

Question number	Answer	Notes	Marks
1 (a)	potassium / sodium / magnesium / zinc	accept K / Na / Mg / Zn if both name and symbol given, mark name only	1
(b)	M1 bubbles of gas produced rapidly/quickly M2 solid disappears quickly	accept any indication that the rate of evolution of bubbles and the disappearance of the solid is in between that of magnesium and zinc	2
(c) (i)	potassium hydroxide	accept KOH if both name and formula given, mark name only	1
(ii)	MgO		1
(d) (i)	carbon/C <u>and</u> it displaces/replaces zinc/Zn	reject 'displaces zinc oxide / displaces oxygen' accept 'it gains oxygen (from the zinc oxide) / it reduces zinc (oxide)'	1
(ii)	M1 carbon / C M2 it removes oxygen from the zinc (oxide) / causes zinc <u>ions</u> to gain electrons / gains oxygen / is oxidised	M2 dep on M1 reject 'displaces oxygen'	2

Question number	Answer	Notes	Marks
2 b i	B (the products are both elements)		1
	ii electrons on wrong side / should be on right /should be $- 2e^-$ 2Br should be Br ₂	Accept + in front of electrons (should be $-$) Accept product is shown as a bromine atom / should be shown as a bromine molecule Equation correctly rewritten scores both marks	1 1
	iii ions stop moving / ions not free to move OR electrons stop moving (through wires)	Ignore liquid becomes solid / no free ions Accept electric current in place of electrons Reject implication that electrons stop flowing through liquid	1
Total 9 marks			

Question number		Answer		Notes	Marks
3	a	M1	(same) volume of solution/liquid	Accept amount in place of volume	3
		M2	(same) concentration (of solution/liquid)		
		M3	(same) amount of metal	Accept solid in place of metal Accept moles/mass in place of amount Reject salt in place of metal	
		M4	(same) (total) surface area / state of subdivision of solid	Accept all powder / all particles same size / size of metal	
		M5	(same) method/length of time/speed of stirring		
				Ignore references to polystyrene cup / starting temperature	
				Any three for 1 each	
	b	M1	22.4	Ignore trailing zeroes and award 1 mark for both correct values in wrong order	1
		M2	17.7		1
		M3	4.7	Consequential on values used in M1 and M2 Reject -4.7	1

Question number			Answer	Notes	Marks
3	c	i	M1 magnesium / Mg		1
			M2 largest difference in (recorded) temperatures	DEP on M1 Do not accept results in place of temperatures Explanation must be comparative: Not just rises are 10.5 and 15.5 without reference to values for other metals Not just very different temperature changes Accept two temperatures furthest apart Not just largest temperature rise No penalty for quoting wrong difference, eg 4 C	1

Question number			Answer	Notes	Marks
3	c	ii	M1 magnesium / Mg		1
			M2 largest temperature <u>rise/change</u>	DEP on M1 Do not accept results in place of temperatures Accept answers stating most heat produced / most exothermic	1
		iii	silver/it is less reactive (than copper) / lower in the reactivity series OR no reaction	Must be implied comparison Accept copper more reactive than silver but not just silver is unreactive	1
				Reject references to differences in reactivities of silver and copper ions / silver and copper sulfate	
		iv	silver and X both have no temperature rise/change OR two metals show no temperature rise/change	Accept two metals did not react Accept two showed zero (temperature rises)	1
	d		$\text{Zn} + \text{CuSO}_4 \rightarrow \text{Cu} + \text{ZnSO}_4$	Ignore state symbols Accept correct ionic equation with or without spectator ions	1
				Total	13

Question number			Answer	Notes	Marks
4	a		M1 exothermic	Accept phonetic spellings Do not accept endothermic or any spelling that could be taken as endothermic or a hybrid such as exdothermic	1
	b	i	M1 volume of solution M2 concentration (of solution) M3 amount / mass of metal M4 same surface area of metal M5 same (rate/time of) stirring M6 same <u>starting/initial</u> temperature	Allow amount of solution Allow quantity of metal Allow same size pieces / same state of subdivision Ignore references to room temperature Any two for 1 each	1 1 1 1 1 1
		ii	M1 18.7(0) M2 26.8(0) M3 8.1(0)	Conseq on M1 and M2	1 1 1
		iii	M1 Zn / zinc M2 X	Accept phonetic spellings	1 1

Question number			Answer	Notes	Marks
4	c		M1 $\text{Zn} + \text{XSO}_4 \rightarrow \text{ZnSO}_4 + \text{X}$	Ignore state symbols	1
	d		M1 would react with water OR forms insoluble calcium sulfate/product	Allow <u>too</u> reactive/ <u>very</u> reactive/ <u>too</u> high in the reactivity series Do not allow more reactive than other metals (in experiment)	1

Total 10 marks