Question		Answers	Notes	Total	Crit
1	a	Tension		1	A
	b	Acceleration = 4 (ms^{-1}) / 2 (s) 2 (ms^{-2}) ms^{-2}	*Seen or implied* *Accept m/s^2*	3	A
	c	She will not move (because) the resultant / net / total force is zero	*WTTE*	2	A
	d	C The car is moving at constant speed ***and*** in the same direction.	 *WTTE*	2	A
2	a	Glucose + Oxygen → Carbon dioxide + Water + Energy All correct		1	A
	b	***Input:*** chemical (potential) ***Useful:*** kinetic ***Waste:*** thermal / heat ***or*** sound		3	A
	c	***Evidence of correct calculation:*** 290598 (cm) ***or*** 2905.98 (m) ***or*** 2.90598 (km) 2.90598 or 2.91 (km) ***Answer expressed to 3 sig figs:*** 2.91 (km)	 *Second marking point is for converting to km* *ECF from first marking point, award this mark for any correct distance to 3 sig figs* *Award 3 marks if only 2.91 (km) is seen.*	3	A A D

	d	A calculation of distance divided by time 2.91/0.5 5.82 (kmh^{-1})	*ECF from part (c)* *Award 1 mark for 0.097 $kmmin^{-1}$. Unit must be included to award this mark.*	**2**	A
3	**a**	109 (kmh^{-1})		**1**	A
	b	A		**1**	A
	c	Between 10 and 30 seconds ***or*** for 20 seconds the car was moving at a constant velocity/speed of 20$\underline{ms^{-1}}$	*Do **not** accept constant motion*	**3**	A
	d	Half base x height 400 $\underline{m}$	*Seen or implied* *Unit must be included*	**2**	A
	e	B		**1**	A
4	**a**	Transition metals		**1**	A
	b	Strong ***or*** stable ***or*** malleable	*Do **not** accept electrical conductor, thermal conductor*	**1**	A
	c	How does the (size/amount /value of) current affect the mass/grams (/amount of nickel coating/covering) the coin	*WTTE* *Max 1 for correct research statement linking IV and DV but not phrased as a question*	**2**	B
	d	IV: (Size/amount of) current DV: mass (of nickel)		**2**	B
	e	***Time:*** Mass will be less than expected (because) there is less time for ions to coat the coin ***Temperature:*** Mass will be more than expected (because) the ions will move more quickly to coat the coin	*WTTE*	**4**	B

5	**a**	$average = \frac{(m_1 + m_2 + m_3)}{3}$ ***or*** 6.4333333 Correctly expressed to two significant figures as 6.4	*Please check table and response box for correct answer* *Award 2 marks for correct answer alone*	**2**	C
	b	Current on x axis and (average) mass on y axis Units correct for current and mass Evenly spaced increments on both axes Two points correctly plotted (± 0.1) All points correctly plotted (± 0.1)	*Award independently* *Axes can be swapped for the third mark* *Award max 1 for plotting if **all** points are correctly plotted on swapped axes*	**5**	C
	c	Trial 2 at 8.00A ***Accept any reasonable suggestion, for example*** • the coin was wet so the increase in mass was due to water and nickel • the coin was left in the solution for too long so the mass was higher than expected • the temperature was too high so the mass was higher than expected • there was an error in using the balance		**2**	C
	d	As the current increases the mass of nickel coating the coin increases In a proportional relationship ***or*** the line of best fit would be a straight line <u>passing through (0,0)</u> since more ions will travel to the copper coin	*WTTE*	**3**	C

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<tr><td></td><td>e</td><td>Invalid

(because) the graph shows a proportional relationship or the graph is not inversely proportional

