

Paper 2 Higher

Question number	Answer	Mark
1(a)	B	(1)

Question number	Answer	Mark
1(b)	An answer that provides a description by making reference to: <ul style="list-style-type: none"> • adds carbon dioxide/adds water vapour (1) • removes oxygen (1) 	(2)

Question number	Answer	Additional guidance	Mark
1(c)	<p>An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark):</p> <ul style="list-style-type: none"> • as concentration of carbon dioxide increases the (mean global) temperature increases (overall) (1) • {but there is no evidence that the increase in (mean global) temperature is caused by the increase in concentration of carbon dioxide/other factors may cause the increase in (mean global) temperature} (1) <p>OR</p> <ul style="list-style-type: none"> • as concentration of carbon dioxide increases the (mean global) temperature increases (1) • so this does provide evidence that an increase in carbon dioxide is causing the Earth's temperature to rise (1) <p>OR</p> <ul style="list-style-type: none"> • as concentration of carbon dioxide increases the (mean global) temperature overall increases but {fluctuates/increases and decreases} (1) • so this does not provide evidence that an increase in carbon dioxide is causing the Earth's temperature to rise (1) 	Award for conclusion (second mark) only given if reason given	(2)

Question number	Answer	Mark
1(d)	D	(1)

Question number	Answer	Additional guidance	Mark
2(a)	An answer that combines the following points of understanding to provide a logical description: <ul style="list-style-type: none"> • (hydrogen produced as a gas so) there would be {effervescence/fizzing/bubbles} (1) • and (calcium hydroxide produced as a solid so) the water would go {cloudy/a white precipitate would form} (1) 	Allow: <ul style="list-style-type: none"> calcium moves (around) (1) calcium decreases in size/disappears/dissolves (1) 	(2)

Question number	Answer	Mark
2(b)	$\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2$ <ul style="list-style-type: none"> • LHS (1) • RHS (1) 	(2)

Question number	Answer	Additional guidance	Mark
2(c)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): <ul style="list-style-type: none"> • In calcium the outermost electron(s) {are further away from nucleus /experience(s) greater shielding} (from the nucleus) (as shown by the electronic configuration) (1) • Therefore less attraction between nucleus and electron(s)/ the electron(s) is/are easier to remove (1) 	Allow answers in terms of why reactivity of magnesium is less than that of calcium	(2)

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	answer must refer to water vapour water vapour condensed / rain falls / water vapour removed / (water vapour) turns to water		(1)

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	An explanation linking <ul style="list-style-type: none"> • carbon dioxide (level) reduced (1) • so oxygen (level) increased (1) 	carbon dioxide turned into oxygen (1)	(2)

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	$2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$ (3) lhs (1) rhs (1) balancing of correct formulae (1)	accept multiples ignore state symbols even if incorrect	(3)

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	$\frac{21}{100} \times 50$ (1) (= 10.5 cm ³) 50 minus answer to previous step (1) or $100 - 21$ (1) (= 79 cm ³) $\frac{79}{100} \times 50$ (1) (= 39.5 cm ³)	correct answer with no working / 39.5 (cm ³) (2) allow TE allow TE	(2)

Question Number	Answer	Acceptable answers	Mark
3(b)(iii)	C nitrogen		(1)

Total for Question 3 = 9 marks

Question Number	Answer	Acceptable answers	Mark
3(a)	B large amount of carbon dioxide and small amount of oxygen		(1)

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	<p>Both marks must come from the same pair only, not one from each pair</p> <p>An explanation linking</p> <p>EITHER plants (1) photosynthesis / take in carbon dioxide and release oxygen (1) OR oceans / rain / seas / water (1) {dissolve/absorb/take in} gas (1)</p>	<p>Allow convert to hydrocarbon (1) iron seeding (1)</p> <p>Reject respiration for photosynthesis</p> <p>Ignore breathe in carbon dioxide</p> <p>Ignore carbon is locked up in rocks</p>	(2)

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	<p>Both marks must come from the same pair only, not one from each pair</p> <p>An explanation linking</p> <p>burning/ (complete) combustion(1) (fossil) fuels/wood/rubbish/plastic etc (1) or plants/animals/organisms (1) respiration / gas exhaled / breathing / decaying (1) or volcanic activity/volcanoes (1) eruption (releases gas) (1)</p>	<p>Ignore just 'deforestation'</p> <p>Ignore just 'farming'</p> <p>Allow any type of fuel except hydrogen</p> <p>Allow heating limestone (2)</p>	(2)

Question Number	Answer	Acceptable answers	Mark
3(c)	A description including limewater (1) turns milky/cloudy/white precipitate (1)	Ignore heat Reject observation if incorrect reagent eg bromine water or water	(2)

Question Number	Answer	Acceptable answers	Mark
3(d)	<p>All marks must come from the same section only, do not mix and match</p> <p>An explanation linking:</p> <p>EITHER</p> <p>First 2 marking points concentration of carbon dioxide increases (steadily) (1) but the temperature {fluctuates/increases and decreases} (1)</p> <p>Third marking point dependent on at least 1 comment from a graph any 1 from: not all carbon dioxide is produced by human activity (1) none of the graphs refer to human activity (1) there is no proof that human activity causes the temperature to rise (1) other factors could cause the rise in temperature (1)</p> <p>OR</p> <p>First two marking points as the (mean global) temperature increases (1) concentration/amount} of carbon dioxide increases (1)</p> <p>Third marking point dependent on at least 1 comment from a graph any 1 from: human activity could be causing</p>	Allow the patterns of increase in carbon dioxide and temperature are different (2)	(3)

