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Mark Scheme (Results)

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

(20460/E04)

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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)	Anchor in place (1) Absorb water/nutrients/minerals (1)	Allow answers in either order Allow take in/take up water Allow moisture Ignore provides water Ignore food	2
1 (b)	Contain chloroplasts/chlorophyll	Allow large surface area	1
1 (c)	water evaporates from leaf/water (vapour) {diffuses/lost} from leaf		1
		Total	4

Question Number	**Correct Answer**	Additional Guidance	Mark
2(a)(i)	**D** Vacuole		1
2(a)(ii)	Controls the (activities of the) cell	Reject: brain Ignore references to DNA	1
2(a)(iii)	Cytosine/C		1
2(b)(i)	<table><tr><td></td><td>F</td><td>f</td></tr><tr><td>F</td><td>FF</td><td>Ff</td></tr><tr><td>f</td><td>Ff</td><td>ff</td></tr></table>		1
2(b)(ii)	Offspring must inherit {ff/ two recessive alleles} / ff means cystic fibrosis will develop (1) {One out of four squares/only 1 square/¼ <u>of the Punnett square</u>/25% <u>of the Punnett square</u>} contains {two recessive alleles/ff} (1)	Ignore genes Both alleles need to be f If a {dominant allele/F} is present cystic fibrosis will not develop Three out of four squares contain the dominant allele	2
		Total	6

Question Number	Correct Answer	Additional Guidance	Mark
3(a)	Large surface area (to volume ratio) (1) Absorb (more) oxygen (1)	Ignore bioconcave shape Ignore no nucleus Allow carry/hold (lots of) oxygen.	2
3(b)	Max 2 marks from one of the following pairs: Irregular/Flexible (1) to squeeze out of blood vessels/to get to site of infection/engulf microorganisms (1) OR Can increase in numbers (1) to fight disease (1) OR Cytoplasm contains enzymes (1) to digest ingested pathogens (1) OR Produce/release antibodies (1) to destroy toxins/pathogens/ combine with antigens (1)	 Allow change shape Allow engulf bacteria/virus/pathogens Allow kill bacteria/virus/pathogens Allow carry Allow kill bacteria/virus	2

3(c)	Method to lower blood glucose: Insulin (1) converts <u>glucose</u> to <u>glycogen</u> (1) AND Method to raise blood glucose: <u>Glucagon</u> (1) converts <u>glycogen</u> in to <u>glucose</u> (1)	Allow any four mark points as long as they are related to the correct method of changing blood glucose level.	4
		Total	8

Question Number	Correct Answer	Additional Guidance	Mark
4(a)	One line from top picture to elastic potential (1) One line from battery to chemical (1)	Reject more than one line from each device.	2
4(b)(i)	Wave/Tidal/Geothermal/ Solar/Biofuel/Hydroelectric	Allow sun Reject nuclear	1
4(b)(ii)	Electrical/Mechanical (energy)		1
4 (b)(iii)	Not always windy/ intermittent/too windy (1) so {electricity/energy/power} is not always produced (1)	If no other mark is scored, allow for 1 mark: noisy/eyesore/ disturb local residents/lowers house prices/kill birds	2

		Total	6

Question Number	Correct Answer	Additional Guidance	Mark
5(a)(i)	Thermal/Heat (energy)		1
5(a)(ii)	96 (J) (1) OR 100 – 4 (1)		1
5(b)(i)	1800 (J) (2) OR 15 x 120 (2) OR 15 x 60x2 (2) OR 15 x 2 (1) OR 15 = $\frac{\text{energy}}{60x2}$ (1) OR power x time = energy (1) OR 2 x 60 (1)	 30 15 = $\frac{\text{energy}}{120}$ 120	2
5(b)(ii)	1.56 (p) (2) OR 0.015 x 13 x 8 OR $\frac{15}{1000}$ x 13 x 8 (2) OR 15 x 13 x 8 (1) OR $\frac{15}{1000}$ (1)	 1560 0.015	2

		Allow 1.56 to any power of 10 for 1 mark	
		Total	6

Question Number	Correct Answer	Additional Guidance	Mark
6	**Any six from:** **Similarities** Both transverse waves (1) Both travel at the same speed (in a vacuum)(1) Both transfer energy (1) Both are not visible to the human eye (1) **Differences** X-rays are high frequency and radio waves are low frequency (1) X-rays have a short wavelength and radio waves have a long wavelength (1) X-rays are more penetrating than radio waves (1) X-rays are ionising and radio waves are not (1)		
		Total	6

Question Number	Correct Answer	Additional Guidance	Mark
7(a)	**B** flammable		1

7 (b)(i)	Neutrons (1) Protons (1)	In either order Allow neutron Reject nucleus/newton Allow proton	2
7(b)(ii)	.8.1		1
		Total	4

Question Number	Correct Answer	Additional Guidance	Mark
8(a)	**B** a compound		1
8(b)(i)	Red		1
8(b)(ii)	H_2SO_4	All letters must be capitals All digits must be subscript	1
8(c)	Copper sulfate and water	Can be in either order Allow copper sulphate Both must be present for the mark If symbols are given they must both be symbols and completely correct for the mark. e.g.$CuSO_4$ + H_2O	1
8(d)	Bob's soil is too acidic/pH is too low (1) Add a base (1) Add calcium carbonate/lime (1) To increase the pH (of the soil) (1)	 Allow acid + base → salt + water Allow add alkali Allow any named base To make the soil less acidic Allow to higher/raise pH Reject add an acid to raise pH	4

		Ignore to neutralise the soil	
		Total	8

Question Number	Indicative Content		
9	Similarities • Both contain protons, neutrons and electrons • Both have an atomic number of 35 • Both have 35 protons • Both have 35 electrons Differences • Different mass number • Bromine 79 has 44 neutrons • Bromine 81 has 46 neutrons or • Bromine 81 has 2 more neutrons than bromine 79 Calculation of RAM • Relative atomic mass is an average for the two isotopes/weighted mean The relative atomic mass can be calculated by: • 50 x 79 = 3950 • 50 x 81 = 4050 • 3950 + 4050 = 8000 • 8000 /100 = 80		
Level	Mark	Descriptor	
	0	No rewardable material.	
Pass	1-2	Learners show some understanding of a similarity or a difference between the isotopes or why the sample has a relative atomic mass of 80. 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. The mass number is different as one has more neutrons than the	

		other.
Merit	3-4	Learners show some understanding of a similarity and a difference between the isotopes or why the sample has a relative atomic mass of 80. 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. Atoms of different isotopes have the same number of protons but a different number of neutrons. The relative atomic mass is an average of the two isotopes.
Distinction	5-6	Learners show some understanding of a similarity and a difference between the isotopes and why the sample has a relative atomic mass of 80. The answer is fully explained. A detailed discussion of each atom. The majority of points made will be relevant and there will be some clear link to the situation in question. e.g. Both bromine atoms contain 35 protons and 35 electrons. Bromine-79 contains 44 neutrons while bromine-81 contains 46 neutrons. The relative atomic mass is an average of two isotopes.
		Total 6