



Mark Scheme (Results)

March 2014

NQF BTEC Level 1/Level 2 Firsts in  
Applied Science

Unit 1: Principles of Science (20460E)

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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.

<b>Question Number</b>	<b>Correct Answer</b>	<b>Acceptable Answers</b>	<b>Reject</b>	<b>Mark</b>
<b>1(ai)</b>	Line to any nucleus (black dot)	Multiple lines to multiple nuclei.	Other components of cells labelled.  Incorrectly labelled lines.	1
<b>1(aii)</b>	Chromosomes	Genes  Accept phonetic spelling		1
<b>1(b)</b>	Tissue		Tissue cell	1
<b>1(c)</b>	Thymine			1
<b>Total</b>				<b>4 marks</b>

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2(ai)	Central nervous system	CNS Accept phonetic spelling	If no mention of central or C	1
2(aii)	Endocrine (system)	Accept phonetic spelling		1
2(bi)	Sensory neuron	Sensory nerve Accept phonetic spelling		1
2(bii)	Motor neuron	Motor nerve Accept phonetic spelling		1
2(c)	<p><b>Second marking point is dependent on the first. Either:</b></p> <p>Vasodilatatio006 E (1)</p> <p>{Energy/heat} lost from {blood/skin/body} (1)</p> <p><b>Or:</b></p> <p>Sweating (1)</p> <p>Heat loss by <u>evaporation</u> (1)</p>	Wider blood vessels/more blood near surface		2
<b>Total</b>				<b>6 marks</b>

Question Number	Correct Answer	Acceptable Answers	Reject	Mark																		
<b>3(a)</b>	<table border="1"> <tr> <td></td> <td>B</td> <td>b</td> </tr> <tr> <td>B</td> <td>BB</td> <td>Bb</td> </tr> <tr> <td>b</td> <td>Bb (1)</td> <td>bb (1)</td> </tr> </table>		B	b	B	BB	Bb	b	Bb (1)	bb (1)	bB is acceptable instead of Bb but must be in the correct box	Incorrect case letters	2									
	B	b																				
B	BB	Bb																				
b	Bb (1)	bb (1)																				
<b>3(bi)</b>	Hh	hH  Ignore diagram		1																		
<b>3(bii)</b>	hh	Ignore diagram		1																		
<b>3(c)</b>	<p>Marking point 1 is independent from marking points 2, 3 and 4.</p> <table border="1"> <tr> <td></td> <td>t</td> <td>t</td> </tr> <tr> <td>T</td> <td>Tt</td> <td>Tt</td> </tr> <tr> <td>t</td> <td>tt</td> <td>tt</td> </tr> </table> <p>MP1 - Correct gametes (1) MP2 - Correct offspring (1) MP3 - 2 offspring with short tails (1) MP4 - Female cat/cat 3 must have one recessive allele (1)</p>		t	t	T	Tt	Tt	t	tt	tt	<p>Gametes on the Punnett square can be written the other way Round</p> <table border="1"> <tr> <td></td> <td>T</td> <td>t</td> </tr> <tr> <td>t</td> <td>Tt</td> <td>tt</td> </tr> <tr> <td>t</td> <td>Tt</td> <td>tt</td> </tr> </table> <p>From this point forward ecf at each stage 50% or half of the offspring with short tails If female cat/cat 3 has 2 dominant alleles/TT then all offspring would have long tails</p>		T	t	t	Tt	tt	t	Tt	tt	Incorrect symbols for the alleles for MP1 only	4
	t	t																				
T	Tt	Tt																				
t	tt	tt																				
	T	t																				
t	Tt	tt																				
t	Tt	tt																				
			<b>Total</b>	<b>8 marks</b>																		
Question	Correct Answer	Acceptable Answers	Reject	Mark																		

Number				
<b>4(a)</b>	B a compound			1
<b>4 (b)</b>	Hydrogen (1)	H <sub>2</sub>	Incorrect case eg h <sub>2</sub> , h <sup>2</sup> , h <sub>2</sub> , H <sub>2</sub> , H <sup>2</sup>	2
	Chlorine (1)	Cl <sub>2</sub>	Chloride Incorrect case letters e.g. CL <sub>2</sub> , cl <sub>2</sub> , cL <sub>2</sub> , Cl <sup>2</sup> , Cl <sub>2</sub> , CL <sup>2</sup> ,	
		accept oxygen (O <sub>2</sub> ) as an alternative to either hydrogen or chlorine once only	Incorrect formulae eg Cl, H	
<b>4(c)</b>	D a salt			1
<b>4 (di)</b>	HCl		Incorrect case letters e.g. HCL, hcl, hCl Any number at end or between the H and the Cl	1
<b>4 (dii)</b>	NaCl		Incorrect case letters e.g NACL, nacl, naCl, Nacl, nacl, Nacl Any number at end or between the Na and the Cl	1
<b>Total</b>				<b>6 marks</b>

