

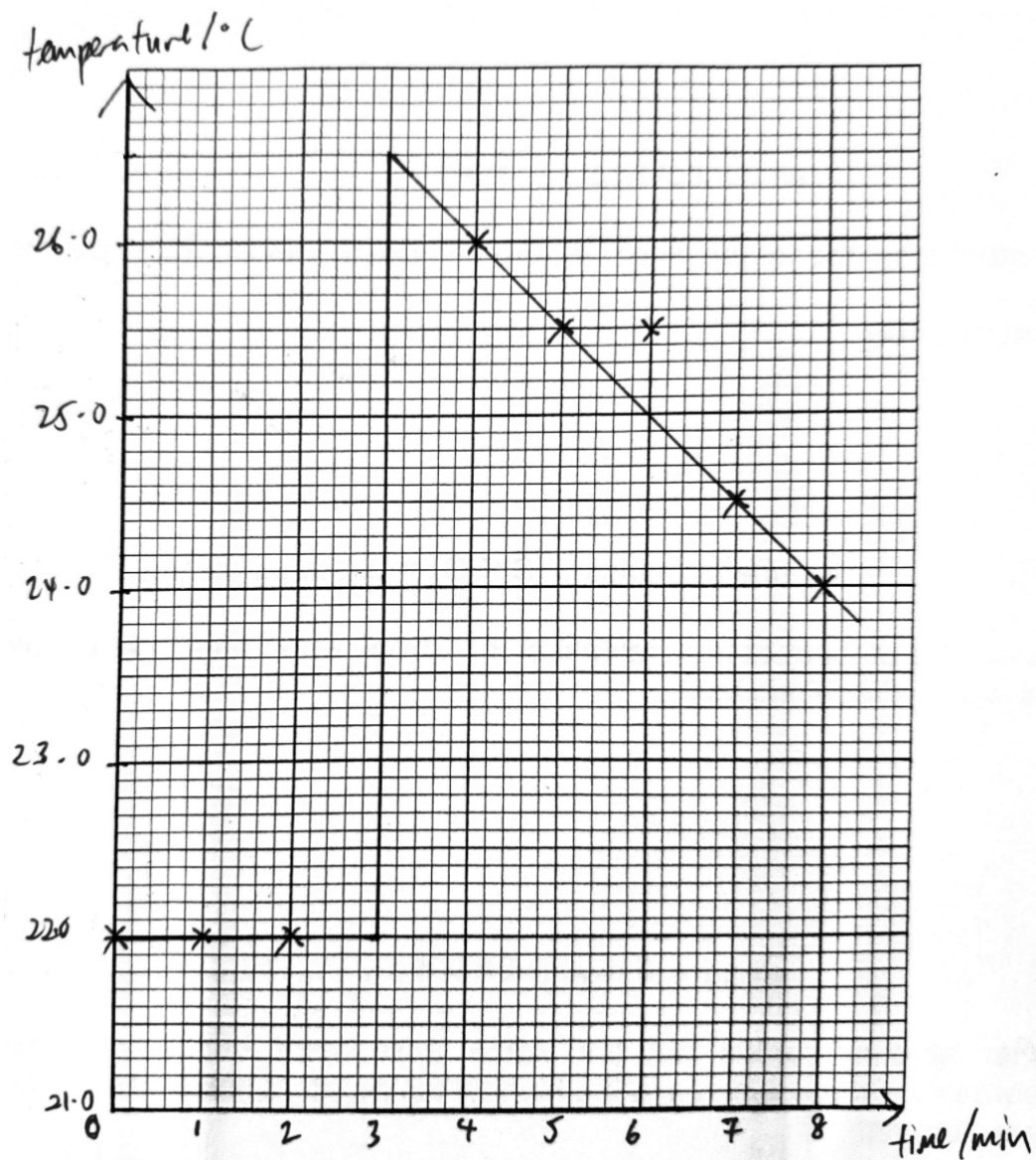
Victoria School
2021 Chemistry O Levels / 6092
Suggested Answer Key

