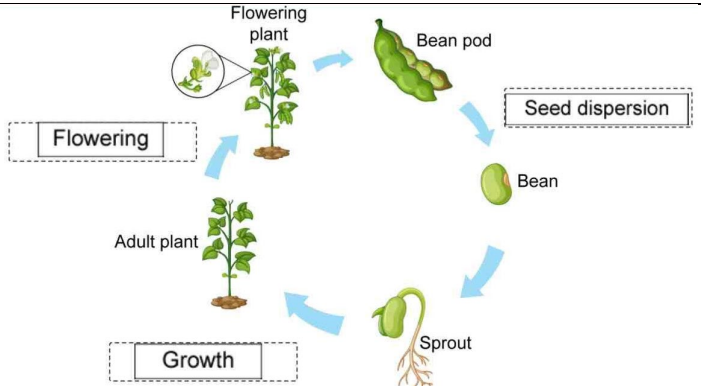
Question		Answers	Notes	Total	Criterion
1	a	Great tit ***or*** badger		**1**	A
	b	*****insert image post scrutineer** bramble – moth – hedgehog – (badger)*** fruit bush moth hedgehog		**3**	A
	c	***Accept any reasonable suggestion linked to light, for example [max 1]*** • nowhere to lay eggs • unable to find food • unable to mate • distracted or injured by light • leave area		**1**	A
	d	moths are food for other species (of birds or bats) (as secondary consumers birds or bats) need to eat a lot of caterpillars to get enough energy (because) energy transfer between one part of the food chain to the next is very low (so) as food supply for birds and bats is low, their numbers will reduce	*Accept caterpillars*	**4**	A
2	a	Chemical energy Electrical energy Heat energy		**3**	A
	b	200 x 500 kWh = 100 000 kWh 100 000/ 80 kWh = 1250 cars	*Award two marks if correct answer is seen*	**2**	A

	c	Coffee generates more electricity per tonne (than corn) ***Accept any two further reasonable points, for example [max 2]*** • Corn could be used as animal feed • coffee grounds are waste • Corn is cheaper ***or*** more widely available • cheaper ***or*** more sustainable to use coffee • Coffee grounds give 165kWh energy more than corn A conclusion as to which is the most suitable source of biofuel based on their reasoning		**4**	D
3	**a**	 One mark for one correct All correct		2	A
	b	***Accept any reasonable reference to climate change, for example [max1]*** • drought • decreased rainfall • increased temperatures	*WTTE*	1	A

	c	***Adaptation:*** Adaptation means longer roots ***or*** More branching of roots ***Justification:*** roots go deeper and reach water more quickly (easily) (which means) more pods ***or*** beans ***or*** seeds	*Do **not** accept grows better*	**3**	A
	d	Weight or gravity		**1**	A
	e	Light needed for <u>photosynthesis</u> So plant must grow upwards to reach light		**2**	A

4	**a**	Proteins ***or*** foods are broken down in the stomach An acidic environment helps to digest proteins ***or*** foods		**2**	A
	b	Acid production decreases with increasing age Any correct use of data comparing two different ages		**2**	C
	c	Water is formed ***or*** neutralization reaction takes place		**1**	A
	d	IV: Temperature of water DV: Height reached by the canister ***Accept any two reasonable CV, for example [max 1]*** • Mass in grams of the solid antacid • Volume of water • Mass of the canister • Size of the canister	*Accept amount for mass* *Do **not** accept amount for volume*	**4**	B

