PEARSON EDEXCEL GCSE PHYSICS (HIGHER) · 1PH0

PHYSICS



MARK SCHEME

TOPIC 5: LIGHT AND THE ELECTROMAGNETIC SPECTRUM (PACK 2)

SCORE	PERCENTAGE
/55	%

STEMUP

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Mark Scheme

Q1.

<table>
<tr><th>Question number</th><th>Answer</th><th>Mark</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>wave velocity</td><td>wavelength</td></tr>
<tr><td>[x] A</td><td>decreases</td><td>decreases</td></tr>
</table>

B is not correct because the wavelength does not increase
C and are not correct because the wave velocity does not increase</td><td>(1)
AO1</td></tr>
</table>

Q2.

Question Number:	Answer	Mark
(i)	☒ C a neutron **The only correct answer is C (neutron causes U-235 fission)** **A** is not correct – incorrect particle **B** is not correct – incorrect particle **D** is not correct – incorrect particle	**(1)**

Question Number	Answer	Additional guidance	Mark
(ii)	recall and substitution (1) $1.2 \times 10^{-11} = ½ \times 1.4 \times 10^{-25} \times v^2$ rearrangement (1) $v^2 = \frac{2 \times 1.2 \times 10^{-11}}{1.4 \times 10^{-25}}$ evaluation (1) (v=) 1.3×10^7 (m/s)	accept rearrangement and substitution in either order ignore POT until evaluation $v^2 = 1.71 \times 10^{14}$ allow numbers that round to 1.3×10^7 (m/s) 1.3 to any other power of ten scores 2 marks award full marks for the correct answer without working	**(3)**

Q3.

Question number	Answer	Additional guidance	Mark
	D a TV remote control		**(1)**

Q4.

Question Number	Answer	Additional guidance	Mark
	in this order infrared (wave) / IR (1) micro(wave) (1) radio (wave) (1) gamma (ray/wave)(1)	 accept μ(wave) accept γ not X	**(4)** AO 1 1

Q5.

Question Number	Answer	Additional Guidance	Mark
(i)	recall (1) (ΔPE) = mgh substitution and rearrangement (1) $h = \frac{1300}{7 \times 10}$ evaluation (1) 19 (m)	 1300 = 7 x 10 x h work done = force x distance accept answers that round up to 19 (m) (e.g. 18.57 (m)) award full marks for the correct answer with no working	**(3)** AO 1 1 AO 2 1

Question Number	Answer	Additional guidance	Mark
(ii)	recall (1) $KE = ½ m v^2$ substitution and rearrangement (1) $v = \sqrt{(2 \times 1100 \div 8)}$ evaluation (1) 17 (m/s)	$v^2 = \frac{2 \times 1100}{8}$ accept answers that round up to 17 (m/s) (e.g. 16.58 (m/s)) award full marks for the correct answer with no working	**(3)** AO 1 1 AO 2 1

Q6.

Question Number	Answer	Additional guidance	Mark
	reading energies from graph (1) 5.2 and 3.9 (kJ) substitution (1) e.g. $\frac{1.3 \times (100)}{5.2}$ evaluation (1) 25(%)	accept 5.0 to 5.4 and 3.7 to 4.1 0.18 to 0.32 18 to 32 (%) award full marks for the correct answer with no working	**(3)** AO 2 1

Q7.

	Answer	Additional guidance	Mark
i	**Two** from: falling water/hydro (1) tides (1) sun/solar (1) geothermal (1) biomass (1)		**(2)** **AO1**

	Answer	Additional guidance	Mark
(ii)	recall and substitution (1) (%) efficiency = $\frac{2.2 \ (\times 100)}{6.2}$ evaluation (1) 0.35 (1)	 allow numbers that round to 0.35 e.g. 0.3548 accept 35(%) for full marks award full marks for correct answer without working.	**(2)** **AO2**

	Answer	Additional guidance	Mark
(iii)	**One** from: air (has to be) moving on the other side of the blades (1) not all of the air hits the blade (1) friction within the turbine/generator (1) some energy (always) transferred to thermal (1) it is fitted with a speed limiter (1)		**(1)** **AO3**

Q8.

Question number	Answer	Additional guidance	Mark
	An answer that combines the following points of understanding to provide a logical description: • radio waves will not reach the satellites (from Earth) / be received (on Earth) from the satellites (1) • because they are reflected by the atmosphere (1)	 ORA for microwaves reflected by ionosphere / before reaching satellite	**(2)**

Q9.

Question Number	Answer	Mark
	B natural gas **is the only correct answer** *A geothermal is not a non-renewable source of energy* *C tidal is not a non-renewable source of energy* *D solar is not a non-renewable source of energy*	**(1)** AO 1 1

Q10.

Question Number	Answer	Additional guidance	Mark
	an explanation linking: increased use of renewables/decrease use of nonrenewables (1) reason (1)	 accept "them" as renewable accept reason why renewables are beneficial accept reason why non-renewable(s) are not beneficial	**(2)** AO 1 1

Q11.

Question Number	Answer	Additional guidance	Mark
	an explanation linking: (the colours have) different wavelengths (1) different wavelengths / colours travel at different speeds (1) so refract by different amounts (1)	 allow the word frequencies for wavelengths for refract allow bend/change direction/follow different path	**(3)** AO 2 1

Q12.

Question number	Answer	Additional guidance	Mark
	(original) GPE – KE (at bottom) (1)	allow (idea of) input – output allow wrong way round (eg output-input)	**(1)**

Q13.