Evidence of use of at least two data points to prove proportionality</td><td></td><td>3</td><td>C</td></tr>
<tr><td>6</td><td></td><td>
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<tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1. V
(Variables)</td><td>Concentration or mass implied as variables but not identified</td><td>Concentration as IV or mass as DV and one CV identified</td><td>Concentration as IV and mass as DV and one CV identified</td><td>Concentration as IV and mass as DV and two CV identified</td></tr>
<tr><td>2. H
(Hypothesis)</td><td>Simple statement</td><td>Incomplete hypothesis linked to IV and DV no explanation</td><td>Incomplete hypothesis correctly linked to IV and DV no explanation</td><td>Testable hypothesis correctly linked to IV and DV correct explanation</td></tr>
<tr><td>3. D
(Data)</td><td>Reference to different trials</td><td>At least three trials</td><td>At least three trials and calculates mean</td><td></td></tr>
<tr><td>4. E
(Additional equipment)</td><td>Equipment suggested to measure volume or mass</td><td>Equipment suggested to measure volume and mass</td><td></td><td></td></tr>
<tr><td>5. M
(Method)</td><td>Attempt at method but may be not relevant</td><td>Attempt at method, insufficient detail and not likely to give relevant data</td><td>Method described, could be followed, will produce relevant data</td><td>Complete method fully explained and could be replicated</td></tr>
<tr><td>6. S
(Safety)</td><td>A relevant safety precaution linked to electrical hazard</td><td></td><td></td><td></td></tr>
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</td><td>18</td><td>B</td></tr>
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7	**a**	Potassium	*Do not accept K, the name is required*	**1**	C
	b	Copper This is the least reactive metal	 *Do not award the second mark unless the first mark is awarded*	**2**	C
	c	The suggestion is invalid ***or*** magnesium is not suitable ***or*** zinc is a better metal (because) magnesium is more reactive than nickel	*WTTE* *ORA*	**2**	C
	d	Potassium is very reactive ***or*** has the highest reactivity so it will react / combine other elements or compounds		**2**	C
8	**a**	***Three from the following four responses [max 3]*** • Strong • Flexible • Lightweight • Water resistant		**1**	D
	b	***Accept any reasonable points, for example [max 2]*** • plastic manufacture creates employment • workers are needed to transport finished plastic items • plastic is cheaper than glass • generates income from export	*Do not accept information repeated from video with no further information or context provided*	**2**	D

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<tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1. P
(Plastic pollution)</td><td>A statement about plastic pollution</td><td>A statement about plastic pollution and one example</td><td>A statement about plastic pollution and more than one example or
a statement about plastic pollution with one example that has scientific justification</td><td>A statement about plastic pollution and more than one example and one with scientific justification</td></tr>
<tr><td>2. A
(Advantages to environment)</td><td>Attempt at an advantage of microorganisms</td><td>A relevant advantage of microorganisms</td><td>More than one relevant advantage of microorganisms</td><td></td></tr>
<tr><td>3. D
(Disadvantages to environment)</td><td>Attempt at a disadvantage of microorganisms</td><td>A relevant disadvantage of microorganisms</td><td>More than one relevant disadvantage of microorganisms</td><td></td></tr>
<tr><td>4. E
(Economic considerations)</td><td>Statement of one economic consideration</td><td>Statements of more than one economic consideration
or
one statement of an economic consideration with justification</td><td>Statements of more than one economic consideration with justification for at least one consideration</td><td></td></tr>
<tr><td>5. C
(Concluding appraisal)</td><td>A concluding appraisal giving their opinion</td><td>A concluding appraisal giving their opinion compared with burning</td><td></td><td></td></tr>
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<tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1.A
(Advantages)</td><td>A statement of an advantage</td><td>A statement of two or more advantages
or a statement of one advantage with further details</td><td>A statement of two or more advantages with further detail for at least one</td><td></td></tr>
<tr><td>2. D
(Disadvantages)</td><td>A statement of a disadvantage</td><td>A statement of two or more disadvantages
or a statement of one disadvantage with further details</td><td>A statement of two or more disadvantages with further detail for at least one</td><td></td></tr>
<tr><td>3. C
(Conclusion)</td><td>A simple conclusion</td><td></td><td></td><td></td></tr>
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<td>7</td>
<td>D</td>
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