e

	1 mark	2 marks	3 marks	4 marks
RQ	How does temperature affect the canister? ***or*** How high does the canister go?	How is the height a canister reaches related to the temperature of the water?		
Equipment	equipment to manipulate IV ***or*** measure DV ***or*** monitor a CV	equipment to manipulate IV ***and*** measure DV ***or*** monitor a CV ***or*** equipment to manipulate IV ***or*** measure DV ***and*** monitor a CV	equipment to manipulate IV ***and*** measure DV ***and*** monitor one CV	equipment to manipulate IV ***and*** measure DV ***and*** monitor ***two*** CV
Method	Attempt at a method but detail is insufficient to follow	Method can be followed but detail is incomplete or incorrect	Complete method is described, fully explained and could easily be followed	
Data	Method implies a range of values	Method includes 5 values of IV ***or*** 3 trials	Method includes 5 values of IV ***and*** 3 trials	Method includes 5 values of IV ***and*** 3 trials ***and*** plans to calculate an average
Safety	A general precaution linked to a valid safety concern	A specific precaution linked to a valid safety concern with justification		

15 B

f

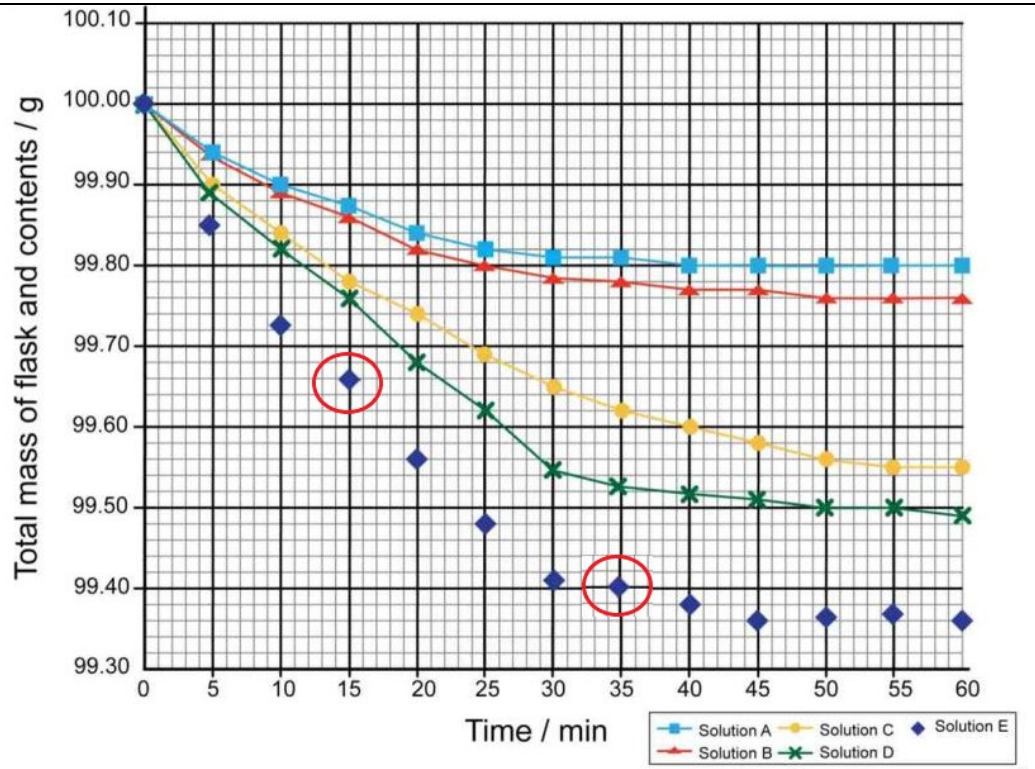
X axis scale has numbers at equal increments with plotted points taking up at least half of the graph

Y axis scale has numbers at equal increments with plotted points taking up at least half of the graph

Units included on both axes

5 C

		Two data points plotted correctly Five data points plotted correctly			
	g	The height reached increases as the volume of water increases ***or*** there is no clear pattern in the data ***or*** the range of data is not sufficient to test the hypothesis (so) the hypothesis is <u>invalid</u> ***or*** is not <u>valid</u>	*Do **not** award the second mark unless the first is awarded*	**2**	C

