
GCSE COMBINED SCIENCE: TRILOGY

PAPER 5: PHYSICS 1H

Mark scheme

Specimen 2018

Version 0.1

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	The current through both lamp P and lamp Q is 1.0 A		1	AO2/2 6.4.2
01.2	6 V		1	AO2/2 6.4.2
01.3	It will be lower in the series circuit than the parallel circuit.		1	AO2/2 6.4.2
01.4	3 V		1	AO2/2 6.4.2
01.5	(the lamp will be) dimmer (increasing the resistance) decreases the current		1 1	AO2/2 6.4.1.3
01.6	potential difference = current $\times$ resistance $R = 3 / 0.15 \text{ (}\Omega\text{)}$ $R = 20 \text{ (}\Omega\text{)}$	accept correct rearrangement allow 20 (Ω) without working shown for the 2 calculation marks	1 1 1	AO1/1 AO2/1 AO2/1 6.4.1.3
01.7	line drawn from the origin with a decreasing gradient.		1	AO2/2 6.4.1.4
Total			10	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(the wasted energy) is dissipated into the environment / surroundings	 accept description of energy becoming more spread out and less useful for 2 marks	1 1	AO1/1 6.2.2.1
02.2	$E_K = \frac{1}{2} \text{ mass} \times \text{velocity}^2$ $E_K = \frac{1}{2} \times 0.8 \times 12^2$ $E_K = 57.6 \text{ (J)}$	 allow 57.6 (J) without working shown for the 2 calculation marks	1 1 1	AO1/1 AO2/1 AO2/1 6.2.1.2
02.3	lower proportion of wasted energy higher proportion of energy is converted into <u>kinetic</u> energy	accept less energy is wasted accept more kinetic energy	1 1	AO2/1 6.2.2.1
02.4	running cost of electric car = £3 000 running cost of petrol engine car = £24 000 total cost of electric car = £30 000 and total cost of petrol engine car = £39 000 the electric car will save £9 000		1 1 1 1	AO3/2b 6.2.3
Total			11	

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	electromagnetic radiation from the <u>nucleus</u>	'electromagnetic radiation' is insufficient	1	AO1/1 6.7.2.1
03.2	(Gamma is the most penetrating) so a large proportion of the emitted radiation will leave the body more easily detected outside the body		1 1	AO1/1 6.7.2.1
03.3	(average) time it takes for the number of nuclei of the isotope in a sample to halve or (average) time it takes for the count rate from a sample containing the isotope to fall to half its initial level		1	AO1/1 6.7.2.3
03.4	initially there is a high level of hazard. level of hazard drops to a low level quickly (activity initially high) due to short half-life or (drops to safe level quickly) due to short half-life	answer must imply short period of time	1 1 1	AO1/1 6.7.2.4
3.5	it is exposed to ionising radiation		1	AO1/1 6.7.2.4
3.6	does not become radioactive		1	AO1/1 6.7.2.4
Total			9	

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	atomic number is the number of protons		1	AO1/1 6.7.1.2
	mass number is the number of protons and neutrons		1	
04.2	a neutron changes into a proton (so atomic number increases by 1)	allow emits a electron with an atomic number of –1	1	AO1/1 6.7.2.2
	neutrons are neutral/have no charge and protons are positively charged (so charge increases by 1)		1	
04.3	Increase absorb electromagnetic radiation	allow collision with <u>named</u> particle	1	AO1/1 6.7.1.1
	Decrease emit electromagnetic radiation		1	
Total			6	

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	water boils at the same temperature each time		1	AO3/3a
	control starting temp by allowing enough time for water and kettle to reach room temperature		1	6.2.1.6 WS2.2
05.2	uncertainty = $(302 - 298)/2$		1	AO2/2
	uncertainty = ± 2 (s)	ignore missing $\pm$	1	6.2.1.6 WS3.4
05.3	Energy transferred = Power $\times$ time		1	AO1/1
	$E = 2.20 \times 300$		1	AO2/1
	$E = 660$ (kJ)	allow 660 (kJ) without working shown for the 2 calculation marks	1	AO2/1 6.2.1.6
05.4	(mass $\times$ change in temperature) / mass	allow 1 mark for any correct pair of values from the table eg 20 / 0.25	1	AO2/2 6.2.1.4
	80 ($^{\circ}\text{C}$)	allow 80 ($^{\circ}\text{C}$) without working shown for 2 marks	1	
05.5	four points plotted correctly	allow 1 mark for three correctly plotted points ecf their 5.3 allow $\pm 1\text{mm}$	2	AO2/2 6.2.1.4 WS3.2
	accurate line drawn	line should be straight and drawn with a ruler line must not go through the origin	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	values read correctly from graph correct conversion into J correct substitution into $\Delta y/\Delta x$ value in range 4200 – 4800 (J/kg°C)	allow value in range 4200 – 4800 without working shown for 4 marks	1 1 1 1	AO2/2 6.2.1.4 WS3.2
05.7	some of the energy supplied does not raise the temperature of the water	some of the energy is wasted is insufficient	1	AO3/3b 6.2.1.4
05.8	(the power of the kettle may not be 2.2kW) (by measuring the power) the student can accurately calculate the amount of energy supplied to each mass of water		1	AO3/3a 6.2.1.4
Total			18	

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	random	accept in all directions description must be of random motion	1	AO1/1 6.6.3.1
06.2	(the particles in a gas) move at high speeds they collide with the walls of the container exerting a force pressure is force per unit area	accept equation for pressure	1 1 1	AO1/1 6.6.3.2
06.3	decreases the internal energy decreases the mean speed of the particles force (on collision with the walls of the container) decreases (so pressure decreases)	allow decreases (mean) kinetic energy	1 1 1	AO1/1 6.6.3.1
06.4	Density = mass / volume $m = 2.5 \times 10^{-5} \times 1000$ $m = 0.025 \text{ (kg)}$ $E = 0.025 \times 2\,260\,000$ $E = 56\,500 \text{ (J)}$	allow 56 500 (J) without working shown for the 4 calculation marks 0 marks awarded for $E = m \times L$	1 1 1 1 1	AO1/1 AO2/1 AO2/1 AO2/1 AO2/1 6.6.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	(condensing boilers) are more efficient less energy is wasted less gas is burned to heat the same amount of water less waste gas (CO ₂) is produced by the boiler or (because less gas is used) they are cheaper to run/save money		1 1 1 1	AO3/1b 6.2.2.2
Total			16	