



Pearson



Mark Scheme

June 2018

Pearson BTEC Level 1/Level 2 Firsts in
Applied Science

Unit 1: Principles of Applied Science
(20460E)



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June 2018

Publications Code 20460E_1806_ms

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BTEC Next Generation Mark Scheme

Applied Science Unit 1 1806

Question Number	Correct Answer	Additional Guidance	Mark
1 (a)	one line from speaker to sound (1) one line from screen to light (1)	do not allow multiple lines	2
1 (b)	thermal	allow heat	1
1 (c)	chemical	allow potential	1
		Total	4

Question Number	Correct Answer	Additional Guidance	Mark
2 (a)	watt(s) /W	allow multiples of the unit, e.g. kilowatts/kW allow J/s	1
2 (b)	A - coal		1
2 (c)	6.5 (%) (2) OR 0.065 x 100 (2) OR $\frac{26}{400} \times 100$ (2) OR $\frac{400 - 374}{400} \times 100$ (2) OR 400-374 (1) OR 0.065 (1)	allow ECF throughout allow $\frac{13}{2}$ 26 seen gains 1 mark	2

2(d)	<p>any two from:</p> <p>only produces water / does not produce carbon dioxide / better for the environment (1)</p> <p>hydrogen reacts with oxygen (only) (1)</p> <p>so does not pollute (the atmosphere) / does not produce {acidic gases / sulfur dioxide} does not cause acid rain (1)</p> <p>efficient (reaction) (1)</p>	<p>accept responses that refer to other fuel cells</p> <p>allow conserves fossil fuels ignore they give more energy than other fuels ignore cheap</p>	2
		Total	6

Question Number	Correct Answer	Additional Guidance	Mark
3 (a)(i)	3 / three	allow + 3 / -3	1
3 (a)(ii)	2 / two		1
3(b)	<p>240 (Hz) (2)</p> <p>OR</p> <p>$\frac{360}{1.5}$ (2)</p> <p>OR</p> <p>$\frac{\text{wavespeed}}{\text{wavelength}} = \text{frequency}$ (1)</p> <p>OR</p> <p>$360 = 1.5 \times \text{frequency}$ (1)</p>		2

3(c)	<p><u>benefit</u></p> <p>Any two from:</p> <p>(gamma rays) can penetrate the body (1)</p> <p>(so, with computer software) identifies where cancer is in the body (1)</p> <p>(gamma rays) can be targeted onto cancer / tumours (1)</p> <p>so that cancer cells are destroyed/tumour is shrunk (1)</p> <p>(gamma rays) can destroy bacteria (1)</p> <p>so can be used to sterilise medical equipment (1)</p> <p>AND</p> <p><u>Risk</u></p> <p>Any two from:</p> <p>(gamma rays) damage DNA (1)</p> <p>which can cause cancer (1)</p> <p>may cause radiation sickness (1)</p> <p>can cause burns (1)</p> <p>some (surrounding healthy) {tissue/cells} can be damaged (1)</p> <p>can put {healthcare workers / people in contact with patients} at risk (1)</p>	<p>allow can be used to treat cancer</p> <p>allow kills bacteria</p> <p>allow mutates DNA</p> <p>allow kills {normal/healthy} cells</p> <p>allow health care workers could become ill</p>	4
		Total	8

Question Number	Correct Answer	Additional Guidance	Mark
4 (a)	C - He		1
4 (b)	D - Li and Rb		1
4 (c)	D - P		1
4 (d)(i)	B	allow boron	1
4 (d)(ii)	relative mass = 1 (1) relative charge = +1 (1)	allow +1 allow + / 1	2
		Total	6

Question Number	Correct Answer	Additional Guidance	Mark
5 (a)(i)	harmful / moderate hazard / irritant / health hazard / hazardous to ozone layer / caution / skin sensitiser	allow danger	1
5 (a)(ii)	carbon dioxide	allow CO ₂	1
5 (b)(i)	use a lit splint (1) (burns with a squeaky) pop (1)	allow flame second mark point cannot be score if incorrect test given allow pop (test) for 1 mark	2
5(b)(ii)	$\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$ LHS = 1 RHS = 1	allow correct multiples if they add to the Mg and MgCl ₂	2
		Total	6

Question Number	Correct Answer	Additional Guidance	Mark
6	<p>any four from:</p> <p>sulfur dioxide is a gas (1)</p> <p>that dissolves in {clouds / water vapour} (1)</p> <p>{acid rain / sulfuric acid} is formed (1)</p> <p>{acid rain / sulfuric acid} (falls into lakes and) makes them acidic / acid rain lowers the pH of the lake (1)</p> <p>can kill fish / destroy plants (1)</p> <p>(this then) {disrupts/destroys} food chains (1)</p> <p>any two from:</p> <p>acid + base → salt + water (1)</p> <p>{calcium carbonate / named base /named alkali / base/ alkali} (1)</p> <p>can reduce acidity / adding a base raises the pH (1)</p>	<p>MP 3, 7 and 8 can be scored with a correct word or symbol equation, e.g. sulfuric acid + calcium carbonate → calcium sulfate + carbon dioxide + water (3)</p>	
	Total		6

Question Number	Correct Answer	Additional Guidance	Mark
7(a)	<p>A = nucleus</p> <p>B = cell wall</p> <p>C = vacuole</p>		3
7 (b)	<p>(site of) photosynthesis / absorb light (for photosynthesis) / convert light energy into chemical energy</p>	<p>allow absorb (suns) energy</p> <p>allow stores chlorophyll</p> <p>allow stores chemical energy</p>	1

		ignore stores energy alone allow makes glucose / turns sunlight into glucose reject respiration	
		Total	4

Question Number	Correct Answer	Additional Guidance	Mark
8(a)	A - homeostasis		1
8(b)(i)	brain (1) spinal cord (1)	ignore spine	2
8(b)(ii)	peripheral (nervous system) / PNS	do not allow nervous system alone	1
8(c)	any four from: no trapped (insulating layer of) air (1) allows air to get closer to the skin (1) so heat can be lost (1) {water/sweat} absorbs {heat/energy} from {skin/blood/body} (1) {water/sweat} evaporates (1)	allow heat is not trapped (by insulating layer of air) allow {water/sweat} is vaporised	4
		Total	8

Question Number	Indicative Content	
9	<p>Red blood cells</p> <ul style="list-style-type: none"> • have a large surface area (to volume ratio) • contain haemoglobin to bind to oxygen • haemoglobin contains iron • transport oxygen around the body • biconcave shape • no nucleus • can carry large amounts of oxygen <p>White blood cells</p> <ul style="list-style-type: none"> • different types with different functions • fight infection/ disease <ul style="list-style-type: none"> ▪ irregular shape ▪ to squeeze out of blood vessels ▪ highly mobile to get to site of infection ▪ engulf antigens / microorganism ▪ can increase in numbers / multiply ▪ contain enzymes ▪ to digest pathogens ▪ release antibodies ▪ to destroy toxins / pathogens / combine with antigens ▪ have memory to infections 	
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. red blood cells transport oxygen around the body and have a biconcave shape.
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. red blood cells have no nucleus so that they have a large surface area so that they can transport a large amount of oxygen.
Distinction	5-6	A detailed discussion of each. The majority of points made will be relevant and there will be some clear link to the situation in question, e.g. red blood cells have no nucleus so they have a large surface area so that they can transport a large amount of oxygen and white blood cells fight infection.
		Total 6

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