	<p>the rise in carbon dioxide (1) (world) population has increased (so the amount of carbon dioxide has increased) (1) (increase in) use of {fossil/carbon-based} fuels (produces more carbon dioxide) (1) (increase in) deforestation (decreases the amount of carbon dioxide removed by photosynthesis)</p>		
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Question number	Answer	Acceptable answers	Marks
1 (a)	<p>A description to include any two of</p> <ul style="list-style-type: none"> • {water vapour / steam} (1) • the Earth cooled (1) • {water vapour / steam} condensed / changed to liquid (1) 		(2)

Question number	Answer	Acceptable answers	Marks
1 (b) (i)	<p>A description to include any two of</p> <ul style="list-style-type: none"> • marine organisms /sea creatures absorb/take in carbon dioxide (1) • (and use the carbon dioxide) to form shells /calcium carbonate (1) • (shells) form sedimentary (rocks) (1) 	<p>reject incorrect references to metamorphic (heat and pressure/ igneous rock formation</p> <p>allow limestone/chalk</p>	(2)

Question number	Answer	Marks
1 (b) (ii)	<p>A calcium carbonate</p> <p>The only correct answer is A</p> <p>B is not correct because sodium chloride is not formed from dissolved carbon dioxide</p> <p>C is not correct because calcium hydroxide is not formed from dissolved carbon dioxide</p> <p>D is not correct because iron oxide is not formed from dissolved carbon dioxide</p>	(1)

Question number	Answer	Acceptable answers	Marks
1 (c)	An explanation linking <ul style="list-style-type: none"> plants photosynthesise (1) M1 so reducing/decreasing/ lowering carbon dioxide levels (1) 	allow plants take in carbon dioxide and release oxygen ignore reference to respiration/ breathing for M1 Ignore remove must reference to lowering/reduction	(2)

Question number	Answer	Acceptable answers	Marks
1 (d)	$\text{methane} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water}$ LHS (1) RHS (1)	ignore air allow water vapour ignore heat/energy allow reactants on LHS and products on RHS in either order allow $\text{CH}_4 + 2\text{O}_2$ $\rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$ (2) ignore state symbols allow = for \rightarrow	(2)

(Total for question 1 = 9 marks)

Question Number	Answer	Acceptable answers	Mark
1(a)	<p>An explanation linking</p> <p>water vapour: <u>condensed/turned to liquid/turned to water/</u> <u>cooled</u> AND formed oceans/ formed <u>rain</u> (1)</p> <p>carbon dioxide: dissolved/absorbed in the {water/ oceans/rivers/lakes} (1)</p>	<p>Ignore 'turned to/ formed oceans/seas' etc if not explained how this happened</p> <p><u>photosynthesis</u> / incorporated into rocks/shells</p> <p>Ignore descriptions of photosynthesis –term is required</p>	(2)

Question Number	Answer	Acceptable answers	Mark
1(b)	<p><u>Heat</u> is: trapped / absorbed / stopped from escaping / reflected back / radiated back</p> <p><u>IR radiation</u> is absorbed etc.</p>	<p>Ignore radiation/ UV/ rays/ warmth/ light/ Sun's rays / energy/ it's an insulator/ insulates Earth/ keeps Earth warm/ greenhouse gas</p> <p>Reject references to ozone layer</p>	(1)

Question Number	Answer	Acceptable answers	Mark
1(c)	deforestation / <u>respiration</u>	<p>Ignore farming/ increased population/ breathing/ use of cars/ industry</p> <p>Reject photosynthesis/ volcanic activity</p>	(1)

Question Number	Answer	Acceptable answers	Mark
1(d)	other factors could be causing the temperature to rise / correlation is not cause / not enough data to establish trend / no data between the two stated years	<p>insufficient evidence /could be due to methane or other (greenhouse) gases</p> <p>Ignore only small temp. rise / could be anomalous etc / different percentage changes in conc. and temp.</p>	(1)

Question Number	Answer	Acceptable answers	Mark
1(e)(i)	<p>Advantage Any one from:</p> <ul style="list-style-type: none"> •! only water is produced / no CO₂ or CO or SO₂ / no pollutants / no waste products / no toxic gases/ no harmful gases/ no hazardous gases •! sustainable / preserves crude oil or fossil fuels / renewable •! more energy per gram / per unit mass •! can be produced in unlimited amounts (from water) <p style="text-align: right;">(1)</p> <p>Disadvantage Any one from:</p> <ul style="list-style-type: none"> •! expensive <u>to produce</u> •! difficult to store/ transport •! limited outlets/ low availability of filling stations •! has to be stored in strong tanks / at high pressure <p style="text-align: right;">(1)</p>	<p>Ignore better for environment / less pollution / cleaner fuel / refs to unspecified greenhouse gases / just releases more energy</p> <p>Ignore cost arguments other than <u>production</u> Ignore may need fossil fuel to produce hydrogen Ignore 'dangerous'/ explosive etc.</p>	(2)

Question Number	Answer	Acceptable answers	Mark
1(e)(ii)	hydrogen + oxygen → water	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ <p>Reject any other symbol equation (incorrectly balanced) or mixed words and symbols / hydrogen oxide – only water allowed / energy as a product</p> <p>Allow = for →</p>	(1)

Total for Question 1 = 8 marks