

New
Specification



Rewarding Learning

ADVANCED
General Certificate of Education
2018

Chemistry
Assessment Unit A2 3
assessing
Further Practical Chemistry
Practical Booklet B (Theory)
[ACH32]

WEDNESDAY 20 JUNE, MORNING

**MARK
SCHEME**

1

metal ion	colour of solution	few drops of dilute ammonia solution	excess dilute ammonia solution
iron(II)	Green	Green precipitate	Precipitate remains
cobalt(II)	Pink	Blue precipitate	Dissolves to form a yellow solution (brown on standing)
nickel(II)	Green	Green precipitate	Dissolves to form a blue solution

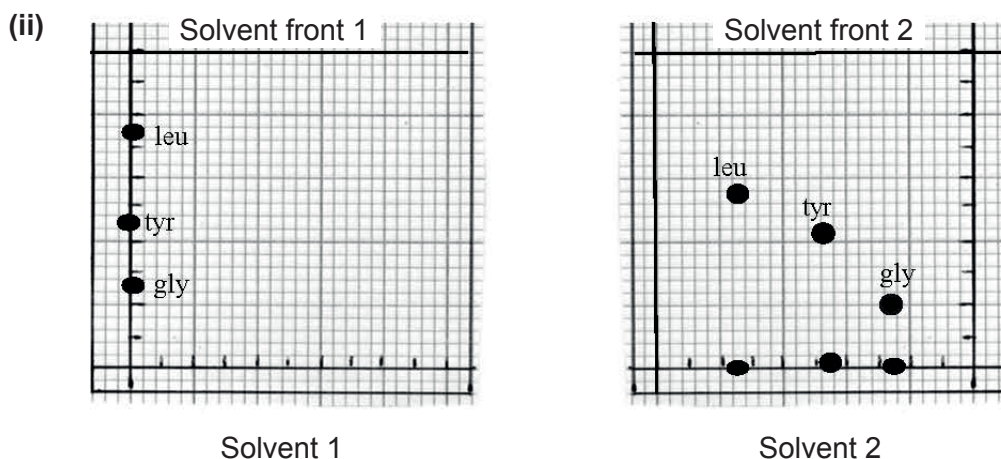
[1] for each

[6]

AVAILABLE
MARKS

6

2 (a) (i) The distance travelled by the spot/distance by the solvent [1]



Solvent fronts drawn at 5 cm (1 mark)

Positions after first run [1], positions after second run [1]

Third mark dependent on second

[3]

(b) (i) 1000 – 1300 cm^{-1} (\rightarrow C – O carboxylic acid)
2500 – 3200 cm^{-1} (\rightarrow O – H carboxylic acid)
3300 – 3500 cm^{-1} (\rightarrow N – H amines)
1650 – 1800 cm^{-1} (C=O acid)
750 – 1100 cm^{-1} (C-C alkane)
2850 – 3000 cm^{-1} (C – H alkane, alkyl groups, alkanes, arenes)
(3 = [2], 2 = [1]) [2]

(ii) 1450 – 1650 cm^{-1} \rightarrow C=C arenes
or 3200 – 3600 cm^{-1} \rightarrow O–H alcohol [1]

(c) (i) Sodium nitrite + (dil/conc) hydrochloric acid [1]
Below 10 °C [1] [2]

(ii) Effervescence/bubbling/fizzing [1]

AVAILABLE
MARKS

10

3 (a)

volume of metal nitrate solution (cm ³)	volume of sodium hydroxide solution (cm ³)	initial temperature (°C)	final temperature (°C)	temperature rise (°C)
			24.0	
				6.0
			22.9	
				3.8

[1]

(b) Temperature rise = 6.8 °C

Volume of the metal nitrate solution = 52.5 cm³

[1]

(c) (52.5 × 1) : (47.5 × 3.25)

Ratio = 1:3

Formula = M(OH)₃

[3]

(d) Smaller temperature rise [1]

Peak further to the left [1]

[2]

