Mark Scheme

(Results)

March 2019

BTEC Level 1/Level 2 Firsts in Applied Science

Unit 1: Principles of Science (20460E)

20460E
1411

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General Marking Guidance

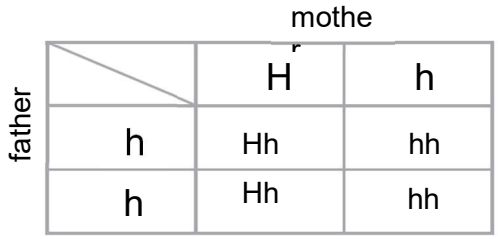
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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)	chemical		1
1 (b)	kinetic/mechanical	allow motion/movement (energy)	1
1 (c)	sound/thermal	allow heat	1
1 (d)	140 (W) (1) OR $\frac{700}{5}$ (W) (1)		1
		Total	4

Question Number	Correct Answer	Additional Guidance	Mark
2 (a)(i)	X-ray	allow gamma rays	1
2 (a)(ii)	infrared / IR / visible light / gamma rays / ultraviolet / UV		1
2 (b)	ultraviolet / UV	allow visible light	1
2 (c)(i)	satellite / communications /weather forecasting / radar	allow mobile phone / cell phones	1
2 (c)(ii)	Any two from : cells contain water (1) (microwaves) heat water (in the cells)/ make water molecules (in the cell) vibrate more (1) higher temperatures {cause damage to cells / may affect (cell) reactions / denature enzymes in cells} (1)	allow heat up cells	2
		Total	6

Question Number	Correct Answer	Additional Guidance	Mark
3 (a)	(energy source that can be easily) replaced / replenished once used / is not finite / not depleted	allow will not run out allow can be reused / used again	1
3 (b)	coal / (natural) gas / crude oil / fossil fuel / nuclear	allow named fossil fuel	1
3 (c)	6000 (2) OR $\frac{900}{15} \times 100$ (2) OR $\frac{900}{15}$ (1) OR $\frac{\text{(useful energy)}}{\text{efficiency}} \times 100 = \text{(total energy supplied)}$ (1) OR $15 = \frac{900}{\text{total energy supplied}} \times 100$ (1)	allow $\frac{15}{900} \times 100$ (1) power of 10 error scores 1 mark	2

3 (d)	6×10^{-7} (4) OR 0.0000006 (3) OR $\frac{3 \times 10^{8}}{5 \times 10^{14}}$ (3) OR $\frac{300\ 000\ 000}{500\ 000\ 000\ 000\ 000}$ (3) OR $\frac{3}{5\ 000\ 000}$ (3) OR $\frac{300\ 000\ 000}{5 \times 10^{14}}$ (2) OR $\frac{3}{5 \times 10^{6}}$ (2) OR 300 000 000 = wavelength x 500 000 000 000 000 (2) OR 3×10^{8} = wavelength x 5×10^{14} (2) OR 300 000 000 = wavelength x 5×10^{14} (1) OR wavelength = $\frac{\text{wave speed}}{\text{frequency}}$ (1)	Correct answer to any correct power scored full marks e.g. 0.6×10^{-6} If no other marks are scored: 500 000 000 000 000 seen (1) or 3×10^{8} seen (1) or incorrect working given to correct standard form	4
		Total	8

Question Number	Correct Answer	Additional Guidance	Mark
4 (a)(i)	nucleus/mitochondria	allow chromosomes allow genes	1
4 (a)(ii)	**A—T** **C—G**	allow lower case/ adenine and guanine	1
4 (b)(i)	 all correct (2) any two offspring correct (1)	accept hH for Hh	2
4 (b)(ii)	50 (%)	allow ECF from diagram drawn	1
4 (b)(iii)	contains two copies of the same allele	allow contains two recessive alleles allow only one type of allele allow the alleles are the same ignore gene	1
		Total	6

Question Number	Correct Answer	Additional Guidance	Mark
5 (a)	B chloroplast		1
5 (b)	oxygen	allow O_2 / O	1
5 (c)(i)	anchorage / {active transport/absorption} of minerals	allow stability allow nutrients ignore water	1
5 (c)(ii)	they are underground / in the dark / no light / do not photosynthesise		1
5 (c)(iii)	transpiration (1) through the xylem (1)	allow reference to osmosis reject phloem	2
		Total	6