PAPER 3

Question		Answer	Mark
1	a	On gentle heating, the light green solid turned white. Colourless liquid was formed on the walls of the test-tube. On strong heating, the white solid turn yellow. Dark brown (to near black) solid was formed. Colourless pungent gas produced turned damp red litmus paper blue.	2
	bi	test	observation
		Test 1	Colourless solution turns reddish-brown. Effervescence of colourless gas was observed. Gas relighted a glowing splint. Oxygen was produced. Heat was given out.
		Test 2	Dirty green ppt was formed
			Ppt was insoluble in excess aqueous sodium hydroxide
		Test 3	Dirty green ppt was formed. Upon warming, a colourless pungent gas was produced which turned moist red litmus paper blue. Ammonia gas was produced. Upon standing, green ppt turns red-brown.
		Test 4	Reddish-brown ppt was formed. The orange-brown solution turned to light yellow.
			The ppt was insoluble in excess aqueous sodium hydroxide.
		Test 5	No reaction was observed when dilute nitric acid was added. White ppt was formed when aqueous barium nitrate was added.
	bii	Cation: NH_4^+ and Fe^{2+}	2

		Anion: SO_4^{2-}	
	biii	Redox reaction. Hydrogen peroxide was reduced to form water and <u>iron(II) ions were oxidised to iron(III) ions as seen from test 1</u> where the colourless solution turns brown.	2
2	ai	Titration number	1
		2	
		Final burette reading / cm^3	22.30
		Initial burette reading / cm^3	0.00
		Volume of P / cm^3	22.30
		Best titration results	✓
	aii	Average volume of P = $(22.30 + 22.30) \div 2 = 22.30 \text{ cm}^3$	5
	bi	Number of moles of thiosulfate ions = $0.120 \times (22.30/1000) = 0.00268 \text{ mol}$	1
	bii	Number of moles of iodine = $0.00268 \div 2 = 0.00134 \text{ mol}$ Number of moles of Cu^{2+} = $0.00134 \times 2 = 0.00268 \text{ mol}$ Number of moles of Cu^{2+} in 1 dm^3 = $0.00268 \div 25/1000 = 0.107 \text{ mol}$	1
	biii	Mass of copper in brass screw = $0.107 \times 64 = 6.85 \text{ g}$	2
	biv	Percentage by mass of copper = $6.85 \div 9.50 \times 100\% = 72.1\%$	3
	c	Potassium iodide becomes the limiting reactant, resulting in a smaller number of moles of Cu^{2+} ions being involved in the reaction, leading to a smaller mass of Cu calculated. Hence, the calculated value for percentage by mass of copper will be lower than expected.	2
3	a	Concentration of acid in mol/dm^3 = $36.5 \div 36.5 = 1.00 \text{ mol/dm}^3$	3
		Measure 10 cm^3 of hydrochloric acid using a 10 cm^3 measuring cylinder and add it into a 100 cm^3 beaker. Measure 90 cm^3 of water using a 100 cm^3 measuring cylinder and add it to the beaker. Using a glass rod, stir and mix the 100 cm^3 of 0.100 mol/dm^3 hydrochloric acid well.	

bi



4

bii Maximum temperature rise = $26.5 - 22.0 = 4.5\text{ }^{\circ}\text{C}$

1

biii Amount of heat released = $50 \times 4.5 \times 4.2 = 945\text{ J}$

1

	biv	Mass of calcium carbonate = $24.8 - 21.3 = 3.50$ g Number of moles of calcium carbonate = $3.50 \div 100 = 0.0350$ mol	1
	bv	Amount of heat released = $0.945 \div 0.0350 = 27.0$ kJ/mol	1
	bvi	The <u>extrapolation of the graph</u> would allow the temperature rise to be <u>more accurately</u> calculated as the highest temperature measured may not be accurate due to <u>heat loss to the surroundings</u> .	1
	c	Add <u>excess nitric acid</u> to the sample. Effervescence is observed and the <u>white solid is completely dissolved</u> . Add <u>aqueous ammonia</u> to the solution. If a <u>white ppt</u> is formed, which <u>dissolves in excess</u> , zinc cations are present.	2