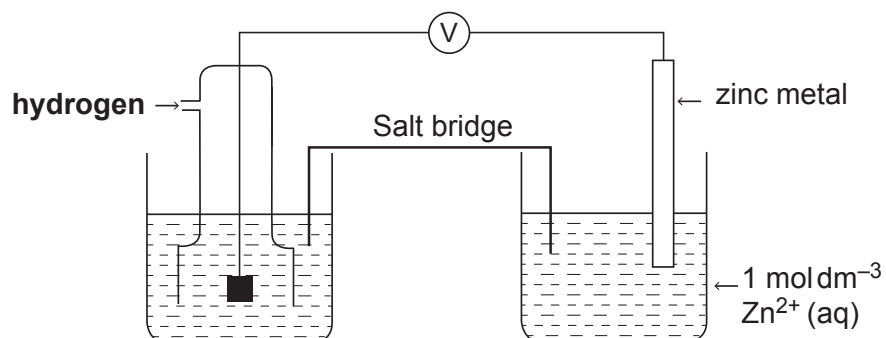
AVAILABLE MARKS

7

- 4 (a) 25 °C/298K
 1 atmosphere pressure
 1 mol dm⁻³ H⁺ ions
 ([-1] for each mistake)

[2]

(b)



Voltmeter [1]
 Salt bridge [1]
 Zinc metal/electrode [1]
 1 mol dm⁻³ Zn²⁺ (aq) [1]

[4]

- (c) (i) Dissolve ammonium metavanadate in hydrochloric acid/sulfuric acid (in a conical flask) [1]
 Add zinc (and stopper the flask with cotton wool) [1]

[2]

(ii)

VO ₂ ⁺	yellow
VO ²⁺	blue
V ³⁺	green
V ²⁺	violet

([1] for each row)

[4]

AVAILABLE
 MARKS

12

			AVAILABLE MARKS
5	(a) (i)	Manganese(IV) oxide [1]	
		Brown/black [1]	[2]
	(ii)	$\text{KMnO}_4 = 39 + 55 + 64 = 158$	
		Mass = $(158 \times 0.0050)/4 = 0.198/0.1975 \text{ g} = 0.20 \text{ g}$ (error [-1])	[2]
	(b) (i)	Colourless [1] to pink [1]	
		(1 mark for the reverse)	[2]
	(ii)	14.7 cm^3 (no mark if the rough is used)	[1]
	(c)	$\text{MnO}_4^- + 8\text{H}^+ + 5\text{Fe}^{2+} \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O} + 5\text{Fe}^{3+}$	[1]
(d)	Moles of $\text{MnO}_4^- = (14.7 \times 0.005)/1000 = 7.35 \times 10^{-5}$		
	Moles of Fe^{2+} in $25 \text{ cm}^3 = (7.35 \times 10^{-5}) \times 5 = 3.675 \times 10^{-4}$		
	Moles of Fe^{2+} in $250 \text{ cm}^3 = 3.675 \times 10^{-3}$		
	Mass of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ in $250 \text{ cm}^3 = (3.675 \times 10^{-3}) \times 278 = 1.02165/1.02 \text{ g}$		
	% mass of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O} = (1.02/1.85) \times 100 = 55.14\%$ (55.135135) (1.02165 gives 55.2243243%)		
	if divided by 5 for 1 tablet then $(0.204/0.37) \times 100 = 55.14\%$ or $(0.20433/0.37) \times 100 = 55.2243243\%$	[4]	
		12	

		AVAILABLE MARKS
6 (a)	The volume of both vapours will be affected equally as long as the temperature and pressure remains the same for both syringes	[1]
(b) (i)	Propanone = 0.10 g Z = 0.17 g	[1]
(ii)	Propanone $0.10/51 = 1.96 \times 10^{-3} \text{ g cm}^{-3}$ [1] Z = $0.17/51 = 3.33 \times 10^{-3} \text{ g cm}^{-3}$ [1]	[2]
(iii)	$Z/58 = 3.33 \times 10^{-3}/1.96 \times 10^{-3} = 1.699$ $Z = 58 \times 1.699 = 98.54 = 99$	[2]
(c) (i)	An alkane which has two hydrogen atoms replaced by two halogen atoms	[1]
(ii)	$\text{C}_2\text{H}_4\text{Cl}_2$	[1]
(d) (i)	Boil/warm the halogenoalkane with an alkali	[2]
(ii)	Add nitric acid to (neutralise the alkali) [1] Add silver nitrate solution [1] White precipitate [1]	[3]
Total		13
		60