PEARSON EDEXCEL GCSE PHYSICS (HIGHER) · 1PH0

PHYSICS



MARK SCHEME

TOPIC 3: CONSERVATION OF ENERGY (PACK 2)

SCORE	PERCENTAGE
/70	%

STEMUP

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Mark Scheme

Q1.

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)**

Q2.

Question number	Answer	Additional guidance	Mark
(a)	An answer that combines the following points of understanding to provide a logical description: • measurement of time between(or at) two positions using suitable timing equipment (1) • measurement of suitable distance along the runway with metre rule (1) • measurement of vertical height to starting position (1) • repeats AND averages AND use of a correct equation (1)	allow stopwatch, light gates minimum is 0.5 m metal tape measure average speed = distance/time OR average speed = (speed at A − speed at B)/2	(4)

Question number	Answer	Additional guidance	Mark
(b)(i)	Substitution of correct data from graph and mass conversion (1) $0.5 \times 0.65 \times (0.61)^2$ Answer (1) 0.12 (J)	maximum of 1 mark if mass in g used allow tolerance of ±0.2 for speed	(2)

Question number	Answer	Additional guidance	Mark
(b)(ii)	• Tangent to the graph at $h = 0.1$ (1) • Answer in the region 3.5 to 3.6	either seen on graph or suitable pairs of values of Δv and Δh	(2)

Question number	Answer	Mark
(b)(iii)	An answer that combines points of interpretation/evaluation to provide a logical description: • for each change in height, as the height increases the speed of the trolley increases • the greatest change in speed is between the change in height from 0.04 m to 0.9 m	(2)

Question number	Answer	Additional guidance	Mark
(c)	An answer that combines the following points to provide a logical description of the plan/method/experiment: • identifies control variables (1) • uses at least 3 different surfaces (1) • calculates average speed for each surface and repeats (1)	constant height, constant slope, constant starting points and same length of surface	(3)

Q3.

Question Number	Answer	Additional Guidance	Mark
(i)	recall (1) $(\Delta PE) = mgh$ 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 =√(2 x 1100÷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

Q4.

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) $KE = \frac{1}{2} m v^2$ 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

Q5.

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

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	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

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: 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

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
	(original) GPE – KE (at bottom) (1)	allow (idea of) input – output allow wrong way round (eg output-input)	**(1)**

Q14.

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)**

Q15.

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)**

Q16.

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)**

Q17.

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)**

Q18.

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)**

Q19.

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)

Q20.

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)**

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
	B. when there are energy transfers, the total energy does not change ***A*** *is not correct because the total energy does not reduce* ***C*** *is not correct because the total energy does not reduce* ***D*** *is not correct because the total energy does not increase*	**(1)** **AO1**