

Question	Answers	Notes	Total	Criterion	
1	a	Period 4	1	A	
	b	transition metals	1	A	
	c	Accept any reasonable response (max 2), for example: <ul style="list-style-type: none"> • variable oxidation state/number • form coloured compounds • any named metallic property 	2	A	
	d	Protons: 27 Neutrons: 32 Electrons: 25	<i>Accept: "they have colour"</i> <i>Do not accept "hard"</i>	3	A
	e	CoCl ₂ Ionic (bonding)		2	A
	f	cobalt oxide or cobalt (II) oxide cobalt carbonate or cobalt (II) carbonate	<i>Roman numeral must be correct if present</i> <i>ECF from part e "cobalt monoxide"</i>	2	A

2	a	plastic – dissolves in organic solvent steel – magnetic glass – sinks in water		3	A
	b	Fe ₂ O ₃		1	C
	c	mass Fe = 56 and O = 16 seen or implied 160 g or g mol ⁻¹	<i>ECF from part b for all marking points</i>	3	A D
	d	n=m/M or 0.5/160 seen or implied 3.125 x 10 ⁻³ (moles) seen or implied 3.13 x 10 ⁻³ or 0.00313	<i>Award 1 mark only for an answer of 320</i> <i>no ECF from 2nd marking point</i>	3	A Di
	e	Covalent electrons shared between silicon and oxygen atoms		2	C
	f	(silicon oxide is) insoluble in water <u>giant</u> covalent structure will not dissolve in water	<i>Accept reference to glass or sand not being soluble for the second marking point</i>	2	A
	g	Accept any three reasonable points (max 3), for example <ul style="list-style-type: none"> • save beaches • preserve biodiversity • conserve raw materials • improves sustainability 		3	D

3	a	<p>Independent variable: type of fruit</p> <p>Dependent variable: pH</p> <p>Control variables: mass of fruit, time of mixing fruit same volume of water added, same volume of mixture tested, same equipment used</p>	<p>accept "acidity"</p> <p>Do not accept "amount"</p>	4	B
	b	a research question linking pH with type of fruit	<i>Accept "acidic"</i>	1	B
	c	<p>cranberry and (pH =) 2.4</p> <p>this has the lowest pH or this has the highest acidity</p> <p>the higher the acidity in the stomach, the more severe the heartburn</p>	<p><i>This mark is awarding for linking stomach acidity with heartburn so it can be awarded for an incorrect juice</i></p>	3	C
	d	<p>bar chart</p> <p>data for all juices presented correctly</p> <p>title linking DV with IV</p> <p>x axis: type of fruit juice</p> <p>y axis: pH</p>		5	C
	e	<p>Any reasonable extension, for example</p> <ul style="list-style-type: none"> • different (varieties of) fruits • length of time the fruit is blended • different ripeness of fruit 		1	C
	f	<p>(with more than one trial you are able to) calculate the mean</p> <p>reduces experimental errors or increases accuracy</p>		2	C

	g	red green purple red		4	C
	h	the indicator gives a range of pH or the colour change would not be visible		1	C

4	a	Cayenne – jalapeño – red chilli – habanero any two in the correct location all correct		2	C
	b	the data show that habanero peppers contain the most capsaicin (so) the prediction is not valid	<i>Only award 2nd mark if the 1st mark is awarded</i>	2	C
	c	compound 1 contains a (C=C) double bond or alkene (group) compound 1 has a longer (carbon) chain or it has an extra carbon	ORA	2	C
	d	if the temperature of the method is low or the pepper is raw then the spiciness will increase or the spiciness will be the highest because the capsaicin will not melt or boil or evaporate or be destroyed		3	B

5							
			1	2	3	4	
	Variables	A variable is identified	Independent variable and dependent variable identified	Independent variable and dependent variable identified and one control variable is stated	Independent variable and dependent variable identified and more than one control variable is stated		
	Additional equipment	One piece of additional equipment is listed	Stopwatch and one piece of additional equipment	Stopwatch and mortar and pestle or balance and one piece of additional equipment	Complete equipment is listed: balance, measuring cylinder or 25 cm ³ pipette/burette, stopwatch, mortar and pestle		
	Method	Attempt at a method	Time for neutralization is measured	Time for neutralization is measured and mass is measured or powder is used	Time for neutralization is measured and mass is measured and powder is used		
	Data	One treatment is investigated	All treatments are investigated	All treatments are investigated with repeats	All treatments are investigated with repeats and plans to calculate means		
Assumptions	All of the acid has reacted						
Safety	A safety precaution is stated	A safety precaution is stated and linked to hazard					
						19	B

6	a	value of 2.9 ± 0.2 from graph value for carbon footprint for the potato in the range 0.65 – 0.74 value 11.32 ± 0.04 for total carbon footprint (accept any sig figs) final value given to two sig figs			<i>ECF from first marking point</i> <i>ECF from second marking point</i>	4	C D																														
	b	energy values are similar for both (but) environmental impact is higher for meat-based than for vegetable correct use of 11.32 (kgCO ₂ e) for meat-based or 1.91 (kgCO ₂ e) for vegetable-based			<i>Do not award this mark if no data is given, ECF from part a for meat-based meal</i>	3	D																														
7	a	$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$ reactants correct products correct				2	A																														
	b	<table border="1"> <thead> <tr> <th></th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Advantages and disadvantages of cattle farming</td> <td>An attempt at an advantage or disadvantage</td> <td>An advantage or disadvantage</td> <td>An advantage and disadvantage</td> <td>An advantage and disadvantage with at least one justified</td> </tr> <tr> <td>Economic impacts of cattle farming</td> <td>An attempt at an economic impact</td> <td>An economic impact</td> <td>More than one economic impact</td> <td></td> </tr> <tr> <td>Environmental impact of CH₄ capture</td> <td>An attempt at an environmental impact</td> <td>An environmental impact</td> <td>More than one environmental impact</td> <td></td> </tr> <tr> <td>Ethical aspects of CH₄ capture</td> <td>A statement about the impact on a cow or a statement about the methane hazard</td> <td>A statement about the impact on a cow with justification or a statement about the methane hazard with justification</td> <td>A statement about the impact on a cow with justification and linked to a statement about the methane hazard</td> <td></td> </tr> <tr> <td>Concluding appraisal</td> <td>A conclusion is given</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					1	2	3	4	Advantages and disadvantages of cattle farming	An attempt at an advantage or disadvantage	An advantage or disadvantage	An advantage and disadvantage	An advantage and disadvantage with at least one justified	Economic impacts of cattle farming	An attempt at an economic impact	An economic impact	More than one economic impact		Environmental impact of CH ₄ capture	An attempt at an environmental impact	An environmental impact	More than one environmental impact		Ethical aspects of CH ₄ capture	A statement about the impact on a cow or a statement about the methane hazard	A statement about the impact on a cow with justification or a statement about the methane hazard with justification	A statement about the impact on a cow with justification and linked to a statement about the methane hazard		Concluding appraisal	A conclusion is given					14
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