Raffles Girls' School (Secondary)
2022 Year 4 Chemistry PPA 2
Answer Scheme (Student)

Section A: MCQ (10 Marks)

*1	**C**	6	**B**
*2	**D**	7	**B**
*3	**C**	8	**D**
4	**D**	9	**A**
*5	**B**	*10	**C**

Section B: Structured Questions (30 marks)

Qn		Answer	Marks
11	***(a)**	Reddish brown/Pink solid is formed.	1
	(b)	No. of moles of Sn = No. of moles of $CuSO_4$ = 2.0 x (250 / 1000) = 0.500 mol Mass of Sn = 0.500 x 119 = **59.5 g**	1
	(c)	No. of moles of $SnSO_4$ = No. of moles of $CuSO_4$ = 0.500 mol Theoretical yield of $SnSO_4.H_2O$ = 0.500 x [119 + 32 + 4(16) + 18] = 0.500 x 233 = 116.5 g % yield of $SnSO_4.H_2O$ = (111.6 / 116.5) x 100 = **95.8 %**	2
***12**	**(a)**	**P :** calcium, Ca **Q :** iodine, I_2 **R :** calcium iodide, CaI_2 **S :** silver iodide, AgI	4
	(b)	$2I^-(aq) + Cl_2(aq) \rightarrow 2Cl^-(aq) + I_2(aq)$	1
	(c)	Oxidising agent / To **oxidise** I^- to I_2	1
13	**(a)**	A: anode / positive electrode B: cathode / negative electrode Direction of electron flow: → clockwise	2
	(b)	A: $2H_2O(l) \rightarrow O_2(g) + 4H^+(aq) + 4e^-$ B: $2H_2O(l) + 2e^- \rightarrow H_2(g) + 2OH^-(aq)$	2
	(c)	Effervescence is observed. Colourless and odourless gas evolved relights a glowing splint.	2
	(d)	Concentration of zinc sulfate will increase over time due to decomposition of water to form oxygen and hydrogen gas.	2

	(e)	The product formed at the anode will be the same. But, the product formed at the cathode would be copper metal [1] as Cu^{2+} ion is below H^+ ion in the electrochemical series and will be preferentially discharged.	3
14	***(a)**	Aluminium, zinc, X, iron	1
	***(b)**	Aluminium oxidises readily / reacts readily with oxygen in air to form a protective layer of aluminium oxide around the aluminium metal. Very slow reaction is observed initially as the reaction is between the acid and the oxide layer. Once the oxide layer has reacted away, the acid is able to react with the underneath aluminium metal, resulting in the sudden rapid and violent reaction.	2
	***(c)**	The charge of the metal X ion formed is +3. For the same number of moles of metal used, X produced the same total volume of hydrogen gas as aluminium. Hence X ion must have the same charge as aluminium ion.	2
	(di)	$Zn + 2HCl \rightarrow ZnCl_2 + H_2$	1
	(dii)	Zn is oxidised as the oxidation state of Zn increases from 0 in Zn to +2 in $ZnCl_2$ / Zn^{2+} ions. HCl / H^+ ions is reduced as the oxidation state of H decreases from +1 in HCl / H^+ ions to 0 in H_2. Hence, the reaction is a redox reaction.	2
	(diii)	No. of moles of Zn = No. of moles of H_2 = 96 / 24 000 = 0.00400 mol Mass of Zn = 0.00400 x 65 = **0.260 g**	1