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
<b>5(ai)</b>	Ca (1)		Incorrect case letters e.g CA or ca  Any number at end or between the C and the a.	1
<b>5(aii)</b>	N (1)	Accept N <sub>2</sub>	Incorrect case letters eg n, n2, n <sub>2</sub> , n <sup>2</sup> , N2, N <sup>2</sup>	1
<b>5(bi)</b>	20	Twenty		1
<b>5(bii)</b>	40	Forty		1
<b>5(c)</b>	LHS nitric acid (1) RHS carbon dioxide (1)	Allow correct formula – HNO <sub>3</sub> CO <sub>2</sub>	Incorrect case	2
<b>Total</b>				<b>6 marks</b>



Question Number	Correct answers	Additional Guidance Reject	Mark
6	<p><b><u>Method</u></b></p> <p>A maximum of <b>three</b> from:</p> <p>Add each chemical in small increments to {soil/solution} (1)</p> <p>Test the pH using {pH probe/indicator paper/universal indicator} (1)</p> <p>Note the amount of chemical needed to neutralise/become pH7 (1)</p> <p><b>Or</b></p> <p>(Crush two samples) of the soil and mix with water (1)</p> <p>Add Calcium Oxide to one sample of soil and Calcium Carbonate to the other sample (1)</p> <p>Test the pH using { pH probe/indicator paper/universal indicator} (1)</p> <p>Or</p> <p>For <b>one mark only</b> in the method</p> <p>Grow the plants in soil treated with each chemical to see how they grow (1)</p> <p><u>Validity</u></p> <p>A Maximum of <b>two</b> from:</p> <p>all variables must be the same (1)</p> <p>apart from the type of chemical used (1).</p> <p>For <b>one mark only</b> in validity</p> <p>At least <b>two</b> variables given from amount of soil/same amount of chemical/same amount of water/same conditions (1)</p>	<p>Reject litmus</p> <p>Reject add calcium oxide <b>and</b> calcium carbonate to one sample</p> <p>Reject litmus</p> <p>Accept complete list of variables</p> <p>Reject to make it a fair test</p> <p>Reject to make it valid</p>	6

	<p><b><u>Conclusion</u></b></p> <p>A maximum of <b><u>one</u></b> from:</p> <p>The best chemical is the one that uses the least amount/mass (to neutralise the soil) (1)</p> <p>Or</p> <p>The best chemical is the one that has the highest increase in pH (1)</p> <p>Or</p> <p>The best chemical is the one that keeps the plant alive the longest (1)</p> <p>Or</p> <p>The best chemical is the one that makes the soil least acidic (1)</p>		
			<b>Total 6 marks</b>

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
7(ai)	A nuclear			1
7(aii)	A chemical			1
7(b)	B gravitational potential			1
7(c)	Thermal	Heat Light		1
<b>Total</b>				<b>4 marks</b>

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
8(ai)	Chemical			1
8(aii)	Light	Heat/thermal Electrical		1
8(b)	Hydrogen (1) Oxygen (1)	Either order Accept H/H <sub>2</sub> and O/O <sub>2</sub>  Allow other correct examples of fuel cells that use 2 gases eg methane/natural gas and oxygen		2
8(ci)	60 (2)  Or Time x power = energy (1)  Or $2 = \frac{\text{energy}}{30}$ (1)	30 x 2 (2)  If followed by any further incorrect working max 1 mark.		2

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
8(cii)	<p>22.5 (2)</p> <p>Or</p> $\frac{5 \times 450}{100} \quad (2)$ <p>Or</p> $5 = \frac{\text{(useful energy)}}{100} \times 450$ <p>(1)</p> <p>Or</p> $\frac{\text{Total energy} \times \text{efficiency}}{100}$ <p>(1)</p> <p>Or</p> $5 \times 450 \quad (1)$	<p>22.5 to any power of 10 gains 1 mark if no other mark is awarded.</p>		2
<b>Total</b>				<b>8 marks</b>

Question Number	Indicative content	
9	<p>Examples of wireless communication:</p> <p>Infrared- keyboards, mice, remote controls  advantages: use at a distance  disadvantages: heavy battery use, strong light causes interference</p> <p>Radio- radio, phones, laptops  advantages: communicate over large distances, laptops can be used in different parts of a house  disadvantages: laptop signals can be intercepted remotely</p> <p>Microwave- TV, phones  advantages: communicate over large distances, can carry large amounts of information, can communicate with remote areas  disadvantages: delay in communication, expensive to set up, concerns over health risks</p> <p>Light- lighthouses, flares  advantages: fast, does not rely on electronics  disadvantage: line of sight, weather dependent</p> <p>Ignore no wires.</p> <p>Pass</p>	
Level	Mark	Descriptor
	0	No rewardable material
Pass	1-2	Uses basic science to address the question simply E.g. mobile phones use microwaves. Microwaves can cause damage to cells.
Merit	3-4	More detailed scientific descriptions are used. E.g. laptops use radiowaves so can be used in different parts of the house, however the signals can be intercepted remotely.
Distinction	5-6	Both advantages and disadvantages of waves in the electromagnetic spectrum that are used in communication are discussed in detail. E.g microwaves can be used for communication by mobile phones because they can carry large amounts of information. However they may cause damage to cells. Radiowaves can be used in radios because they can travel large distances. Infrared can be used in remote controls, however strong light causes interference

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