Mark Scheme (Standardisation)

June 2016

NQF 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 judgment 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.

BTEC Next Generation Mark Scheme

Item	Expected answers	Additional guidance	Marks
1 (a) (i)	test tube / boiling tube	Reject 'tube' alone	1
1 (a) (ii)	Any **two** from: hot {water/test tube} (1) flame/burning crisp (1) needle/spike (1)	Ignore 'broken glassware' Allow hot glass/thermometer 'hot needle' – 2 marks	2
1 (a) (iii)	type(s) of crisp		1
1 (b)	use a range of volumes of water (1) measures the initial/start/beginning temperature (of water) (1) heats the water until the crisp goes out/for the same amount of time (1) measures the final/end temperature (of water) (1) calculate the change in temperature (1) **AND** Max **two** from: uses the same mass of crisp each time (1) uses the same type of crisp each time (1) keeps crisp same distance/height from the test tube (1) uses same size test tube (1)	allow three or more given volumes eg: 5ml, 10ml, 15ml allow amounts for volume allow record for measures allow record for measures allow amount/size of crisp	6
		Total mark	**10**

Item	Expected answers	Additional guidance	Marks
2(a)	4.4 (2) OR $\frac{4+3+6+4+5}{5}$ (2) OR $\frac{22}{5}$ (2) OR 4+3+6+4+5 (1) OR A number divided by 5 (1)	allow correct answer in average column 22	2
2(b)	column labelled (name of) flower and column labelled number/frequency (of flowers) (1) correctly places the numbers in the corresponding column (1) results placed in logical order (1)	columns can be in either order allow a tally as an alternative to numbers.	3
		Total mark	**5**

Item	Expected answers		
3 (a) (i)	C		1
3 (a) (ii)	The figure is given to a decimal place (thermometer 1) ORA (1)		1
3 (b)	Take another/repeat measurement (1) Ignore anomalous measurement (1)		2
		Total mark	**4**

Item	Expected answers	Additional guidance	Marks
4 (a)	Matt black	Reject black alone or shiny black	1
4 (b)	**Graph** **Axes(2)** Correct y-axis labelled including unit °C (1). Bars correctly labelled (1). **Scaling (2)** Correct numbers on y-axis (1). Scale appropriate (1). **Plotting (2)** All 5 bars drawn correctly (2) or 3 or 4 bars drawn correctly (1).	Accept horizontal bars, i.e. axes reversed Accept appropriate abbreviations for colours Allow y-axis that does not start at zero graph needs to cover at least half the graph paper If numbers on the y axis are directly taken from the table and evenly spaced e.g. 36,45,48,54,60 Allow a max of up to 2 marks for axes only. Accept no gaps between bars/columns drawn Max 1 mark for plotting scatter/line graph. Allow +/- one small square	6
		Total mark	**7**

Item	Expected answers	Additional guidance	Marks
5(a)	Any **two** from: Added too much weight (to the hanger) (1) pushed the car (1) pulled down on the weight (1) The toy car may have covered a distance less than 1m (1) Started the timer too late/stopped the timer too early (1) **And** toy car moved faster/quicker (1) time recorded is smaller (1)	 allow used a lighter toy car Allow time is quicker	4
5(b)(i)	single smooth curve of best fit (1)	Reject dot to dot/straight lines/tram lines Ignore extension to line after plotted points	1
5(b)(ii)	The car increases in speed as weight is increased/ added (to the hanger) ORA (1) The increase in speed is not linear/not proportional/the gradient is changing (1)	allow a positive correlation	2

5(c)	0.15 (3) OR $1.5x10^{-1}$ (3) OR 1500/10 000 (3) OR $\frac{1500}{1x10^4}$ (2) OR 1500 = 10 000 x acceleration (2) OR 1500 = 1 x 10^4 x acceleration (1) OR Converting 1 x 10^4 to 10 000 (1) OR $\frac{1500}{\text{(mass)}}$ = acceleration (1) OR word equation rearranged correctly (1)	10000	3
		Total mark	**8**

Item	Expected answers	Additional guidance	Marks
6 (a)	The point at 8 km/hr is circled (1)	Reject if more than one point circled	1
6 (b)	1 300 000(J) (2) OR 2 600 000 2 (2) OR 2 600 000 x 0.5 (2) OR 30 = 0.5 60 (1) OR 60 = 2 30 (1)	Allow 1300kJ **OR** 1.3 MJ	2
6 (c)	Conclusion is incorrect (no mark awarded): Any **two** from: Sam runs for twice as long on a flat road (1) ORA Sam needs to compare energy for the same amount of time. (1) In 10 minutes running on a flat road Sam uses 800 000 J/in 20 minutes running uphill Sam uses 2 400 000 J/ 80000J per min running on the flat/120 000J per min running uphill.	if they have stated conclusion is 'correct' allow max 1 mark for: **Either** stating running on a flat road has used 400 000 J more than running uphill **OR** giving any of the explanations	2

Total Mark	**7**

Item	Expected answers	Additional guidance	Marks
7(a)	Oil is the largest segment (1)	Needs to be a comparison	1
7(b)	Any **two** from: The section for {Coal/natural gas/oil/non-renewable energy sources} will {be smaller/decrease} (1) The section for renewable energy sources will {be larger/increase} (1) Renewable segment could be split into specific types of renewable energy sources (1)	 Less use of fossil fuels Allow specific examples of energy sources	2

Item	Indicative Content	Marks
8	• Use a specific volume/amount of (copper sulfate) solution as different volumes will give different temperature rises. • Use the same concentration of (copper sulfate) each time as different concentrations will give different temperature rises. • Use the same mass/amount of metal each time as different masses of metal will give different temperature rises. • Use pieces of metal with the same surface area/size because different surface areas will cause different rates of reaction which could cause different amounts of heat loss. • Stir the solution and metal to ensure even temperature distribution/so that the thermometer records the temperature of the reaction correctly. • Use a calorimeter/use insulated cup/add a lid to the beaker to reduce heat lost to the surroundings. • Measure the initial temperature to calculate the temperature change. • Record the highest temperature (for each metal) because this shows when the reaction has stopped.	6

Level	0	No rewardable material
Pass	1-2	Identifies an appropriate improvement and explains simply or two improvements. E.g. use a specific volume of copper sulfate solution as different volumes will give different temperature rises.
Merit	3-4	Identifies appropriate improvements and explains them. E.g. Stir the solution to ensure an even temperature distribution. Use pieces of metal with the same surface area because different surface areas will cause different rates of reaction.
Distinction	5-6	Identifies a range of improvements and explains them. E.g. Use an insulated cup to reduce heat losses to the surroundings. Use the same mass of metal each time as different masses will give different temperature rises. Record the highest temperature as this will show that the reaction has stopped.
		Total Mark 6

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