



Mark Scheme (Results)

March 2019

BTEC Level 1/Level 2 Firsts in
Applied Science

Unit 8: Application of Science (20474E)

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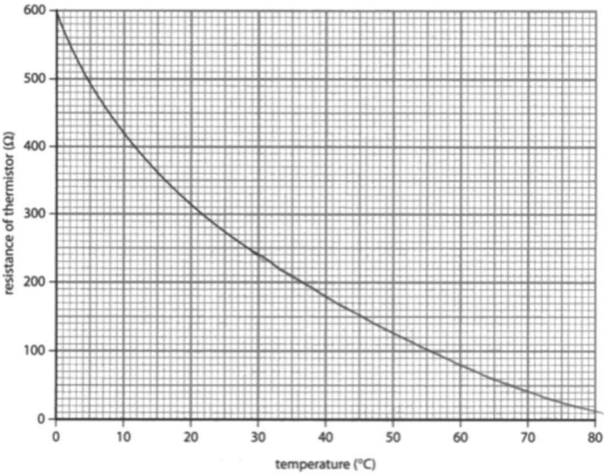
General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- All marks on the mark scheme should be used appropriately.
- All marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if a candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt about applying the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed-out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Phonetic spelling should be accepted.

BTEC Next Generation Mark Scheme

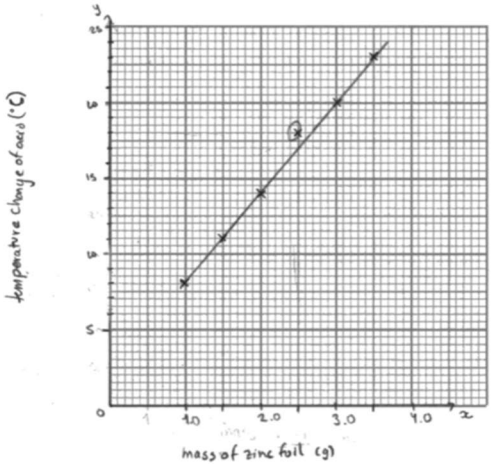
Item	Expected answers	Additional guidance	Marks
1 (a)	stopwatch/stop-clock/ timer/watch/clock /phone app /pulse-meter/named type of watch any other valid device		1
1 (b)(i)	cuts / bruises / broken bones / strained muscles/{twisted/sprained} ankles any other valid answer	allow 'injured herself'/'hitting head' ignore 'harmful'/'hurting' alone	1
1 (b)(ii)	use a handrail / complete exercise near a wall / use a nonslip surface / wear trainers with nonslip soles/ tie up shoe laces/ use a lower step/ not do the steps too fast/go slowly/stop when tired/paying attention/not being distracted any other valid answer	allow answers about securing the boxes together in some way/boxes stable ignore answers relating to a constant rate /protective items of clothing/'suitable shoes'	1
Total			3

Item	Expected answers	Additional guidance	Marks
2 (a)(i)	voltage / potential difference / p.d.	allow 'volts'	1
2 (a)(ii)	any two from: (same) resistor (1) length of wires (1) thickness of wires (1) {material/type} of the wire (1) (same) ammeter (1) (same) voltmeter (1) (same) power supply (1)	ignore resistance/ohms ignore current/amps ignore volts/voltage ignore same 'power' alone ignore references to switch	2

<p>2 (b)</p>	<p>graph drawn to continue in a curve towards the x axis (1)</p> 	<p>allow the line to go to 0</p> <p>allow the line to be a straight continuation downwards</p> <p>reject a line that levels off or rises at the end.</p> <p>reject a vertical line downward</p>	<p>1</p>
<p>2 (c)</p>	<p>any 6 from:</p> <p>more than one temperature reading (1)</p> <p>stir the water to make sure the water is all at the same temperature (1)</p> <p>record the reading on the (resistance) meter (1)</p> <p>heat the water with a Bunsen to change the water temperature (1)</p> <p>take repeat readings at each temperature (1)</p> <p>allow equipment to cool between each repeat experiment (1)</p> <p>same thermistor (1)</p> <p>keep the thermistor the same distance from the thermometer (1)</p> <p>keep the thermometer/thermistor away from the bottom of the beaker (1)</p>	<p>allow specific values of temperature</p> <p>allow ohmmeter/multi-meter</p> <p>allow use kettle/water-bath</p> <p>ignore 'the same thermometer'/'resistance meter'</p> <p>allow close together</p> <p>allow same volume of water</p>	<p>6</p>
<p>Total</p>			<p>10</p>

Item	Expected answers	Additional guidance	Marks
3 (a)	add a {label / title / type of juice/fruit juice(s)} to the first column (1) AND mass of sugar data placed in {ascending /descending} order OR type of fruit juice placed in alphabetical order (1)	allow 'smallest to biggest number'	2
3 (b)	10.3(g) (2) OR $\frac{10.0 + 9.6 + 12.4 + 9.2}{4}$ (2) OR 41.2 (2) 4 OR 10.0 + 9.6 + 12.4 + 9.2 (1) OR a number divided by 4 (1)	allow 41.2	2
Total			4

