(b) Iron to make bikes is extracted from iron oxide.

During the extraction, iron oxide reacts with carbon monoxide to make

iron. When iron corrodes it reacts with oxygen to form iron oxide.

The equations show what happens in these two reactions.

Extraction: Fe₂O₃ + $3CO \rightarrow 2Fe + 3CO_2$

Corrosion: $4Fe + 3O_2 \rightarrow 2Fe_2O_3$

Explain the difference between oxidation and reduction.

Use examples from the equations in your answer.

^[3] preview from Notesale.co.uk preview from Notesale.co.uk Page 6 of 52 (c) Scientists think that the Earth's early atmosphere came from volcanoes.

The table shows the percentage composition of gases from a volcano and in the Earth's atmosphere 4400 MYA.

	Percentage composition			
Gas	Volcano gas	Earth's atmosphere 4400 MYA		
Water vapour	92%	5%		
Carbon dioxide	4.6%	80%		
Hydrogen	0.5%	4%		

(i) Scientists think that water vapour from volcanoes turned into liquid water over 4000 MYA and formed the Earth's oceans.

What does this suggest about the temperature of the Earth at that

time? Explain your reasoning.

	ale	
	Notesala [2	
(ii)	Which of these statements support the idea that h Euch's atmosphere came from volcanoe	es?
	Use the later the table and no graps	
	Tick (3) two boxes.	
	Hydrogen comes from volcanoes and was in the Earth's atmosphere 4400 MYA.	
	There was more water vapour in the Earth's atmosphere 4400 MYA than in volcano gas.	
	The Earth's atmosphere 4400 MYA and volcano gases both contain carbon dioxide.	
	The percentages of gases in the Earth's atmosphere 4400 MYA are not the same as today.	
		[2]

- (c) Chemicals are usually made in industry in continuous processes.Chemicals are usually made in the laboratory in batches.
- (i) State one advantage of using continuous processes in industry.

(ii) State one advantage of making chemicals in the laboratory in batches.

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(b) The empirical formula of an alkane is the simplest ratio of hydrogen atoms to carbon atoms. Table 9.2 shows the molecular formula and empirical formula of some alkanes. Complete **Table 9.2** by filling in the empirical formula for butane.

Table 9.2

Alkane	Molecular formula	Empirical formula
Ethane	C ₂ H ₆	CH3
Propane	C3H8	C3H8
Butane	$C_4 H_{10}$	

(c) Alkanes come from crude oil.

Why is crude oil important to modern life?

Tick (3) two boxes.

Jue bonte lote sale.co.uk Nemical industry 52 Chemicals in crude oil have different boiling points. Crude oil contains molecules with single bond Crude oil is a feedstock for the Crude ce of

[1]

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Question			Answer	Marks	element	Guidance
9	(a)	(i)	all plots plotted correctly	3	1.2	ALLOW ±1/2 small square (by eye)
			best fit line	.uk		ALLOW 1 mark for 3 points plotted correctly ALLOW Best fit based on plotted points (±2 squares) ignoring any identified outliers
		(ii) (ii)	values 90, 100 Markings on graph showing to vreading was made	2	1.2	
	P (b)		C2H2	1	2.2	
	(c)		Crude oil is a feedstock for the petrochemical industry. Crude oil is a main source of hydrocarbons.	2	1.1	

					AO	
Question			Answer	Marks	element	Guidance
10	(a)	vi	carbon dioxide causes the greenhouse effect/is a greenhouse gas/climate change/global warming which makes ice caps or glaciers melt / searcol rise / crops fail / extinctions / externel weather events		2 x 2.1 3.2a	IGNORE references to layers of carbon dioxide /ozone layer / use of fossil fuels IGNORE natural disasters/tsunamis IGNORE indirect effects e.g. habitat loss/damage to ecosystems ALLOW examples of extreme weather e.g. tornadoes/droughts/wildfires
			FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 816 (millions of tonnes) award 3 marks Substitution: 49 = (400÷mass added) x 100 shows evidence of rearranging formula e.g. (400/49) x 100 ✓	3	2.2	ALLOW 2 or more sig figs from 816.32653 ALLOW 2 marks for (400/49) x 100 seen in answer (MP1 and MP2) IGNORE incorrect unit conversion for MP1 and MP2 e.g. ALLOW 2 marks for 816 000 000 / 81 600 DO NOT ALLOW MP3 if there is a unit conversion Use of 51 rather than 49 loses MP1 only e.g. ALLOW 2 marks for 784 million tonnes (answer based on 51%)
	(c)	(i)	> 2.3 x 10^4 millions tonnes \checkmark	1	3.2b	
		(ii)	demand for transport/cars/vehicles/(domestic) heating/manufacturing / use of renewables / use of other fuels e.g. hydrogen/biogas/fuels from waste. ✓	1	1.1	IGNORE demand for fuels/energy alone / cost ALLOW demand for fuel for specified use/petrol IGNORE population growth / supply of fossil fuels/ efficiency arguments / limits on emissions

					AO	
Question			Answer	Marks	element	Guidance
11	(a)	(i) (i)	Shows upside down measuring cylinder in container with delivery tube entering bottom of cylinder at least two correct apparatus labels apparatus and water level approfilitie to collect gas charef in container, and of measuring cylinder below		2 x 1.2 3.3a	IGNORE gas syringe DO NOT ALLOW MP1 if tube is shown joined to cylinder Appropriate labels are: measuring cylinder, (delivery) tube and trough/beaker/bowl/container/tray etc IGNORE small gaps only
		(ii)	use a ga <u>s syri</u> nge / use a burette	1	3.3b	
	(b)	(i)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.47 (cm ³ /s) award 3 marks Shows (132-48) OR (21 x 4) OR 84 in working Shows (210-30) OR 180 in working 84/180 = 0.47 (cm ³ /s)	3	2.2	 ALLOW 2 or more sig figs from 0.466666 seen anywhere in answer ALLOW MP3 ECF on incorrect readings but substitution must be correct For MP3 answer must be given to 2 or more significant figures seen anywhere. ALLOW answer on ECF to 1dp if calculation computes exactly to 1dp ALLOW 0.46 if 84 and 180 are shown in working
		(ii)	The rate of reaction at 120s	1	3.1b	