

Mark Scheme

March 2015 (1503)

NQF BTEC Level 1/Level 2 Firsts in
Applied Science

Unit 8: Scientific Skills (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.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the 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 the 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 regarding the application of 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.

Item	Expected answers	Additional guidance	Marks
1 (a) (i)	stopclock/stopwatch (1)	Clock/ watch/timer (accept any appropriate timing device). do not allow 'use the treadmill readout' without correct qualification e.g. timer	1
1 (a) (ii)	Glucose (1)	allow (different) sports drinks	1
1 (a) (iii)	Any one of the following: (1) Athlete Volume of sports drink Track or surface Track/surface gradient Pace/speed of runner (running) shoes clothing	allow the runner/person OWTTE allow amount of sports drink ignore person taking pulse	1
1 (a) (iv)	Any one of the following: Stop the person before they become ill/place a time limit on the activity Allow rest periods between sessions (make sure the) track or environment is free from hazards Correct footwear Warm up/stretch before running Keep hydrated/drink water Limit the volume/amount (of drink) that the person consumes in a session Check the person does not have a medical condition/specific condition e.g. diabetes, asthma, allergies	allow ensure shoelaces are tied ignore 'Health problems'	1

1 (b)	Change in pulse (rate) (1)	allow pulse/ heart rate/ Beats per minute/BPM (1)	1
Total mark			5

Item	Expected answers	Additional guidance	Marks
2	<p>Any three from;</p> <p>The ball will slow down more the further/longer it travels (1)</p> <p>If you increase the distance the average speed will decrease/ORR (1)</p> <p>Rate of decrease is getting less/gradient of graph is reducing (1)</p> <p>The ball decelerates (1)</p>	<p>ignore responses relating to reasons for the hypothesis</p> <p>it will be at its slowest at the end of the lane</p> <p>ignore comments relating to force or ball being thrown</p> <p>allow as the distance continues to increase the decrease in speed is not linear/not proportional/motion is non-uniform</p>	3
Total mark			3

Item	Expected answers	Additional guidance	Marks
3 (a)	<p>Any two from:</p> <p>Weigh the tissue (1)</p> <p>Before and after (the experiment) (1)</p> <p>Subtract masses/ find the difference (1)</p>	<p>allow use a balance/scales</p> <p>ignore measure the mass</p> <p>ignore references to measuring volume of sweat</p>	2
3 (b)	<p>Specify 3 or more different ramp/treadmill angles/heights (1)</p> <p>Repeat the test (after resting) (1)</p> <p>Use same athlete / same amount of fluid / same exercise time / same distance / same time to recover / same clothing (1)</p> <p>Keep the speed of the treadmill the same /same treadmill (1)</p> <p>Measure sweat from athletes (1)</p> <p>If there is a large enough range of angles we can compare the amount of sweat produced at each angle to see if the hypothesis is correct. (1)</p>	<p>allow same room temperature</p>	6
Total mark			8

Item	Expected answers	Additional guidance	Marks
4 (a)	<p>Column labelled number of carbon atoms / oil fractions and column labelled time (1)</p> <p>Correctly places the numbers in the corresponding column (1)</p> <p>Results placed in correctly ascending/ descending order (1)</p>	<p>allow carbon atoms</p> <p>columns can be in either order.</p> <p>ignore units</p>	3
4 (b) (i)	<p>0.36 (2)</p> <p>OR</p> <p>$\frac{0.35 + 0.36 + 0.37}{3}$ (2)</p> <p>OR</p> <p>$\frac{1.08}{3}$ (2)</p> <p>OR</p> <p>0.35 + 0.36 + 0.37 (1)</p> <p>OR</p> <p>A number divided by 3 (1)</p>	<p>allow correct answer in average column</p> <p>1.08</p>	2

4 (b) (ii)	<p>As the diameter/size of the hole increases the (average) speed of oil flow increases / ORA (2)</p> <p>Or</p> <p>As the diameter/size of the hole changes the (average) speed of oil flow changes (1)</p>	The difference in speed increases more with each increase in diameter (2)	2
Total mark			7

Item	Expected answers	Additional guidance	Marks
5 (a)	A (1)		1
5 b(i)	The temperature decreases (1)	<p>allow the temperature falls</p> <p>allow 'it goes down'</p> <p>allow 'it gets colder'</p>	1
5(b) (ii)	<p>-1.5 (2)</p> <p>OR</p> <p>-3÷2 (2)</p> <p>OR</p> <p>-3 (1)</p> <p>OR</p> <p>A number divided by 2 (1)</p>	ignore sign	2
Total mark			4

