Mark Scheme (Results)

February 2020

Pearson BTEC Level 1/Level 2 Firsts in Principles of Applied Science

Unit 1: Principles of Science (20460E)

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General Marking Guidance

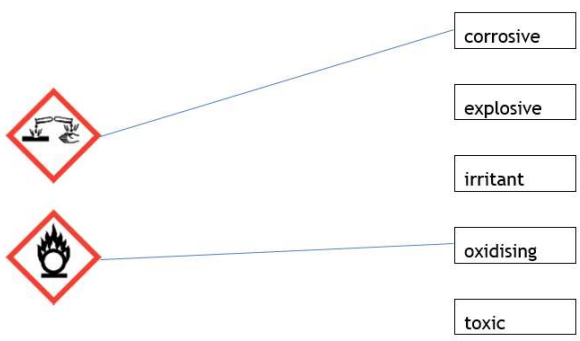
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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.
- Phonetic spelling should be accepted.

Question Number	Correct Answer	Additional Guidance	Mark
1	input energy – electrical (1) useful energy – light (1) - sound (1) wasted energy – thermal (1)	allow electric ignore electricity useful energies can be in either order allow heat	4
		Total	4 marks

Question Number	Correct Answer	Additional Guidance	Mark
2 (a)(i)	(crude) oil / (natural) gas / coal		1
2 (a)(ii)	takes millions of years to make again / cannot be (easily) replaced	allow takes thousands of years to make again allow (once used) it cannot be used again allow they will run out	1
2 (a)(iii)	chemical		1
2 (b)	the proportion of energy transferred to useful forms	allow amount / percentage for proportion allow efficiency equation	1
2 (c)	1785 (2) OR $\frac{15\,000}{1000}$ x 17 x 7 = (1785) (2) OR $\frac{15\,000}{1000}$ (1) OR 15 000 x 17 x 7 = (1)	 15 1 785 000	2
		Total	6 marks

Question Number	Correct Answer	Additional Guidance	Mark
3 (a)	Wavelength	allow λ	1
3 (b)	number of waves (that pass a point/sent out) in one second	allow other units of time	1
3 (c)	any two from: long wavelength (1) can travel long distances (1) not {harmful/dangerous} to humans (1) they are reflected (1) allow any other valid response.	allow low frequency (1)	2
3 (d)	1.0×10^9 (4) OR $\frac{3 \times 10^8}{0.3}$ (3) OR 1 000 000 000 (3) OR $\frac{300\ 000\ 000}{0.3}$ (2) OR $3 \times 10^8 = 0.3 \times$ frequency (2) OR 300 000 000 = 0.3 x frequency (1) OR frequency = $\frac{\text{wave speed}}{\text{wavelength}}$ (1) OR 3×10^8 (1)		4

		allow 1 mark for incorrect answer with working written in correct standard form	
			Total 8 marks

Question Number	Correct Answer	Additional Guidance	Mark
4 (a)		reject multiple lines from a symbol	2
4 (b)	allow any value between 6.99 and 0 inclusive	allow a range within these numbers	1
4 (c)(i)	**B** HNO_3		1
4 (c)(ii)	two or more different {elements/atoms/ions} (1) (chemically) bonded/joined (1)	allow two or more elements	2
		Total	6 marks

Question Number	Correct Answer	Additional Guidance	Mark
5 (a)(i)	D ●		1
5 (a)(ii)	C ★		1
5 (a)(iii)	A ▲		1

5 (a)(iv)	-1/negative/minus one/-/minus/e^{-}/e^{-1}/e minus	do not allow 1 alone	1
5 (b)	an explanation linking any two from: isotope (1) not all atoms (in a sample) have the same mass (1) some atoms have a different number of neutrons (1) (the relative atomic mass is a weighted) {average/mean} of (natural isotopic) masses (1)		2
		Total	6 marks

Question Number	Correct Answer	Mark
6	a description linking: • use a delivery tube (1) • upside down test tube or measuring cylinder over water / gas syringe (1) • test for carbon dioxide using limewater (1) • (carbon dioxide) limewater will turn cloudy/milky (1) • test for hydrogen using a lit splint (1) • (hydrogen) will produce a squeaky pop (1)	6
	Total	6 marks

Question Number	Correct Answer	Additional Guidance	Mark
7 (a)(i)	single (labelled) line to vacuole		1
7 (a)(ii)	**D** Stores cell sap		1
7 (a)(iii)	absorbs {water/minerals}		1
7 (b)	large surface area/thin cell wall/(more) permeable/more mitochondria	allow description of shape of root hair cell	1
		Total	4 marks

Question Number	Correct Answer	Additional Guidance	Mark
8 (a)	**A** Homeostasis		1
8 (b)(i)	temperature / pH / salt levels / gas levels / oxygen levels /water allow named examples. allow any other valid response.	ignore blood sugar/glucose	1
8 (b)(ii)	insulin	allow phonetic spelling	1
8 (b)(iii)	pancreas	allow phonetic spelling	1
8 (c)	any four from : endocrine system is slow(er) / nervous system is fast(er) (1) (because) the hormones move around via the blood stream (1) (because) electrical signals are sent via {neurones / nerve cells} (1) effects due to hormones are long- lasting / effects due to electrical impulses are short-lived (1) (because) hormones remain in the blood stream (1) allow any other valid response.		4
		Total	8

Question Number	Indicative Content
9	• white sheep is heterozygous • the white sheep has one dominant white allele and one recessive black wool allele • the black sheep is homozygous • the black sheep has two recessive black wool alleles • the white wool allele is dominant • the black wool allele is recessive • the lambs have a 50:50/2:4/50% chance of being black or white • both lambs can only receive a black wool allele from the black sheep • the first lamb inherited a white wool allele from the white sheep • the second lamb inherited a black wool allele from the white sheep • the first lamb has the genotype Ww • because the white wool allele is dominant • it has the phenotype of white wool • the second lamb has the genotype ww • it has the phenotype of black wool Allow a labelled Punnett square.

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.
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.
Distinction	5–6	A detailed explanation. The majority of points made will be relevant and there will be some clear link to the situation in question.
Total		6 marks