled **Solution N** concentration 0.50 mol dm⁻³;
- (d) 10 cm³ of aqueous starch solution (1%);
- (e) approximately 1 g of ammonium iron(II) sulphate, labelled **Solid B**. The identity of this compound must **NOT** be revealed to candidates;
- (f) approximately 0.5 g of 2-hydroxybenzenecarboxylic acid, (salicylic acid), labelled **Solid C**. The identity of this compound must **NOT** be revealed to candidates;
- (g) approximately 1 g (≈1.5 cm³) of ethanoic acid, labelled **Liquid D**. The identity of this compound must **NOT** be revealed to candidates;
- (h) 5 cm³ aqueous sodium hydroxide, 1.0 mol dm⁻³;
- (i) 2 cm³ aqueous barium chloride, 0.5 mol dm⁻³;
- (j) 10 cm³ dilute hydrochloric acid, 1.0 mol dm⁻³;
- (k) 1 g lead(IV) oxide;
- (l) 2 cm³ aqueous potassium thiocyanate, 1.0 mol dm⁻³;
- (m) 15 cm³ aqueous sodium carbonate, saturated;
- (n) 2 cm³ aqueous bromine, prepared by adding 5 cm³ bromine to 250 cm³ water;
- (o) litmus paper, red and blue;
- (p) 1 cm³ concentrated sulphuric acid;
- (q) 1 cm³ ethanol
- (r) supply of distilled water.