

Mark Scheme - 6

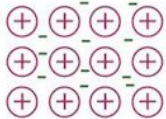
1.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)		2	reaction takes place since iron is higher in the series / more reactive than copper (1) brown solid formed / solution becomes colourless / decolourises (1)			
(b)		2	reaction takes place since magnesium is higher in the series than hydrogen (1) effervescence / bubbling / temperature rise / exothermic (1)	magnesium disappears		
(c)		2	no reaction takes place (1) aluminium is higher in the series / more reactive than carbon (1)	no displacement		

2.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)		1	magnesium zinc copper (must be correct order)	Mg Zn Cu		
(b)		2	copper (metal) (1) magnesium sulfate (solution) (1)	Cu MgSO ₄		
(c)		1	ZnSO ₄			
(d)	(i)	1	2 PbO 2 Pb both needed			
	(ii)	2	carbon (1) as it gains oxygen (1)	C loses electrons	reacts with oxygen	
	(iii)	1	any one from: aluminium is more reactive (than carbon) aluminium is too reactive carbon is less reactive (than aluminium) carbon is not reactive enough	Al is above C in reactivity series	Al is very reactive	

3.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)		1	2,8,1			
(b)		2	 <p>positive ions fixed positions electrons mobile / sea</p> <p>– all four points (2) – two/three points (1)</p>			
(c)	(i)	1	floats moves fizzes / bubbles goes into a round shape / melts – any two		vigorous reaction dissolves	
	(ii)	1	sodium hydroxide and hydrogen – both needed	NaOH + H ₂	H	
(d)		1	potassium burns / lilac flame		potassium moves faster	yellow / orange / red / green flame
(e)		2	atoms get bigger / greater distance between the (positive) nucleus and the (outer) electron (1) outer electron more weakly held (1)			

4.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)		2	(silicon difficult to classify) because it has metallic and non-metallic properties (1) response clearly indicating one or more metallic property and contrasting non-metallic property, e.g. it has a high melting point/boiling point like a metal but is brittle like a non-metal (2)	semi-metal / metalloid		it is a metal and a non-metal
(b)		1	Mg (ignore atomic number / mass number)		magnesium	
(c)	(i)	1	2			
	(ii)	1	Ag ₂ O	Ag ⁺ ₂ O ²⁻		
(d)	(i)	1	antibacterial / antiviral / antifungal	kills germs / kills bacteria / antiseptic	disinfectant reduces smells	
	(ii)	1	silver nanoparticles can get into drinking water / water supplies / lakes / rivers could be dangerous to health / harmful / toxic don't know the effect / long term effect not known <i>uncertainty must be implied</i>		reference to the air / atmosphere / rain pollutes water / the environment	

6.

Mark	Answer
6	<p>Indicative content Temperature very high. Coke is oxidized to carbon monoxide. ($2\text{C} + \text{O}_2 \rightarrow 2\text{CO}$) Carbon monoxide reduced the iron ore to iron. ($3\text{CO} + \text{Fe}_2\text{O}_3 \rightarrow 2\text{Fe} + 3\text{CO}_2$) Molten iron flows to the bottom of the furnace. Limestone is decomposed by heat to calcium oxide and carbon dioxide. The calcium oxide reacts with the impurities (sand/silica) to form slag which flows to the bottom of the furnace and floats on the molten iron.</p> <p>5-6 marks: The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</p> <p>3-4 marks: The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</p> <p>1-2 marks: The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</p> <p>0 marks: The candidate does not make any attempt or give a relevant answer worthy of credit.</p>

7.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)	2	iron(III) oxide + aluminium → iron + aluminium oxide (1) for both reactants (1) for both products	correct chemical equation	powder	magnesium as reactant
	(ii)	2	aluminium more reactive than iron (1) must be correct to award second mark takes oxygen from iron / reduces iron(III) oxide (1)			
	(iii)	1	no reaction			
(b)	(i)	3	iron ore – provides the iron (1) coke – reduces iron oxide / fuel / burns to produce heat / forms carbon monoxide (1) limestone – removes impurities (1)		makes iron source of heat forms slag	
	(ii)	I	1	$\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$		
		II	1	loss of oxygen / gain of electrons		

8.

