

Mark Scheme (Final)

March 2017

BTEC Level 1/Level 2 First Award in
Applied Science

Unit 1: Principles of Applied Science

(20460/E01)

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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	Mark
1 (a)	Cooking/thermal imaging/optical fibres/remote controls /heat lamps/security systems	Ignore 'TV' on its own	1 grad
1 (b)	{Mutation of/damages} cells/cancer/DNA	Ignore 'harms'	1 grad
1 (c)(i)	The number of (complete) waves (passing a point/emitted by a source) in one second.	Accept other timescales/ per unit time	1 expert
1 (c)(ii)	Gamma (Rays) / γ	Do not allow 'g' Do not allow 'y'	2 grad
		Total	4

2 (a)(i)	Wave/wind/tidal/hydroelectricity/ geothermal/biomass/biofuels	Ignore solar/Sun Reject nuclear	1 grad
2 (a)(ii)	Light (energy)/ electrical (energy)	chemical (energy)	1 grad
2(a)(iii)	Thermal/heat (energy)		1 clerical
2(b)(i)	Useful energy output: allow any value more than 60, up to 100 Wasted energy output: 100 minus their value for useful energy output	Both values needed for the mark	1 expert
2(b)(ii)	40(J) (2) OR $\frac{30}{75} \times 100 = (2)$ OR $75\% = \frac{30}{\text{useful energy}} \times 100 = (1)$ OR $\frac{\text{useful energy}}{\text{efficiency}} \times 100 = (1)$ OR $\frac{30}{75} (1)$	0.4	2 expert
			6

		Total	
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3 (a) (i)	chemical	potential?	1 clerical
3 (a) (ii)	(once used up) cannot be replaced	Allow 'Would take millions of years to replace.'	1 expert
3(b)	Any four from Water absorbs {thermal/heat} energy /temperature of the water rises (1) {liquid/water} expands (1) {liquid/water} becomes less dense (1) {hot liquid/water} / less dense {liquid /water} rises (1) Carries coloured crystal with it (1) {Cooler/more dense} {liquid/water} replaces warm water (at the bottom)/falls (1)		4 expert
3(c)	{Thermal/heat} energy makes particles vibrate (faster) (1) Vibrating particles make the particles next to them vibrate (faster)/ vibrations are passed on (1)	<i>mobile electrons, which can help to carry the heat energy through the metal</i>	2 expert
		Total	8

4 (a)	Any two from (increased) Sweating (1) Vasodilation (1) Hairs lie flat on skin (1)	<u>increased blood flow to extremities/named extremity</u>	2 grad
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4 (b)(i)	A glucagon		1 comp
4 (b)(ii)	homeostasis		1 clerical
4 (b)(iii)	endocrine		1 clerical
4 (b)(iv)	pancreas		1 clerical
		Total	6

5 (a)	Single line to one nucleus	Accept two lines as long as they both label a nucleus Allow references to turgor	1 grad
5 (b)	Provides (extra) {support/structure} to the cell	allow holds waste materials	1 grad
5 (c)	Plant takes in carbon dioxide, water and sunlight (1) To produce sugars/glucose and oxygen (1)	Carbon dioxide + water +light energy → glucose + oxygen (2) Allow symbol equation for full marks	2 expert
5 (d)	Water is lost/passes out of cell (1) Cells straighten up /become {flaccid/limp} (1)	Allow 'water is lost from vacuole' osmosis?	2 expert
			Total 6

6	<p>Any six from</p> <p>Receptor detects {stimulus/sharp pin} (1) (M)</p> <p>electrical signals/impulses (transmitted along nerve cells/neurones) (1) (M)</p> <p>(from receptor along) sensory neurone to the spinal cord (1) (D)</p> <p>In the spinal cord signals travel across synapses (1) (D)</p> <p>(signals travel across synapses) using chemical transmitters/neurotransmitter (1) (D)</p> <p>electrical signal passes along motor neurone (1) (M)</p> <p>(Motor neurone releases chemical) impulses to effector muscle (1) (D)</p> <p>Effector/muscle lifts foot/muscle contracts (1) (M)</p>	<p>6</p> <p>Expert</p> <p>Allow mark for 'foot moves'</p>
	Total	6

7(a)(i)	A the acid		1 comp
7 (a)(ii)	D 8-14		1 comp
7(b)(i)	H ₂ O	H and O must be capitals 2 must be subscript	1 grad
7(b)(ii)	Two (or more) <u>different</u> elements <u>chemically</u> combined / bonded	Accept 'joined'	1 expert
		Total	4

8(a)(i)	2.8.4		1 grad
8(a)(ii)	B Element B		1 comp
8(a)(iii)	D Element D		1 comp
8(a)(iv)	5		1 clerical
8(b)(i)	<p>similarity:</p> <p>Both have three protons/electrons (1)</p> <p>Difference:</p> <p>Lithium-6 has three neutrons, lithium-7 has four neutrons (1)</p>	<p>Allow lithium-7 has one more neutron than lithium-6</p> <p>Maximum of 1 mark for generic definition of an isotope</p>	2 expert
8(b)(ii)	$4\text{Li} + \text{O}_2 \rightarrow 2\text{Li}_2\text{O}$ <p>substances correct (1)</p> <p>balancing correct (1)</p>	allow correct multiples	2 expert
		Total	8

Question Number	Indicative Content	
9	<p><u>Method to make gas</u> Gas is produced in both reactions Add sulfuric/hydrochloric/nitric/other suitable named acid to a substances Collect gas in gas syringe/over water (suitable diagram to show method of gas collection) Test gas produced</p> <p><u>Test for carbon dioxide</u> Add limewater If it turns cloudy/milky carbon dioxide present Therefore a metal carbonate is present</p> <p>If it is not cloudy repeat test but this time collect gas and test for hydrogen (ORA)</p> <p><u>Test for hydrogen</u> Use a lit splint Squeaky pop Therefore metal is present</p> <p>If it does not turn cloudy and there is no squeaky pop then it is not a metal or a metal carbonate.</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. e.g. add hydrochloric acid and test the gas
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. e.g. add sulphuric acid, add limewater to the gas, if the limewater goes cloudy then a carbonate is present.
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. e.g. add hydrochloric acid, collect the gas in a gas syringe. Test the gas with a lit splint if a squeaky pop is heard it is hydrogen. Test again with limewater, if it goes cloudy carbon dioxide is present therefore it must be a metal carbonate.
		Total 6

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