

AQA Style

GCSE

COMBINED SCIENCE: TRILOGY

Higher Tier

Physics Paper 1

H

Mark Scheme



Question 1

Question	Answers	Extra information	Mark
01.1	vibrate (in fixed positions)		1
01.2	$9450 = 0.5 \times c \times 9$ $\frac{9450}{0.5 \times 9}$ or $\frac{9450}{4.5}$ $= 2100 \text{ (J/kg } ^\circ\text{C)}$	An answer of 2100 with no working scores 3 marks.	1 1 1
01.3	specific heat capacity is the amount of energy required to raise the temperature of one kilogram (of the substance) by one degree Celsius specific latent heat is the amount of energy required to change the state of one kilogram (of the substance) (with no change in temperature)	Allow $^\circ\text{C}$ for degree Celsius.	1 1
01.4	the temperature stays the same		1
01.5	the mass stays the same because the number of particles does not change/no particles have been lost	Allow the mass is 0.5kg.	1 1
01.6	it will recover its original properties if the change is reversed	Allow chemical changes cannot be easily reversed.	1
Total			10



Question 2

Question	Answers	Extra information	Mark
02.1	kg/m ³	If more than one box is ticked, award no marks.	1
02.2	Level 3: There is a clear description which would produce an accurate measurement of both the regular and irregular objects. Steps are logically ordered and could be followed to obtain valid results.		5-6
	Level 2: There is a clear description of one method to measure density, or a partial description of both methods. Steps may not be logically ordered.		3-4
	Level 1: There are simple statements that give a brief description of parts of the method(s).		1-2
	No relevant content.		0
	Indicative content: For both: <ul style="list-style-type: none">• measure the mass using balance/scales• calculate density using density = $\frac{\text{mass}}{\text{volume}}$ (allow $\rho = \frac{m}{v}$) Regular objects: <ul style="list-style-type: none">• measure the length of the sides of the object/cube using a ruler/tape measure/Vernier callipers• evidence of volume = length × width × height Irregular objects: <ul style="list-style-type: none">• immerse in water/displacement can/eureka can• measure the volume of water displaced/collected using a measuring cylinder• the volume of the object is equal to the volume of water displaced		



02.3	density decreases	Accept goes down/ is lower.	1
	because the particles have more (kinetic) energy		1
	(so) the particles are spread further apart/ take up more space		1
Total			10





Question 3

03.1	protons neutrons	Both answers are required for the mark.	1
03.2	electrons have a charge of -1/are negative and protons have a charge of +1/are positive		1
	the number of protons is equal to the number of electrons	If no other mark is awarded, allow 1 mark for the charges cancel out.	1
03.3	atoms of the same element	Allow the same number of protons.	1
	that have a different number of neutrons		1
03.4	14	Answers in this order only.	1
	7	Both answers required for the mark.	
03.5	Y		1
03.6	the (average) time taken for the amount/ number of nuclei/atoms (in a sample) to halve	Allow the time taken for the count-rate/radioactivity to fall to half.	1
03.7	all points plotted correctly	Allow $\pm \frac{1}{2}$ a small square. Allow 1 mark for 3 or 4 points plotted correctly.	2
	curve of best fit	Do not award the mark if a straight line has been drawn. Allow correct line of best fit for incorrectly plotted points.	1



03.8	4 (hours)	Allow 1 mark for evidence of finding half-life on Figure 6.	2
03.9	1:8		1
Total			14





Question 4

Question	Answers	Extra information	Mark
04.1	chemical	Answers in this order only.	1
	kinetic		1
	gravitational potential		1
04.2	energy transferred = power \times time	Allow $E = Pt$ Allow any correct rearrangement.	1
04.3	$15 \times 60 = 900$ (s)	An answer of 4320 (J) with no working scores 3 marks.	1
	4.8×900		1
	4320 (J)	Allow 2 marks for an answer of 72 (J).	1
04.4	it is transferred to the surroundings		1
04.5	$\frac{1920}{3200}$	An answer of 0.6 with no working scores 2 marks.	1
	0.6	Allow 60%	1
04.6	Any one from: <ul style="list-style-type: none">• lubricate moving parts/propellers (to reduce friction)• streamline the shape of the toy (to reduce air resistance)• use wires with less resistance• reduce vibrations/tighten loose parts (to reduce sound)		1
Total			11



Question 5

Question	Answers	Extra information	Mark
05.1			1
05.2	15mA (15mA ÷ 1000 =) 0.015A		1 1
05.3	$0.7 = 0.015 \times R$ $\frac{0.7}{0.015}$ 46.7 (Ω)	Allow error carried forward from 05.2 . Allow 46.6(6...) (Ω) or any correct rounding. An answer that rounds to 46.7(Ω) with no working shown scores 3 marks.	1 1 1
Total			6



Question 6

Question	Answers	Extra information	Mark
06.1	A current that repeatedly changes direction.		1
06.2	230V	Unit is required for the mark.	1
06.3	the (brown) wire is live		1
	(so) there is a risk of electric shock/ electrocution (if someone touched the case)	Do not allow the case would become live.	1
06.4	(step-up transformers) increase voltage/ potential difference		1
	(which) reduces current		1
	(which) reduces energy loss from the cables	Accept increases the efficiency of energy transfer.	1
Total			7



Question 7

Question	Answers	Extra information	Mark
07.1	the energy source can be replenished as it is used	Allow replaced/ restored. Allow replaced faster than it is used. Do not allow renewed. Do not allow reused. Do not allow can be used again.	1



07.2	Level 3: Relevant points are identified, given in detail and logically linked. There is a judgement given.	5-6
	Level 2: Some logically linked points are given. There may also be a simple judgement.	3-4
	Level 1: Relevant points are made. They are not logically linked.	1-2
	No relevant content.	0
	<ul style="list-style-type: none">• neither source produces pollutant gases/named gas/ greenhouse gases/contributes to global warming• both require structures to be built, which takes up land and has an impact on the habitats, visually unappealing• nuclear energy is non-renewable (although there is no sign of resources running out soon)• wind farms cause noise pollution• nuclear energy sources are more reliable/can generate all the time• wind is less reliable as it relies on the weather• nuclear energy is a concentrated source of energy/can generate a lot of/more electricity• nuclear produces waste products which need storing safely (for a long time)• there are no waste products from wind turbines• nuclear energy is/can be radioactive/emits radiation which might have an impact on the environment and/or health• nuclear energy has higher running costs because of the need for transporting fuel and waste• there are no transport costs associated with wind power	



07.3	$(E_k =) 0.5 \times 1000 \times (20)^2$		1
	$= 200\,000 \text{ (J)}$	200 000 (J) with no working shown scores 2 marks.	1
	$200\,000 = 1000 \times 9.8 \times h$	Allow their $E_k = 1000 \times 9.8 \times h$	1
	$\frac{200\,000}{1000 \times 9.8}$ or $\frac{200\,000}{9800}$	Allow $\frac{\text{their } E_k}{1000 \times 9.8}$ or $\frac{\text{their } E_k}{9800}$	1
	$= 20.4 \text{ (m)}$	Allow 20.4(0816) (m) or any correct rounding. Allow an answer consistent with their value of E_k . An answer that rounds to 20.4 (m) with no working shown scores 5 marks.	1
Total		12	