Item	Expected answers	Additional guidance	Marks												
4 (a)(i)	67.2 circled <table border="1" data-bbox="268 1556 608 1753"> <thead> <tr> <th>mass of zinc foil (g)</th> <th>volume of hydrogen gas (cm³)</th> </tr> </thead> <tbody> <tr> <td>0.1</td> <td>35.6</td> </tr> <tr> <td>0.2</td> <td>72.3</td> </tr> <tr> <td>0.3</td> <td>109.0</td> </tr> <tr> <td>0.4</td> <td>67.2</td> </tr> <tr> <td>0.5</td> <td>179.4</td> </tr> </tbody> </table>	mass of zinc foil (g)	volume of hydrogen gas (cm ³)	0.1	35.6	0.2	72.3	0.3	109.0	0.4	67.2	0.5	179.4	reject more than one other number circled	1
mass of zinc foil (g)	volume of hydrogen gas (cm ³)														
0.1	35.6														
0.2	72.3														
0.3	109.0														
0.4	67.2														
0.5	179.4														
4 (a)(ii)	Any two from: repeat the reading (1) ignore the result (and use the others) (1) draw a graph and use it to predict the value for the anomalous result (1)		2												

<p>4 (b)</p>	<p>Axes (1) X- axis mass of zinc foil g AND Y -axis: temperature change °C (1)</p> <p>Scaling (2) scale appropriate (1)</p> <p>correct numbers on both axes (1)</p> <p>Plotting (2) all 6 points plotted correctly (2)</p> <p>OR</p> <p>4 or 5 points plotted correctly (1)</p> <p>Line (1) line of best fit (1)</p> 	<p>allow reversal of axes</p> <p>data spread must cover at least half the graph paper</p> <p>scale must be linear on both axes</p> <p>if numbers on the axes are taken directly from the table for the temperature in the order of the table then allow a maximum of 1 mark for correct axes (1) +/- one small square</p> <p>line of best fit must be a straight line not dot to dot</p> <p>line of best fit only for the plots, extensions above and below ignored</p> <p>if bar chart drawn 1 mark max for axes and label (1)</p>	<p>6</p>
<p>Total</p>			<p>9</p>

Item	Expected answers	Additional guidance	Marks
5 (a)(i)	8 (°C) OR 20 - 12		1
5 (a)(ii)	as the mass of ammonium chloride increases the change in temperature {increases/is greater} (1) there is positive correlation/ (directly) proportional (1)	ORA	2
5 (b)(i)	4.4 (J/g/°C) (3) 4.375 (J/g/°C) (2) OR <u>1400</u> (2) 20 x 16 1400 = 20 x c x 16 (1) OR c = <u>joules</u> (1) mass x temperature change	allow 4.40 for 2 marks allow 4.38 or 4.37 for 2 marks <u>1400</u> 320 allow further simplification e.g. <u>700</u> 160	3

5 (b)(ii)	<p>Any two linked pairs from four: incomplete dissolving (1) so not all the energy was absorbed (1) OR temperature did not drop as much (1) as the solution gained heat from the surroundings (1) OR the mass (of ammonium nitrate) was less (1) so less energy was absorbed (1) OR the volume of water was more than 20 ml (1) so, the temperature change was less (1) OR temperature taken too soon (1) so, the solution has not cooled as much as it should (1)</p>	ORA	4
Total			10

Item	Expected answers	Additional guidance	Marks
6(a)(i)	anywhere between 7.0(s) and 10(s) inclusive		1
6(a)(ii)	22 (m/s)	allow between 21 and 23 inclusive	1
6(b)	<p>skydiver C (1) And any two from: because the {decrease/change} in speed is the greatest /fastest/ has the steepest gradient (1) has the lowest (final/terminal) velocity/speed (1) (reaches the lowest steady) {speed /velocity} {fastest/first} (1)</p>	<p>ORA marking points 2,3 and 4 are independent of the first marking point, so can be awarded if the wrong sky diver is selected.</p>	3
Total			5

Item	Indicative Content		Marks
7(b)	<p>use a specific volume / amount of water in the boiling tube so that the same volume / amount of water is heated for each crisp</p> <p>use the same mass of each crisp / same size crisp so that the amount of crisp is the same each time</p> <p>measure the temperature of the water before (and after heating the water) so that the temperature rise/change/difference of the water can be found</p> <p>hold the crisp the same distance below the boiling tube each time so that the boiling tube is being heated evenly by every crisp used</p> <p>stir the water so that the water temperature is the same throughout</p> <p>avoid draughts / keep the room conditions the same so that each crisp heats the boiling tube evenly</p> <p>cover the top of the tube to stop heat loss from the tube</p> <p>repeat the whole experiment again to see if the results are concordant /the same</p>		6
Level	0	No rewardable material.	
Pass	1-2	<p>Identifies an appropriate improvement and explains simply or two improvements unexplained. e.g. use 10ml of water in a test tube, so that the same volume of water is heated.</p> <p>OR</p> <p>use a specific volume of water in the test tube and use the same mass of each crisp.</p>	
Merit	3-4	<p>Identifies improvements to the method and explains the reasons for the changes or identifies some appropriate changes and explains one. e.g. use 10ml of water in a test tube, so that the same volume of water is heated. Use the same mass of each crisp, so that the amount of crisp is the same each time.</p>	
Distinction	5-6	<p>Identifies a range of improvements and explains them to show how it is repeatable. e.g. use 10ml of water in the test tube, so that the same volume of water is heated. Use the same mass of each crisp, so that the amount of crisp is the same each time. Repeat the whole experiment again to see if the results are concordant.</p>	
		Total: 9 marks	

Ofqual



Llywodraeth Cynulliad Cymru
Welsh Assembly Government



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