Item	Expected answers	Additional guidance	Marks
6 (a)(i)	<p>The correct answer is identified (2.05) (1)</p> <p>The result is lower than the other readings in the row/ the result does not fit the pattern for the column (1)</p>	<p>allow answer circled in table</p> <p>allow the second reading in row three/drop height 3m/2.05 (1)</p> <p>allow the result does not match the other readings in the row</p>	2
6 (a) (ii)	<p>Any one from:</p> <p> timing error/stopped the timer too early/started timer too late (1)</p> <p> drop height measured incorrectly (1)</p> <p> Reading error/ read the timer incorrectly (1)</p> <p> Recording error/wrote it down incorrectly/wrong row (1)</p> <p> Conditions error/wind may have affected flight (1)</p> <p> Broken parachute/parachute not opened properly (1)</p> <p> Parachute thrown instead of dropped (1)</p>	<p>ignore 'human error'</p>	1
6 (b)	<p>The timer only measured to two decimal places (1)</p> <p>The average would imply an accuracy greater than they could measure (1)</p>	<p>allow the timer was not this accurate</p> <p>allow measurement recorded to two decimal places</p>	2

6 (c)	<p>Axes (2) Correct y-axis labelled, units (1). Bars correctly labelled (1).</p> <p>Scaling (2) Linear scale on y-axis (1). Scale appropriate (1).</p> <p>Plotting (2) All 5 bars plotted /drawn correctly (2) or 3 or 4 bars plotted /drawn correctly (1).</p>	<p>If numbers on the y axis are directly taken from the table in the order of the table then allow a maximum of 2 marks for the axes.</p> <p>allow horizontal bars i.e. axes reversed Labels can be shortened to initials</p> <p>allow y-axis that does not start at zero. Data spread (between 0.4 and 0.8) needs to cover at least half the graph paper.</p> <p>allow no gaps between bars/columns drawn. allow +/- 1 small square plotting error</p> <p>Minimum width is a line.</p>	6
6(d)	Tissue paper (1)		1

6(e)	<p>0.0096 or 9.6×10^{-3} (2)</p> <p>OR</p> <p>$0.5 \times 0.03 \times 0.64$ (2)</p> <p>OR</p> <p>$(0.8)^2$ seen (1)</p> <p>OR</p> <p>0.5×0.03 seen (1)</p> <p>OR</p> <p>0.015 (1)</p> <p>OR</p> <p>$0.5 \times 0.03 \times 0.8$ (1)</p>	<p>0.64</p> <p>$\frac{1}{2} \times 0.03$ seen 0.015</p> <p>0.012</p> <p>Power of 10 error e.g. 0.096 (1)</p>	2
Total mark			14

Item	Expected answers	Additional guidance	Marks
7	<p>Any three from the following.</p> <p>Maximum two from each list.</p> <p>List 1 (supports conclusion):</p> <p>The air bubble moved more when it was windy (1)</p> <p>The plant did lose more water when it was windy (1)</p> <p>She repeated the experiment to check the reliability of the results (1)</p> <p>List 2 (Does not support conclusion):</p> <p>Could not be sure that this was the same for all plants (1)</p> <p>Did not test different plants (1)</p> <p>Does not know if the fan was controlled (1)</p>	<p>allow answer using data from the table to show the air bubble has moved eg. 8 when but 11 when windy</p> <p>allow she only tested one plant</p> <p>allow she only tested one fan level</p>	3
Total mark			3

Item	Expected answers		Additional guidance
8	<p>Indicative Content</p> <p>Improvement:</p> <ul style="list-style-type: none"> Name the chemicals they plan to use Use different types of chemicals Use at least three different chemicals State the amount of chemical used Use the same amount for each chemical Use clean test tubes each time Use Universal Indicator/pH meter Add the same amount of indicator (a few drops) to each chemical Stir the chemical/indicator Hold the test tube against white paper Use a pH chart to find the pH <p>Explanation:</p> <ul style="list-style-type: none"> So the experiment can be repeated by others To see the pH of different chemicals To collect a range of results To ensure a fair comparison between chemicals So they can measure a range of pH accurately (from 1 to 11) So that there was no contamination between the chemicals To ensure a fair comparison with added indicator To ensure that the indicator is mixed with the chemical To see the colour clearly on a colour chart To give an accurate/reliable measure of pH value 		6
Total mark			6
Level	0	No rewardable material	
Pass	1-2	<p>Identifies one appropriate variable to control/improvement/change and explains simply or identifies a second improvement/change.</p> <p>E.g.</p> <p>Use (at least) three chemicals.</p> <p>Should have specified an amount of chemical to use.</p>	
Merit	3-4	<p>Identifies changes to the method/control variable and explains the reasons for the changes. Or identifies three appropriate changes and explains one.</p> <p>E.g.</p> <p>Use (at least) three chemicals so that different chemicals are tested to give a range. Compare the colour of the Universal Indicator to the colour chart so the pH number can identified.</p>	

Distinction	5-6	Identifies appropriate changes and discusses/explains them to show how it is repeatable. E.g. Should use the same volume of each chemical so that there is a fair comparison between the chemicals. Take repeat readings so that the results are considered reliable. This will allow a valid conclusion to be drawn and allow another person to follow the method and gain the same results.
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TOTAL FOR THE PAPER		50
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