Sub-section	Mark	Answer	Accept	Neutral answer	Do not accept
(a) (i)	2	an ion: $\text{Al}^{3+} / \text{O}^{2-}$ an atom: Al a molecule: O_2 All three correct (2) Any one correct (1)	2O^{2-}		
(ii)	2	cathode / negative / – (1) Al^{3+} / aluminium ions / positive ions attracted to cathode / negative electrode (1)	'go to opposite charge'	'go to'	attach
(iii)	2	aluminium oxide (1) Al_2O_3 (1)	$\text{Al}^{3+}_2\text{O}^{2-}_3$		
(iv)	1	<i>problem to be associated with electrolysis process not the extraction of the ore</i> fluoride emission / acid rain / global warming / climate change		reference to carbon dioxide / greenhouse gas	
(b)	1	heat conductor e.g. saucepans low density e.g. aeroplanes malleable e.g. cans corrosion resistance e.g. window frames ductile e.g. over-head power cables shiny e.g. mirrors <i>correct property must be linked with an appropriate use to gain mark</i>			

9.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)		1	copper sulfate (solution)	CuSO ₄		
(b)		1	anode			
(c)	(i)	1	0.8			
	(ii)	3	plotting six correct points (2) five correct points (1) smooth line of best fit (1)			
	(iii)	1	0.66 (graph) ±0.02			

10.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)	1	cryolite			
	(ii)	1	2 4			
(b)	(i)	2	Pb^{2+} (1) + 2e (1)			
	(ii)	3	<p>any 3 of 4 points for (1) each</p> <p>bromide ions are negative (1)</p> <p>bromide ions attracted to the anode/+ve electrode (1)</p> <p>loss of electrons (1)</p> <p>two bromide ions / bromine atoms form a bromine molecule (1)</p> <p>award credit for above points in suitable equations</p> <p>max (2) if reference to 'bromine ions' or 'bromide atoms'</p>			award 0 if bromide ions are described as positive ions

11.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)		2	resists corrosion (1) lasts longer than iron (1) – linked to 1 st mark or low density (1) easier to install (1) – linked to 1 st mark	less maintenance / weather resistant	iron rusts doesn't rust forms oxide layer	
(b)	(i)	1	oxide / O^{2-}			oxygen O_2^-
	(ii)	1	aluminium oxide → aluminium + oxygen	$Al_2O_3 \rightarrow Al + O_2$ (ignore any attempt to balance)	reference to 'molten' aluminium oxide and oxygen 'gas'	
	(iii)	1	liquid / l			
	(iv)	1	lot / large amount of electricity used lot / large amount of energy used electricity is expensive		a lot of heat needed	

12.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)		1	allows the ions to be mobile / move		allows electricity to flow	
(b)		1	$2\text{Br}^- - 2\text{e}^- \rightarrow \text{Br}_2$			
(c)	(i)	1	lead ions would gain electrons			
	(ii)	1	shiny or grey substance		lead – needs qualifying	
	(iii)	2	lead metal formed would link the two electrodes (1) lead/metals conduct electricity (1)			

13.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)	2	Cu ions are positively charged (1) must be correct to award second mark opposite charges attract / attracted to negative electrode (1)	Cu^{2+}		
	(ii)	1	$\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$			
(b)	(i)	1	0.20			
	(ii)	1	45% error carried forward (ecf) possible from (i)			
	(iii)	2	0.26 (1) increase of approximately 0.02 g per 1.0 V / last 3 results increase by 0.02 g per 1.0V (1) ecf possible from (i)			

14.

Indicative content:

copper – good conductor of electricity = electrical wiring; good conductor of heat = saucepan bases; malleable = water pipes; ductile = electrical wiring; attractive colour and lustre = jewellery

titanium – hard and strong = hip replacements and rotor blades; low density = rotor blades; resistant to corrosion = rotor blades / hip replacements / pipes in chemical industry; high melting point = rotor blades.

5–6 marks: The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.

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Indicative content:

copper – good conductor of electricity = electrical wiring; good conductor of heat = saucepan bases; malleable = water pipes; ductile = electrical wiring; attractive colour and lustre = jewellery

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16.

Mark	Answer
6	<p>Indicative content: e.g. aluminium: low density – used to build aircraft; good heat conductor – saucepans; good electrical conductor and low density – overhead power cables etc.</p> <p>copper: good electrical conductor – electrical wires; good heat conductor – saucepan bases etc.</p> <p>titanium: strong with low density – rotors on helicopters, hip replacements etc.</p> <p>credit can be awarded for correct uses and properties of metals not described in the specification</p> <p>5–6 marks: The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</p> <p>3–4 marks: The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</p> <p>1–2 marks: The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</p> <p>0 marks: The candidate does not make any attempt or give a relevant answer worthy of credit.</p>