



Question	Answer	Marks	AO Element	Notes	Guidance
1	one mark each for any two of: • malleable • ductile • conducts electricity / conducts heat • shiny (when freshly cut)	2			
2	copper < nickel < iron < beryllium if 2 marks not scored one mark for one consecutive pair reversed / all reversed	2			
3(a)	C (1) very strong (1) very good ductility / best ductility (1)	3			
3(b)	B (1) very hard (1) strong / good conductor of heat (1)	3			
4	copper < cobalt < manganese < magnesium (2) If 2 marks not scored one mark for one consecutive pair reversed / all reversed	2			

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5(a)	reacts with water / reacts with chlorine	1			
5(b)	third box ticked (sodium conducts electricity) fourth box ticked (sodium is malleable)	2			
6	iron < zinc < titanium < calcium IF two marks not scored, one mark for one consecutive pair reversed / all reversed	2			
7	copper < zinc < magnesium < sodium IF two marks not scored, one mark for one consecutive pair reversed / all reversed	2			
8(a)	it is above carbon in the reactivity series / more reactive than carbon	1			
8(b)	any one from: • aluminium oxide has high melting point / cryolite has lower melting point than aluminium oxide • using cryolite reduces costs / expensive to melt aluminium	1			

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8(c)	oxygen	1			
8(d)	$Al^{3+} + 3e^{-} \rightarrow Al$	2			
9	forms magnesium chloride (1) forms water and carbon dioxide (1) one mark each for any two of: - reaction is exothermic / (reaction mixture) gets warm - bubbles / effervescence / fizzes - magnesium carbonate disappears (or gets smaller)	4			
10	bauxite	1			
11(a)	hematite	1			
11(b)(i)	slag floats on iron / slag is above the iron ORA	1			

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11(b)(ii)	limestone (1) AND 1 mark each for any 2 of: - it decomposes / it breaks down - forms calcium oxide / forms CaO - reacts with impurities / reacts with silicon dioxide / reacts with silicates / reacts with silica / reacts with SiO ₂	3			
11(c)	to form carbon monoxide / to burn the coke / to burn the carbon	1			
12	copper < nickel < zinc < magnesium (2) if two marks not scored one mark for one consecutive pair reversed / all reversed	2			
13(a)	$2\text{Al}(\text{OH})_3 \rightarrow \text{Al}_2\text{O}_3 + 3\text{H}_2\text{O}$ species (1) balance (1)	2			
13(b)	aluminium carbonate (1) aluminium nitrate (1)	2			

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14	copper < iron < samarium < sodium (1) if 2 marks not scored allow 1 mark for 1 consecutive pair reversed	2			
15	fluorine is more reactive than chlorine / chlorine is less reactive than fluorine	1			
16	1 mark each for any two of: (alloy is) harder / more durable / more resistant to wear ORA for copper (1) (alloy is) stronger ORA for copper (1) (alloy is) more resistant to corrosion ORA for copper (1)	2			
17	hematite	1			
18	<i>any three of:</i> - conducts electricity / conducts heat - malleable - ductile - shiny / lustrous	3			

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19	any three from: • conduct electricity • conduct heat • malleable • ductile • shiny / lustrous	3			
20	strong (1)	1			
	density (1)	1			
	corrosion (1)	1			
21	gold < copper < tin < sodium (2) if 2 marks not scored: 1 mark for 1 consecutive pair reversed	2			
22	bauxite	1			
23	D / Zn / zinc	1			
24	iron is (relatively) low in the reactivity series	1			

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25	any three from: • high melting point / high boiling point • high density • forms coloured compounds • forms ions with different charges / forms ions with variable valency / form ions with different oxidation numbers • forms complex ions • can be used as a catalyst	3			
26	mixture of metal with other element(s)	1			
27	bismuth < lead < zinc < chromium (2) if 2 marks not scored allow 1 mark for 1 consecutive pair reversed	2			
28	any two from: • oxygen • steam • acid	2			

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29(a)	mixture of metal and other elements	1			
29(b)	(alloy) more resistant to wear / stronger / harder / more resistant to corrosion ORA for copper	1			
30	tungsten < nickel < iron < magnesium (2) if 2 marks not scored 1 mark for one consecutive pair reversed	2			
31(a)	any two from: • low melting point or low boiling point • soft • low density	2			
31(b)	any one from: • fizz / bubbles • moves • floats • melts / forms a ball • gets smaller / disappears	1			

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32	all 5 in correct order (2) strontium magnesium zinc iron mercury if 2 marks not scored: 1 mark for 1 consecutive pair reversed / all reversed	2			
33(a)	M1 oxygen M2 water	2			
33(b)	zinc / Zn	1			
34	M1 magnesium above iron / steel in the reactivity series ORA / magnesium more reactive than iron / steel ORA M2 copper below iron / steel in the reactivity series ORA / copper less reactive than iron ORA	2			
35	air	1			
	monoxide	1			
	decomposes	1			

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	slag	1									
36	one mark each for any two of: • malleable • ductile • conducts electricity / conducts heat • shiny / lustrous	2									
37(a)	zinc acts as a barrier which prevents contact between iron and water and air / oxygen	1									
37(b)	M1 zinc is more reactive than iron / steel ORA M2 zinc loses electrons / zinc is oxidised M3 electrons are transferred to iron / iron is not oxidised / does not lose electrons Summary <table><tr><td>M1</td><td>comparison of reactivity</td></tr><tr><td>M2</td><td>zinc loses electrons</td></tr><tr><td>M3</td><td>where electrons move to OR iron does not lose electrons</td></tr></table>	M1	comparison of reactivity	M2	zinc loses electrons	M3	where electrons move to OR iron does not lose electrons	3			
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38	One mark each for any 3 of: • iron has high melting point / boiling point / ORA for K • iron has high density / ORA for K • iron has catalytic activity / ORA for K • iron forms coloured <u>compounds</u> / ORA for K • iron <u>compounds</u> have variable oxidation states / form ions with different charges / ORA for K • iron is hard / potassium is soft / iron is strong / potassium is weak • one suitable difference in chemical properties e.g. iron is less reactive than potassium ORA / potassium reacts with cold water / iron does not react with cold water / iron rusts / potassium does not rust • iron is magnetic / ORA for K	3			

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39	the impurity is C (1) blow oxygen into OR pass oxygen through (molten) iron (1) carbon dioxide escapes OR carbon dioxide is a gas (1)	3			
40	coke is burned (to form carbon dioxide) OR $C + O_2 \rightarrow CO_2$ (1) carbon dioxide is reduced by (more) coke to form carbon monoxide or CO OR $C + CO_2 \rightarrow 2CO$ (1) $3CO + Fe_2O_3 \rightarrow 2Fe + 3CO_2$ (1) limestone (decomposes to) form lime / CaO / calcium oxide (and carbon dioxide) OR $CaCO_3 \rightarrow CaO + CO_2$ (1) $CaO + SiO_2 \rightarrow CaSiO_3$ (1)	5			
[Total: 104]					