5	**a**	$\square CaCO_3(s) + 2 HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$ One correct Both correct		**2**	A
	b	 One point plotted correctly Both points plotted correctly		**2**	C

	c	99.76(g) ± 0.01 ***Accept any reasonable justification, for example [max 1]*** • no changes or constant after 50 min • no more CO_2 released • no more mass loss • reaction is complete or no further reaction is taking place		**2**	C
	d	mass of CO_2 lost = 0.1(0) (g) 0.02 ($gmin^{-1}$)	*Allow ecf from first mp*	**2**	C
	e	Solution E		**1**	C
	f	More particles are present at higher concentrations (so) there will be more collisions The rate of reaction will be faster (because) more frequent collisions ***or*** more collisions per unit time		**4**	C
	g	***Accept any from the list, [max 1]*** • Different acid • different particle size ***or*** surface area to volume ratio • different temperature		**1**	C
	h	***IF:*** the surface area ***or*** particle size ***or*** temperature increases or decreases ***or*** volume ***THEN:*** a correctly linked change to their IV ***BECAUSE:*** correctly linked reference to collision theory		**3**	B

	i	***Accept any reasonable strength for example [max 1]*** • The pieces of $CaCO_3$ are the same size (diag would need to show that!) • The system is sealed so no gas is lost • Gas syringe has good accuracy (need to make sure scale is clearer than in the current example) ***Accept any reasonable limitation, for example [max 1]*** • No controlled variables are monitored • Gas could be lost when setting up the expt • Probe rather than a syringe could remove human error • Gas could be lost if the seals are poor		**2**	C

<table>
<tr><td rowspan="4">6</td><td>a</td><td>flexible and lightweight</td><td></td><td>1</td><td>D</td></tr>
<tr><td>b</td><td>Accept any reasonable statement, for example [max 1]
• Plastic covering plants
• Animals mistake plastic for food
• Plastics hinder movement of animals
Accept any reasonable justification, for example [max 1]
• Can affect photosynthesis
• Become malnourished or die
• If they cannot move, they will die</td><td>WTTE</td><td>2</td><td>D</td></tr>
<tr><td>c</td><td>Accept any reasonable suggestion linked to single-use plastics, for example [max 1]
• You don’t worry about transmitting diseases between people
• Easy to get, widely available
• Low cost
• You don’t have to worry about washing them</td><td></td><td>1</td><td>D</td></tr>
<tr><td>d</td><td>Accept any reasonable suggestion, for example [max 1]
• Promoting awareness of environmental issues
• Running education campaigns
• Introducing laws about recycling
• Building recycling facilities

Accept any reasonable correctly linked supporting statement</td><td></td><td>2</td><td>D</td></tr>
<tr><td>e</td><td colspan="3"><table><tr><th></th><th>1 mark</th><th>2 marks</th></tr><tr><td>Advantages</td><td>One advantage is stated</td><td>One advantage is stated with further support</td></tr><tr><td>Disadvantages</td><td>One disadvantage is stated</td><td>One disadvantage is stated with further support</td></tr><tr><td>Conclusion</td><td>A simple conclusion is given</td><td>A fully supported conclusion is given</td></tr></table></td><td>6</td><td>D</td></tr>
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<tr><th></th><th>1 mark</th><th>2 marks</th><th>3 marks</th><th>4 marks</th></tr>
<tr><td>Economic</td><td>One economic impact is stated</td><td>One economic impact is stated with further support
or
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Two environmental impacts are stated</td><td>Two environmental impacts are stated, one with further support</td><td>Two environmental impacts are stated, both with further support</td></tr>
<tr><td>Ethical</td><td>One ethical consideration is stated</td><td>One ethical consideration is stated for each country</td><td></td><td></td></tr>
<tr><td>Conclusion</td><td>A simple opinion is given</td><td>A fully supported opinion is given</td><td></td><td></td></tr>
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</td>
<td>11</td>
<td>D</td>
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