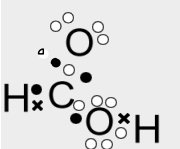


Question	Answers	Notes	Total	Criterion												
1	<p><b>a</b></p> <table border="0"> <tr> <td></td> <td style="text-align: center;"><b>Group</b></td> <td style="text-align: center;"><b>Period</b></td> </tr> <tr> <td>Carbon:</td> <td style="text-align: center;"><input type="text" value="4"/></td> <td style="text-align: center;"><input type="text" value="2"/></td> </tr> <tr> <td>Hydrogen:</td> <td style="text-align: center;"><input type="text" value="1"/></td> <td style="text-align: center;"><input type="text" value="1"/></td> </tr> <tr> <td>Oxygen:</td> <td style="text-align: center;"><input type="text" value="6"/></td> <td style="text-align: center;"><input type="text" value="2"/></td> </tr> </table>		<b>Group</b>	<b>Period</b>	Carbon:	<input type="text" value="4"/>	<input type="text" value="2"/>	Hydrogen:	<input type="text" value="1"/>	<input type="text" value="1"/>	Oxygen:	<input type="text" value="6"/>	<input type="text" value="2"/>	<p>Award only <b>1 mark</b> if groups and periods are interchanged</p> <p>Award <b>1 mark</b> only if all groups are correct</p> <p>Award <b>1 mark</b> only if all periods are correct</p>	<b>3</b>	A
	<b>Group</b>	<b>Period</b>														
Carbon:	<input type="text" value="4"/>	<input type="text" value="2"/>														
Hydrogen:	<input type="text" value="1"/>	<input type="text" value="1"/>														
Oxygen:	<input type="text" value="6"/>	<input type="text" value="2"/>														
	<b>b</b> methanoic (acid)		<b>1</b>	A												
	<p><b>c</b></p>  <p>correct bonds shown <b>or</b> all lone pairs correct</p> <p>structure fully correct</p>	<p>Accept dots or crosses or any combination</p>	<b>2</b>	A												
	<p><b>d</b></p> <p><math>HCOOH(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + HCOO^-(aq)</math></p> <p>reactant(s) correct</p> <p>products correct</p> <p>states all correct</p> <p>correct use of equilibrium arrow</p>	<p>Allow</p> <p><math>HCOOH(aq) \rightleftharpoons H^+(aq) + HCOO^-(aq)</math></p> <p>Accept incorrect order for example, <math>H_2CO_2</math>, <math>CHOOH</math></p> <p>Accept <math> </math> for <math>HCOOH</math></p> <p>Allow any double-headed arrow</p>	<b>4</b>	A												
	<b>e</b> add/react with a base/alkali		<b>1</b>	A												



**C**

Table Object			
Animal Part	Volume of carbon dioxide produced (ml) when reacting to hydrochloric acid		
	Trial 1	Trial 2	Trial 3
Elephant tooth			
Elephant bone			
Horse tooth			
Horse bone			
Human tooth			
Human bone			
Monkey tooth			
Monkey bone			
Dolphin tooth			
Dolphin Bone			

indication of more than one trial

column for independent variable: type of bone

column for dependent variable: volume of CO<sub>2</sub>

unit for volume

*ECF from part (b)*

*Accept dm<sup>3</sup> or cm<sup>3</sup> or mL or ml or l or L for units*

**4**

**C**

	d	<b>Allow ECF from part (b)</b>				17	B	
			<b>1</b>	<b>2</b>	<b>3</b>			<b>4</b>
		<b>Additional equipment (E)</b>	Equipment suggested but is not relevant	Equipment to measure mass <b>or</b> volume <b>or</b> one control variable	Equipment to measure mass <b>and</b> volume <b>and</b> one control variable			Equipment to measure mass <b>and</b> volume <b>and</b> two control variables
		<b>Method (M)</b>	Attempt at a method but may not be relevant	Attempt at a method but detail is insufficient for another student to follow and is not likely to give relevant data	Method is described, could be followed by another student producing relevant data			Complete method is described, fully explained and could be repeated by another student
		<b>Data (D)</b>	Plans to test one type of tooth/bone	Plans to test each type of tooth/bone	Plans to use at least three samples of each type of tooth/bone			Plans to use at least three samples of each type of tooth/bone <b>and</b> calculates a mean
		<b>Assumptions (A)</b>	Assumptions that all bone/teeth/CaCO <sub>3</sub> has reacted <b>or</b> temperature <b>or</b> pressure remain constant	Assumptions that all bone/teeth/CaCO <sub>3</sub> has reacted <b>and</b> temperature <b>or</b> pressure remain constant	Assumptions that all bone/teeth/CaCO <sub>3</sub> has reacted <b>and</b> temperature <b>and</b> pressure remain constant			
	<b>Safety (S)</b>	Use of relevant safety equipment	Use of relevant safety equipment linked to corrosive hazard from acid					
4	a	these points are outliers/anomalies <b>or</b> reason why an outlier was obtained repeat		eg incorrect amount of CaCO <sub>3</sub> was used, amount of CaCO <sub>3</sub> was too high <b>and</b> too low <i>Do not accept interpolation</i>	2	C		
	b	use of graph to give mass of 2.40 g evidence of calculation of % by mass correct value of 24.7 correct identification of horse bone		seen or implied ECF marking point 2 ECF marking point 3 – do <b>not</b> award this mark alone	4	C		

