

Mark Scheme

November 2016

BTEC Level 1/Level 2 First Award in
Principles of Applied Science

Unit 1: Application 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.

Type A. Point Mark Scheme with an accept and reject column

Question Number	Correct Answer	Additional Guidance	Reject	Mark
1 (a)(i)	water / sodium hydroxide	allow H ₂ O/NaOH if formula used, all capitals and subscripts should be correct. allow dihydrogen oxide/hydrogen oxide		1 clerical
1 (a)(ii)	left (hand side)	allow Group 1 allow any group containing a metal allow 'in the middle section'		1 grad
1 (a)(iii)	Na	N must be a capital a must be lower case		1 grad
1 (b)	purple / blue	allow violet do not allow pale blue/ red/yellow/green		1 grad
			Total	4

2 (a)(i)	B		Allow circle around/tick on		1 grad
2 (a)(ii)	A 1		Allow circle around/tick on		1 comp
2(b)(i)	An explanation linking two from (farmers' fields contain) soil with sulfuric acid (from acid rain) (1) calcium carbonate is a base (1) increases pH / neutralises (acidic soil) (1)	Allow acidic soil ignore calcium carbonate reacts with sulphuric acid Allow calcium carbonate is an alkali Note: neutralises acidic soil is worth two marks			2 expert

2(b)(ii)	CaSO ₄ (1) CO ₂ + H ₂ O (1)	products can be in any order All formulae must be fully correct with subscripts where appropriate Allow multiples Maximum one mark if any attempt to balance. ignore any word equations given		2 Expert
			Total	6

3 (a) (i)	Neutral / no charge / zero / 0	allow phonetic spellings allow NIL/nothing/none		1 grad
3 (a) (ii)	1 / one	allow +1	Reject -1	1 grad
3(b)	(Group) 6 (1) 6 electrons in the <u>outer</u> shell (1)			2 expert

3(c)	<p>Two linked pairs from</p> <p>The number of protons are the same / both have 7 protons (1)</p> <p>Because the {atomic / proton} number is the same (1)</p> <p>OR</p> <p>The number of electrons are the same / both have 7 electrons (1)</p> <p>Because the {atomic / proton} number is the same (and there is the same number of electrons as protons) (1)</p> <p>AND</p> <p>The number of neutrons is different / one has 7 neutrons and one has 8 neutrons (1)</p> <p>Because the atomic mass / mass number is different (1)</p>	<p>not just both have 7 - must be linked to electrons/protons</p> <p>allow one has a mass of 14 and one has a mass of 15</p>		4 expert
			Total	8

4 (a)(i)	thermal / sound	accept heat		1 clerical												
4 (a)(ii)	chemical / potential			1 clerical												
4 (b)	<p>microwaves infrared</p> <table border="1" data-bbox="316 1659 770 1794"> <tr> <td>microwave</td> <td>infrared</td> <td>(2)</td> </tr> <tr> <td></td> <td>infrared</td> <td>(1)</td> </tr> <tr> <td>microwave</td> <td></td> <td>(1)</td> </tr> <tr> <td>infrared</td> <td>microwave</td> <td>(1)</td> </tr> </table>	microwave	infrared	(2)		infrared	(1)	microwave		(1)	infrared	microwave	(1)	allow 1 mark if microwave and infrared in the wrong order.		2 grad
microwave	infrared	(2)														
	infrared	(1)														
microwave		(1)														
infrared	microwave	(1)														
4 (c)(i)	detecting forged bank notes / sterilisation / disinfecting (water) / forensic science / curing nail gels / tanning.	<p>allow fluorescent lamps</p> <p>allow applications in forensic science</p>		1 expert												

4(c)(ii)	Damage to {surface cells / eyes}/ <u>skin cancer</u>	allow burns allow causes blindness ignore harms skin		1 grad
			Total	6

5 (a)(i)	Conserves fossil fuels / does not release carbon dioxide / no (atmospheric) pollution / does not produce gases that could cause acid rain / does not produce greenhouse gases	allow does not contribute to global warming. allow cheaper once set up. allow fossil fuels take a very long time to renew/we are going to run out of fossil fuels ignore renewable. ignore fossil fuels are non-renewable. ignore more eco-friendly/environmentally friendly		1 expert
5 (a)(ii)	wind / solar / geothermal / biofuels / hydroelectric	ignore wave / tidal ignore sun		1 grad
5 (b)(i)	720 (2) or 0.2 x 60 x 60 (2) or 60 x 60 (1) or	3600 12		2 grad

