Mark Scheme (Results)

June 2018

NQF BTEC Level 1/Level 2 Firsts in Applied Science

Unit 8: Application of Science (20474E)

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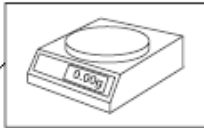
BTEC Next Generation Mark Scheme

Applied Science Unit 8 1806

Item	Expected answers	Additional guidance	Marks
1 (a)		do not accept multiple lines	2
1 (b) (i)	concentration (of hydrochloric acid)	allow phonetic spellings ignore 'amount'	1
1 (b) (ii)	Any two from: volume (of acid) (1) mass/weight/amount/size/length/surface area (of magnesium) (1) (initial) temperature (of the acid) (1)	ignore concentration (of acid) allow amount (of acid) allow stirring allow width	2
1 (c)	causes (skin/eye) irritation (1) from acid (splashing) on the skin/eyes (1) OR cuts (1)	allow (acid) burns allow corrodes	2

	from sharp magnesium ribbon (1)	ignore generic risks, e.g. broken glass cuts.	
		Total mark	**7**

Item	Expected answers	Additional guidance	Marks
2	Any four for the method: place a specified amount/volume of water in a cup/ beaker (1) measure an amount/mass of calcium chloride (1) use at least two different {masses/amounts} of calcium chloride (1) measure the initial temperature of the water (1) (add the calcium chloride and) stir at a constant rate/number of times (1) measure the {maximum/change in} temperature of the reaction (1) AND Any two from controls: use a lid on the beaker to stop heat loss (1) use a polystyrene beaker (1) use the same volume of water each time (1) use the same cleaned out/washed {beaker/cup} each time (1) use the same thermometer each time (1)	allow measure heat produced produced use calibrated thermometer	6
		Total mark	**6**

Item	Expected answers		
3 (a) (i)	99	allow any number between 97 and 101	1
3 (a) (ii)	1.5 hours/1 hour 30 mins/90mins/one hour and a half	allow 18.00 to 19.30 / 6.00 to 7.30	1
3 (b)	column labelled (average resting) heart rate and a column labelled age (1) correctly places the age and heart rate in the corresponding column (1) results placed in correctly ascending/ descending order (1)	ignore units columns can be in either order	3
		Total mark	**5**

Item	Expected answers	Additional guidance	Marks
4 (a)	**Axes (1)** X- axis: temperature °C **and** Y -axis: time for blood to clot (s) (1) **Scaling (2)** linear scale on both axes (1) scale appropriate (1) **Plotting (2)** all 6 points plotted correctly (2) 4 -5 points plotted correctly (1) **Line (1)**	allow reversal of axes allow time (s) if numbers on the time of clot axis are taken directly from the table in the order of the table then allow a maximum of 1 mark for correct axes (1) use half the graph paper to cover the data +/- one small square line of best fit must be a smooth curve not dot to dot	6

	line of best fit (1)	if bar chart drawn 2 marks max for axes (1), scale appropriate (1)	
4 (b)	Any 3 from 4

overall (after the patient stops using warfarin) the blood {takes less time /faster} to clot (1)

clotting time {drops rapidly/faster/negative correlation} at first (1)

clotting time drops less rapidly from the fourth day (1)

clotting time {never goes to zero/remains the same/constant} from the sixth /seventh day (1) | allow clotting time drops from 50 to 10-12 in the 6 days

allow from day 2 to 10 the blood clots more quickly

allow clotting time stays at 10s – 12s /constant after 6 days. | 3 |
| | | **Total mark** | **9** |

Item	Expected answers	Additional guidance	Marks
5 (a) (i)	Any one from:

repeat the {reading/trial} (1)

ignore the result (1) | allow repeat the experiment | 1 |
| 5 (a) (ii) | Any two linked pairs

volume of water was more than it should have been (1)

so there was more water to heat and the temperature went up less (1)

OR

volume of butanol was less than it should have been (1)

so there was not enough fuel to give the right temperature rise (1)

