Mark Scheme

March 2018

NQF BTEC Level 1/Level 2 Firsts in Applied Science

Unit 1: Principles of Applied Science (20460E)

BTEC Qualifications from Pearson

BTEC qualifications from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.btec.co.uk for our BTEC qualifications.

Pearson: helping people progress, everywhere

Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

March 2018
Publications Code xxxxxxxx*

20460E
1411

General Marking Guidance

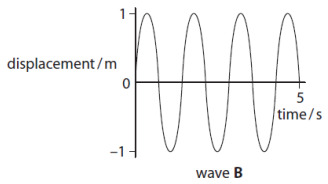
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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)	B - explosive		1
1 (a)(ii)	Use a {fume cupboard / (gas) mask} (1)	allow wear googles/gloves ignore do not breathe in	1
1 (bi)	B - J		1
1 (bii)	Cl_2	C must be capital l must be lower case 2 must be subscript	1
		Total	4

2 (a)(i)	Any number in the range 0-3 inclusive		1
2 (a)(ii)	litmus	allow phenolphthalein/methyl orange allow other correct indicators ignore universal indicator	1
2(b)(i)	magnesium chloride	do not allow magnesium chlorate / magnesium chlorite / magnesium chlorine allow formula, $MgCl_2$, if correct	1
2(b)(ii)	**C** hydrogen		1
2(c)	$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$ all formulae correct (1) balancing of correct formulae (1)	 numbers in formulae must be subscript, lower case must be no more than half the size of capitals allow correct multiples ignore word equations	2
		Total	6

3 (a)	(electron relative charge) -1 (1) (neutron relative mass) 1/one (1)	allow minus one do not allow 1/+1/plus one allow + 1/ plus one do not allow -1/ minus one	2
3 (b)	204.4 (2) OR $\frac{14350 + 6090}{100}$ (2) OR $\frac{20440}{100}$ (2) OR $\frac{(70 \times 205) + (30 \times 203)}{100}$ (2) OR 70 x 205 **and** 30 x 203 (1) OR 14350 + 6090 (1) OR $\frac{6090}{100}$ (1) OR $\frac{14350}{100}$ (1)	ignore 204 without working 20440 60.90 143.50	2

3(c)	any four from protons and neutrons in the nucleus (1) electrons {surround nucleus/ are in shells/are in orbits} (1) 15 protons (1) 16 neutrons (1) (electronic configuration is) 2.8.5 (1)	allow diagram for all mark points ignore 15 electrons	4
		Total	8

4 (a)	ultraviolet / UV (light)	do not allow violet/ultra alone	1
4 (b)	one line from microwaves to satellite transmissions one line from gamma ray to sterilising medical equipment	reject multiple lines	2
4 (c)(i)	(skin) burns / blisters	ignore cancer allow damage to skin/cells	1
4 (c)(ii)	microwaves/radio (waves)		1
4 (d)	B  wave **B**		1
		Total	6

5 (a)(i)	900 J on input arrow **and** 720 J on useful output arrow (1) 180 J on wasted energy arrow (1)	allow ecf	2

5 (a)(ii)	80 (2) OR $\frac{720}{900} \times 100$ (2) OR $\frac{720}{900}$ (1)	0.8 allow $\frac{900}{720} \times 100$ for 1 mark	2
5 (b)	7.28 (p) (2) OR $\frac{65}{1000} \times 14 \times 8$ (2) OR 65 x 14 x 8 (1) OR $\frac{65}{1000}$ (1) OR 0.065 x 8 (1)	0.065 allow 7.28 to any power of 10 gains 1 mark	2
		Total	6

6	any **six** from chemical energy in gas is transformed to {thermal/heat} energy in the Bunsen flame (1) {thermal energy/heat energy/energy} from the Bunsen burner is transferred to the rod (at point A) (1) {thermal energy/heat energy/energy} is transferred (along the rod/from point A to point B) by <u>conduction</u> / metal is a (good) <u>conductor</u> of {thermal energy/heat energy} (1) (because) particles have more (kinetic) energy (1) (so) particles at point A vibrate {faster/more/quicker} (1) (and causes) collisions with neighbouring particles (1) (these collisions) transfers the {thermal energy/heat energy/energy} the {thermal energy/heat energy/energy} moves to (the particles in) the wax (1) the wax melts (1)	6
	Total	6

7(a)	C - sneezing		1
7 (b)	any two from shivering (body) hairs stand on end vasoconstriction (in the skin)	allow stop sweating	2
7 (c)	insulin		1
		Total	4

<table>
<tr><td>8(a)(i)</td><td>nucleus/mitochondria</td><td></td><td>1</td></tr>
<tr><td>8(a)(ii)</td><td>AT/ Adenine Thymine

TA/ Thymine Adenine

CG/ Cytosine Guanine

GC/ Guanine Cytosine</td><td></td><td>1</td></tr>
<tr><td>8(b)</td><td><table><tr><td></td><td>E</td><td>e</td></tr><tr><td>E</td><td>EE</td><td>Ee</td></tr><tr><td>E</td><td>EE</td><td>Ee</td></tr></table>
Horizontal top row E e (1)

Vertical furthest to the left column E E (1)</td><td></td><td>2</td></tr>
</table>

<table>
<tr>
<td>8(c)</td>
<td>Any four from:

both parents must be carriers for Joe to be affected: (1)

parents must be {heterozygous/Dd/dD} (1)

{1:4 / 25%} chance of being affected (1)

if any one parent was not a carrier then it is not possible to have affected offspring / 0% chance (1)

Joe has inherited a recessive allele from each parent (1)

Joe is {homozygous recessive/dd} (1)

Elle must have inherited at least one dominant allele from her parents (1)

Elle could be {homozygous dominant/DD} /
Elle could be {heterozygous /Dd} (1)</td>
<td>
<table>
<tr><td></td><td>D</td><td>d</td></tr>
<tr><td>D</td><td>DD</td><td>Dd</td></tr>
<tr><td>d</td><td>Dd</td><td>dd</td></tr>
</table>

<table>
<tr><td></td><td>D</td><td>D</td></tr>
<tr><td>D</td><td>DD</td><td>DD</td></tr>
<tr><td>d</td><td>Dd</td><td>Dd</td></tr>
</table>
</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>8</td>
</tr>
</table>

Question Number	Indicative Content	
9	• Leaf has large surface area • so that large amount of (sun)light can be absorbed • plant can turn leaves towards light source • so that large amount of (sun)light can be absorbed • leaf cells contain chloroplasts which contain chlorophyll • so that (sun)light can be absorbed • waxy • to reduce water loss • xylem present • to bring water to leaf • phloem present • to remove/transport glucose produced and take to rest of plant • guard cells present • to open and close stoma • stoma/stomata present • to take in carbon dioxide/release oxygen	
Level	Mark	Descriptor
	0	No rewardable material.
Pass	1-2	Learners show some understanding of at least one adaptation of a leaf or cell component linked to photosynthesis. 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.
Merit	3-4	Learners show understanding of two adaptations of the leaf or one adaptation of the leaf and one adaptation of a cell component and how they are linked to photosynthesis. 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.
Distinction	5-6	Learners show a good understanding of an adaptation of the leaf and a cell component and how they are linked to photosynthesis, The answer is fully justified. A detailed discussion of each size. The majority of points made will be relevant and there will be some clear link to the situation in question.
		Total 6