Question Number	Answer	Additional guidance	Mark
	An answer that includes: (measure) mass of the trolley (1) (measure) (vertical) height / h (1) repeat for a range of masses (1) plus **any one** from: method of identifying / measuring h (1) OR repeat firing with same mass (1)	 weigh the trolley NOT measure height of ramp e.g. use of reference mark accept "use ruler to measure height/h" for 2 marks NOT "use ruler to measure height of ramp"	**(4)**

Q14.

Question number	Answer	Additional guidance	Mark
	(vertical) height of slope (1) mass (of the toy car) (1)	 allow (in this context) weight if no other mark scored allow 1 mark for quoting either equation (Δ)GPE =mgh OR KE = ½ mv²	**(2)**

Q15.

Question number	Answer	Mark
(i)	Any three of • sound waves are longitudinal but radio waves are transverse. • sound waves need a medium but radio waves travel through a vacuum. • sound waves have (much) lower velocity than radio waves. • sound waves have lower frequency / greater wavelength than radio waves • sound waves are vibrations but radio waves are electromagnetic waves.	(3)

Q16.

Question Number	Answer	Additional Guidance	Mark
	one from causes heating of the surroundings (1) transferred to thermal energy of surroundings (1) increases the kinetic energy of molecules in the brake pads (1)	must include destination of final energy increases thermal energy of brake pads / wheels	**(1)**

Q17.

Question Number	Answer	Additional guidance	Mark
	suggestion to include **one** from (ultraviolet/UV) is (the most) harmful to the eyes (1) protects eyes from damage/harm (from UV rays) (1)	 (UV) can damage eyes protects against cataracts/cancer accept makes it more comfortable in bright sunlight	**(1)**

Q18.

Question Number	Answer	Additional guidance	Mark
	Any **two** advantages such as: nuclear fuel • does not contribute to global warming • does not use up fossil fuels • occupies less space • does not involve a supply of air • gives less reason to surface/refuel • lasts longer	 accept reverse arguments does not produce carbon dioxide / greenhouse gases ignore cheaper, cleaner, greener, pollutes the sea, more efficient, unqualified safety, renewable	(2)

Q19.

Question number	Answer	Acceptable	Mark
(i)	An explanation that combines identification - understanding (1 mark) and reasoning/justification - understanding (2 marks): • white light is a mixture of different wavelengths (1) • each wavelength / colour is refracted by a different amount (1) • short <u>wavelengths</u> are refracted more / ORA (1)	ignore colours	**(3)**

Question number	Answer	Acceptable	Mark
(ii)	An answer that combines the following points to provide a logical description of the method: • Place a thermometer (with blackened bulb) beyond position of red light (1) • Look for rise in temperature (measured by thermometer) (1)		**(2)**

Q20.

Question Number	Answer	Acceptable answers	Mark
(a)	**D** an ultraviolet wave		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	Ultraviolet (from lamp) <u>absorbed</u> (by fluorescent substance/bank note) (1) (which) emits {visible/light} (into eye) (1)	Allow UV for ultraviolet Allow 'taken in' for absorbed Allow 'given out'/releases/fluoresces for emits 'Fluoresces' on its own is insufficient Mention of both ultraviolet AND visible/light only, scores 1 mark only	**(2)**

Q21.

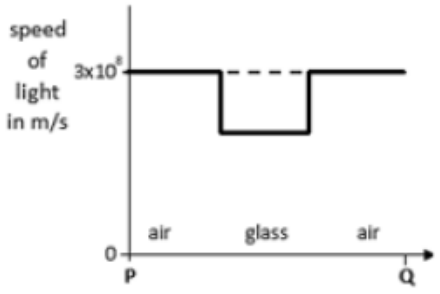
Question Number	Answer	Additional guidance	Mark
	reference to ΔPE = mg(Δ)h (1) relevant values from graph and one calculation to find energy (1) repeated with 2nd set of values (1)	can be seen in calculations e.g. 0.6 x 10 x 0.230 ≈ 1.4 (J) e.g. 1.0 x (10) x 0.138 ≈ 1.4 (J) must see calculations for mp2 and 3 1 mark for 2 calculations of mh with 'g' omitted (MP3)	**(3)**

Q22.

	Answer	Acceptable answers	Mark
(a)	**light**→ electrical → **chemical** energy energy energy (1) (1)	These answers must be in the correct order	**(2)**
(b)(i)	350 (J)	400 – 50 (J)	**(1)**
(b)(ii)	Substitution 50 ÷ 400 (1) or $^{50 \times 100}/_{400}$ (%) Evaluation 13(%) (1)	 12.5(%), 0.125, 0.13 or 1/8 Give full marks for correct answer, no working	**(2)**
(c)(i)	An explanation linking the following points:		**(2)**

	black (1) (because) (good) absorber (of thermal radiation) (1)	{absorbs / takes in} heat radiation **ignore**references to: attract good emitter light dark / darker	
(c)(ii)	an explanation linking any **three**of the following points: • (bag / water) absorbs {thermal energy / heat / radiation} (1) • (bag / water) {radiates / emits} {thermal energy / heat / radiation} (1) • more heat radiated at higher temperature (1) • input and output are balanced (at steady temperature) (1)	idea of energy input e.g. "sun heats the bag up" idea of energy output idea of more heat lost (to surroundings)at higher temperature "absorbing heat at same rate as radiating heat" (3) **ignore**(sun) light / rays	**(3)**

Q23.

Question number	Answer	Mark
	 [X] B **B** is the correct answer A is not correct because the velocity in air is the same before and after the glass C is not correct because the velocity is constant inside the glass D is no correct because the velocity in glass is not greater than the velocity in air	**(1)** **AO3**