OR

the flame went out before all the alcohol was burnt (1)

so less energy was supplied as in the other trials (1)

OR | ignore a different amount of water was used | 4 |

	the flame was further away from the flask/wick was shorter (1)		
	so less energy was transferred to the flask (1)		
	OR		
	there was a draught (1)		
	so less energy was transferred to the flask (1)		
	OR		
	ethanol was used instead of butanol (1)		
	so, the reading was similar to those for ethanol (1)		
	OR		
	took the thermometer out of the water to read the temperature (1)		
	so, it cooled down before it was read (1)		

5 (b)	15.5 (2)
	
	 OR
	
	 $\underline{14 + 16 + 15 + 17}$ (2)
	        4
	
	 OR
	
	 $\underline{62}$ (2)
	  4
	
	 OR
	
	 14 + 16 + 15 + 17 (1)
	
	 OR
	
	 a number divided by 4 (1)
		62+
		
		 ecf if a different alcohol is used with working shown.
			2

		Total mark	**7**

Item	Expected answers	Additional guidance	Marks
6 (a)	the greater the speed of the car the {longer /increased/more/larger/higher} distance it takes to stop (1) stopping distances on wet roads are {greater/more/increased/larger/higher} (than on dry roads) (1)	ORA ORA allow use of numbers from graph	3

	at higher speeds there is a {bigger difference/increasing difference} in stopping distance for dry and wet roads/OWTTE (1)		
6 (b)	146(s) (4)

OR

145.76 (3)

OR

3644 (3)
 25

OR

3.644 (2)
 25

OR

3644 = 25 x time (2)

OR

3.644 = 25 x time (1)

conversion from 3.644 km to 3644 m seen (1) | power of 10 error to 3 sig figs (3)

power of 10 error without sig figs (2)

incorrect answer with working rounded correctly to 3 sig figs gains 1 mark if no other mark awarded | 4 |
| | | **Total Mark** | **7** |

Item	Expected answers	Additional guidance	Marks
7 (a)	a <u>straight</u> line starting at 0,0 between the x-axis and the 'original spring' (1)		1

7 (b)	the line on the graph does show that the elastic band {extends/increases in length} (as weights are added) (1)	allow it shows a positive correlation	2
	the line curves, which does not indicate {a directly proportional/the line should be a straight} if the hypothesis is correct (1)		

Item	Indicative Content		Marks
7 (c)	measure the original length of the band without weights. so that the increase in length can be found when weights are added.		6
	use a ruler (with a mm scale). so that the length of the elastic band can be measured accurately.		
	add equal sized weights to increase the force. so the force added is incremental.		
	add at least three weights to the band. so that a {range of extensions can be found/trend /pattern seen}.		
	avoid dropping weights onto the elastic band. so that the force is not suddenly increased.		
	keep the elastic band vertical and still when measuring the length. so that there are no unknown forces acting on the band and the extension can be measured accurately.		
	attach a pointer to the end of the band/use a reference mark. so that the length can be measured more accurately.		
	have eye level with the pointer. to avoid parallax errors.		
Level	0	No rewardable material.	
Pass	1-2	Identifies an appropriate improvement and explains it or suggests unexplained improvements

E.g. Measure the original length of the band without weights, so that the extension can be found when weights are added. OR two simple improvements | |
| Merit | 3-4 | Identifies appropriate improvements and explains them. | |

		E.g. the method does not specify that the original length of the band should be measured, so measure the original length of the band without weights, so that the extension can be found when weights are added and add three weights (or more) to the band so that a range of extensions can be found to see a pattern in the results.
Distinction	5-6	Identifies a range of improvements and explains them. E.g. the method does not specify that weights have to be added carefully to avoid overstretching the band. Avoid dropping weights onto the elastic band, so that the force is not suddenly increased. AND the method does not specify that the elastic band should be vertical and not moving around. Keep the elastic band vertical and still when adding the weights, so that there are no unknown forces acting on the band and the extension can be measured accurately.
		Total Mark 9

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