Mark Scheme (Results)

Summer 2017

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.

Question Number	Correct Answer	Additional Guidance	Mark
1 (a)(i)	site of (chemical) reactions	allow {holds/supports} organelles allow phonetic spelling	1
1(a)(ii)	(cell) membrane	 allow phonetic spelling	1
1(a)(iii)	mitochondria	allow cytoplasm allow phonetic spelling	1
1 (b)	movement (of the sperm towards the egg)	allow to travel/swim (to egg)	1
		Total	4

<table>
<tr><td>2(a)</td><td>nucleus</td><td>ignore DNA
ignore genes</td><td>1</td></tr>
<tr><td>2(b)</td><td>Adenine/A</td><td>allow phonetic spelling
reject 'adenosine'</td><td>1</td></tr>
<tr><td>2(c)</td><td>Mother
<table><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</td><td>bb</td></tr></table>Father

Complete Punnett = 2 marks

or

bb for mother = (1)

or

correct Punnett from incorrect genotype (1)</td><td></td><td>2</td></tr>
<tr><td>2(d)</td><td>can produce greater diversity in organisms (1)

therefore greater chance of survival of species/fittest (1)</td><td>allow 'diversity' such as 'genetic variation'

allow given beneficial adaptation for first mark

allow gives new/different characteristics/phenotypes</td><td>2</td></tr>
<tr><td></td><td></td><td>Total</td><td>6</td></tr>
</table>

3 (a)	brain (1) spinal cord (1)	 reject spine	2
3 (b)	A = receptor B = motor neurone	allow nerve ending allow temperature receptor do not allow 'nerve' alone	2
3 (c)	Any **four** from: {electrical signal/nerve impulse} travels to point P (1) {chemical/neurotransmitter} (is released at end of sensory neuron) (1) (chemical) diffuses across {gap/synapse} (1) (and binds) to receptors on cell membrane of (relay neuron) (1) (and) triggers another electrical signal (in relay neuron/Q) (1)	 allow terminal for end allow P for sensory neuron allow synaptic cleft for gap allow post synaptic membrane allow Q for relay neuron allow action potential for electrical signal allow electrical impulse for electrical signal	4
		Total	8

4 (a)(i)	B – W and Y		1
4 (a)(ii)	W, X and Z	all three must be present, can be in any order allow names, formulae or drawings	1
4 (a)(iii)	flammable	allow inflammable allow substance may <u>easily</u> set on {fire/burn/combust/ignite} do not allow fire hazard do not allow 'fire' alone do not allow it will burn	1
4 (a)(iv)	CO_2	do not allow co2/ Co_2 / CO^2/ co^2 /oC_2 /2CO /CO2 allow O_2C	1
4 (b)	Second mark is dependent on first. Test – lit splint (1) Result – (burns with a squeaky) pop (1)	 allow flame allow squeaky pop for one mark in result if no test given	2
		Total	6

5 (a) (i)	7/seven		1
5 (a)(ii)	green		1
5 (b)	any **two** from the indigestion remedies contain a base (1) pH increases (1) (reacts with excess acid to) produce a salt and water (1)	 allow alkali/alkaline allow named base allow less acidic allow lower acid levels allow named salt	2
5 (c)	marked independently $ZnSO_4$ (1) H_2O (1) can be in any order	do not accept superscripts/normal numbers max one mark for incorrect balancing	2
		Total	6

6	Any **six** from 11 electrons (1) electronic configuration of 2.8.1 (1) in group 1 / the alkali metals (1) because there is 1 electron in the <u>outer</u> shell (1) period 3 (1) because there are 3 shells of electrons (1) 11 protons (1) 11^{th} element in the periodic table (1)	6
	Total	6

7(a)	Electrical (energy)	do not allow electricity allow electric	1
7 (b)	thermal	allow heat allow infrared/IR	1
7(c)	light / sound	allow heat lost to surroundings	1
7(d)	$\frac{138\ 000\ (J)}{60\ (s)}$ = (1)	2300 (W)	1
		Total	4

8(a)(i)	Electromagnetic (spectrum)	allow EM/em	1
8(a)(ii)	microwaves/infrared/visible/ultraviolet/gamma (rays)	ignore radio waves/X-rays	1
8(b)	{mutation of DNA / damage to cells} in the body (1) (radiation) cannot penetrate lead (1)	allow causes cancer allow {damage/alteration} to {DNA/chromosomes /genetic material} allow stop radiation getting through	2

8(c)	5×10^2 (4) or 500 (3) or $\frac{300\,000\,000}{600\,000}$ (3) or $\frac{3 \times 10^8}{600\,000}$ (2) or 300 000 000 = wavelength (m) x 600 000 (2) or 3×10^8 = wavelength (m) x 600 000 (1) or 3×10^8 = wavelength (m) x 6×10^5 (1) or $\frac{\text{wavespeed}}{\text{frequency}}$ = wavelength (1)	Correct answer to any power scores full marks e.g 0.5×10^3 Power of 10 error scores 2 If no other marks are scored 300 000 000 seen scores (1) or 6×10^5 seen (1) or incorrect working given to correct standard form (1)	4
		Total	8

Question Number	Indicative Content	
9	<u>advantages</u> biofuels will not run out more plants can be grown to make more biofuels sustainable plants absorb carbon dioxide when growing which offsets carbon dioxide produced when biofuels are burnt reduce demand for fossil fuels biofuels don't contain sulfur biofuels won't release sulfur dioxide therefore less acid rain biofuels aren't mined therefore do not destroy landscapes fossil fuels cannot be used again carbon neutral <u>disadvantages</u> growing enough plants to make biofuel takes up large areas of land this land could be used to grow food crops still produce carbon dioxide when burnt growing plants to produce biofuels reduces biodiversity/destroys habitats biofuels are a less concentrated energy source than fossil fuels ignore biofuels are renewable ignore fossil fuels are non-renewable ignore environmentally friendly ignore unqualified references to cost ignore biofuels can be used again / reused ORA throughout for fossils fuels	
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. biofuels will not run out as you can grow more plants.
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. plants that are grown to provide biofuels absorb carbon dioxide when growing therefore reducing overall carbon dioxide emission.
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. biofuels will not run out as more plants can be regrown and it will reduce demand for fossil fuels, however lots of land is required, which could lead to food shortages.
		Total 6

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