5	a	Image 1: <input type="text" value="Corrosive"/> Image 2: <input type="text" value="Flammable"/> Image 3: <input type="text" value="Toxic"/>	Award <b>1 mark</b> for each	3	B
	b	Image 1		1	B
	c	appropriate average = 56 (cm <sup>3</sup> ) it is not appropriate to include an outlier in the average	Award <b>1 mark only</b> for inappropriate average of 60. Do <b>not</b> award 2 <sup>nd</sup> marking point even if justification is correct.	2	C
	d	Limestone = 1.33 ± 0.03 (cm <sup>3</sup> s <sup>-1</sup> ) Crushed oyster shell = 0.28 ± 0.03 (cm <sup>3</sup> s <sup>-1</sup> )		2	C
	e	limestone particles are smaller than crushed oyster shell (so) rate of reaction is greater for limestone correct use of terms <u>surface area</u> and <u>rate of reaction</u>	ORA ORA	3	C D
	f	the crushed oyster shell takes longer to be broken down allowing more time for the hen to absorb <b>or</b> use the calcium carbonate for eggshell production	Accept "digest"	2	C
	g	limestone <u>data</u> is less reliable (because) greater variability in data between trials <b>or</b> poor consistency crushed oyster shell <u>data</u> is more reliable (because) data have good agreement <b>or</b> low variability <b>or</b> good consistency		4	C
	h	increase number of trials <b>or</b> use same size particles of limestone and oyster shell		1	C

6	a	A				1	A																			
	b	more than two compounds <b>or</b> mixtures of compounds can be separated boiling point (depends on size of molecules) <b>or</b> change in state from liquid to gas molecules with smallest mass <b>or</b> length will have the lowest boiling point				WTTE  ORA	3  D																			
	c	<table border="1"> <thead> <tr> <th></th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td><b>Method (M)</b></td> <td>Comment about removal</td> <td>Comment about more than one method of removal</td> <td>Describes removal using all three methods</td> <td>Describes removal using all three methods linked to science Skimmer – oil and water are immiscible Burning – fumes, smoke Dispersion – components remain in water, affect aquatic life</td> </tr> <tr> <td><b>Advantages/disadvantages (AD)</b></td> <td>One advantage <b>or</b> disadvantage implied</td> <td>One advantage <b>and</b> one disadvantage for one method implied <b>or</b> One advantage <b>or</b> one disadvantage for more than one method implied</td> <td>Advantages <b>and</b> disadvantages identified for all three methods</td> <td></td> </tr> <tr> <td><b>Appraisal (A)</b></td> <td>"Best method identified" <b>and</b> supported by scientific evaluation</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					1	2	3	4	<b>Method (M)</b>	Comment about removal	Comment about more than one method of removal	Describes removal using all three methods	Describes removal using all three methods linked to science Skimmer – oil and water are immiscible Burning – fumes, smoke Dispersion – components remain in water, affect aquatic life	<b>Advantages/disadvantages (AD)</b>	One advantage <b>or</b> disadvantage implied	One advantage <b>and</b> one disadvantage for one method implied <b>or</b> One advantage <b>or</b> one disadvantage for more than one method implied	Advantages <b>and</b> disadvantages identified for all three methods		<b>Appraisal (A)</b>	"Best method identified" <b>and</b> supported by scientific evaluation				8
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<b>Appraisal (A)</b>	"Best method identified" <b>and</b> supported by scientific evaluation																									

7

	1	2	3	4
<b>Pipeline (distribution of oil) (P)</b>	A comment about a pipeline	One advantage <b>or</b> one disadvantage of a pipeline implied	One advantage <b>and</b> one disadvantage of a pipeline implied	More than one advantage <b>and</b> more than one disadvantage of a pipeline
<b>Alternative methods (AM)</b>	A comment about an alternative method	One advantage <b>or</b> one disadvantage of one alternative method	One advantage <b>or</b> one disadvantage of both alternative methods <b>or</b> More than one advantage <b>and</b> more than one disadvantage of one alternative method	More than one advantage <b>and</b> more than one disadvantage of a both alternative methods
<b>Environmental considerations (E)</b>	An environmental impact	More than one environmental impact	More than one environmental impact with at least one supported by science	
<b>Social considerations (S)</b>	A social impact of transporting oil	More than one social impact of transporting oil		
<b>Appraisal (A)</b>	A concluding appraisal linking the issues discussed			

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D