Question Number	Correct Answer	Mark
6	any **six** from, with a maximum of **four** from one list: <u>when blood glucose concentration is too high :</u> insulin (1) (insulin) {made in / released from} the pancreas (1) (and insulin is released) into the bloodstream (1) glucose converted into <u>glycogen</u> (1) (<u>glycogen</u>) stored in the liver/muscles (1) <u>when blood glucose concentration is too low :</u> <u>glucagon</u> (1) (<u>glucagon</u>) is {made in / released from} the pancreas (1) (<u>glucagon</u> is then released) into the bloodstream (1) (glucagon is) transported the liver/muscles (1) which turns <u>glycogen</u> into glucose (1) glucose released into blood stream (1)	6
	Total	6

<table>
<tr><th>Question Number</th><th>Correct Answer</th><th>Mark</th></tr>
<tr><td>7 (a)</td><td>
<table>
<tr><th>particle</th><th>position</th><th>relative charge</th></tr>
<tr><td>proton</td><td>nucleus / in shells</td><td>-1 / 0 / +1</td></tr>
<tr><td>neutron</td><td>nucleus / in shells</td><td>-1 / 0 / +1</td></tr>
<tr><td>electron</td><td>nucleus / in shells</td><td>-1 / 0 / +1</td></tr>
</table>
5 correct (3)
3 or 4 correct (2)
2 correct (1)

allow circled answers</td><td>3</td></tr>
<tr><td>7 (b)</td><td>7 / seven</td><td>1</td></tr>
<tr><td colspan="2">Total</td><td>4</td></tr>
</table>

Question Number	Correct Answer	Additional Guidance	Mark
8 (a)(i)	red	allow pink	1
8 (a)(ii)	A 2		1
8 (b)(i)	H_2O (1) CO_2 (1)	can be in either order letters must be capitals, numbers must be subscript. max 1 if incorrect attempt to balance	2
8 (b)(ii)	any **four** from, with a maximum of **three** from one list: <u>Similarities</u> both produce a salt /a sulfate (1) both produce a gas / effervescence / bubbles (1) both (can) produce a neutral solution (if exact amount added) (1) both reactions are exothermic / release heat <u>Differences</u> magnesium produces magnesium sulfate / sodium carbonate produces sodium sulfate / each produces a different sulfate (1) sodium carbonate produces water / magnesium does not produce water (1) sodium carbonate produces carbon dioxide / magnesium produces hydrogen (1) sodium carbonate produces three products / magnesium only produces two products (1)	allow word / symbol equations allow fizzing allow both disappear allow both increase the pH of the acid allow hot to touch ignore different products are formed alone	4
		Total	8

Question Number	Indicative Content
9	atomic mass is the number of protons + neutrons this sample of chlorine has two different isotopes because they are isotopes they have different number of neutrons each the chlorine-35 isotope has 18 neutrons the chlorine-37 isotope has 20 neutrons atomic number is the number of electrons or protons both isotopes are still chlorine so have the same number of protons and electrons both chlorine isotopes have 17 protons both chlorine isotopes have 17 electrons a sample of 100 atoms would have 75 chlorine-35 and 25 chlorine-37 the relative atomic mass is a weighted average there is more chlorine-35 than chlorine-37 therefore mass closer to 35 than 37 35 x 75 = 2625 37 x 25 = 925 2625 + 925 = 3550 <u>3550</u> 100 = 35.5 allow alternative methods for calculating the relative atomic mass

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. there are isotopes so have a different number of neutrons chlorine-35 has 18 and chlorine- 37 has 20.
Merit	3-4	Some points described, **or** a few key points discussed. Most points made will be relevant to the situation in question, but the link will not always be clear, e.g. there are isotopes so have a different number of neutrons chlorine-35 has 18 and chlorine-37 has 20. <u>because there is more chlorine 35 than 37 the mass is closer to 35.</u>
Distinction	5-6	A detailed discussion of each isotope. The majority of points made will be relevant and there will be some clear link to the situation in question, e.g. both have the same number of protons because the atomic number is the same, they both have 17. There are isotopes and so therefore have a different number of neutrons chlorine-35 has 18 and chlorine-37 has 20. because there is more chlorine 35 than 37 the mass is closer to 35.
		Total 6