	0.2 x 60 (1)			
5 (b)(ii)	12.5 (2) OR $\frac{2.5}{0.2}$ (2) OR $\frac{\text{wavespeed}}{\text{frequency}} = \text{wavelength}$ (1) OR 2.5 = wavelength x 0.2 (1)			2 expert
			Total	6

6	<p>Any three linked pairs, with at least 1 pair from each list.</p> <p><u>Conduction</u> Conduction is the transfer of heat/energy from particle to particle. (1)</p> <p>There are no particles between the two walls, therefore conduction cannot take place / plastic is an insulator so prevents {heat /energy} loss through the lid by conduction (1)</p> <p><u>Convection</u> Convection is movement of hot air rising and cool air replacing hot air / less dense air rising and more dense air falling (1)</p> <p>(airtight lid) prevents air moving in/out therefore convection cannot take place (1)</p> <p><u>Radiation</u> Heat radiation is the transfer of energy in the form of waves where there are no particles (1)</p> <p>The inside silver surface reflects radiation/heat back into the flask (1)</p>	
	Total	6

7(a)(i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 40px; text-align: center;">B</td> <td style="width: 40px; text-align: center;">B</td> </tr> <tr> <td style="width: 20px; text-align: center;">b</td> <td style="text-align: center;">Bb</td> <td style="text-align: center;">Bb</td> </tr> <tr> <td style="width: 20px; text-align: center;">b</td> <td style="text-align: center;">Bb</td> <td style="text-align: center;">Bb</td> </tr> </table>		B	B	b	Bb	Bb	b	Bb	Bb	<p>2 correct = 1 mark</p> <p>all correct = 2 marks</p> <p>Allow bB</p>		<p>2</p> <p>grad</p>
	B	B											
b	Bb	Bb											
b	Bb	Bb											
7 (a)(ii)	100(%) / one hundred percent	<p>allow ecf</p> <p>ignore fractions</p>		<p>1</p> <p>grad</p>									
7(a)(iii)	blonde (hair)	Ignore b/bb		<p>1</p> <p>clerical</p>									
			Total	4									

8(a)	<p>brain (1)</p> <p>spinal cord (1)</p>	<p>answers can be in either order</p> <p>do not allow spine</p> <p>allow phonetic spelling</p>		<p>2</p> <p>clerical</p>
8(b)	<p>Any two from</p> <ul style="list-style-type: none"> • temperature (1) • water content (1) • carbon dioxide levels (1) • pH 	<p>ignore blood glucose/sugar levels</p>		<p>2</p> <p>expert</p>

8(c)	<p>Insulin - lowers blood glucose levels (1)</p> <p>(because it) converts <u>glucose</u> to <u>glycogen</u> (1)</p> <p><u>Glucagon</u> increases blood glucose levels (1)</p> <p>(because it) converts <u>glycogen</u> to <u>glucose</u> (1)</p>			<p>4</p> <p>expert</p>
			Total	8

Question Number	Indicative Content	
9	<p><u>roots absorb water</u> root contains root hair cells which have a large surface area which means they can absorb a large amount of water water is absorbed by osmosis</p> <p><u>water drawn up</u> water carried up the xylem in one direction through hollow dead cells</p> <p><u>lost to the air</u> water is lost by transpiration, evaporation and diffusion of water from leaf surface stomata causes a vacuum / pressure difference / pressure gradient / tension / pulling force draws more water from xylem / water leaves xylem down pressure gradient?</p>	
Level	Mark	Descriptor
	0	No rewardable material.
Pass	1-2	The answer is likely to be in the form of a list. Points made will be superficial / generic and not applied / directly linked to the situation in question. For example, water is drawn up through the root hair cells, which have a large surface area.
Merit	3-4	Some points described, or a few key points explained. Most points made will be relevant to the situation in question, but the link will not always be clear. For example, water is drawn up through the root hair cells and then transported up the xylem and lost through the leaf by evaporation.
Distinction	5-6	The answer is fully justified. A detailed discussion of each process. The majority of points made will be relevant and there will be some clear link to the situation in question. For example, water is drawn up through the root hair cells by osmosis, then moves up the xylem by transpiration where it evaporates and diffuses from the leaf surface.
		Total 6

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