AQA Style

GCSE

PHYSICS

H

Higher Tier Physics Paper 1

Mark Scheme

BEYOND SCIENCE

Question 1

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

Question 2

Question	Answers	Extra information	Mark
02.1	hat and hair rub together	Accept there is friction between the hat and the hair.	1
	<u>electrons</u> transfer (from the hair to the hat/from the hat to the hair)	Hat and hair must be mentioned at least once for the second mark to be awarded.	1
02.2	each hair has the same type of charge/is negatively/positively charged	Allow each hair gains/loses electrons.	1
	the (positive/negative) charges repel	Accept the electrons repel.	1
02.3	nylon		1
02.4	take more measurements/repeats		1
	calculate a new mean		1
02.5	reproducible		1
02.6	minimum of three arrows perpendicular to the surface with all arrows pointing outwards	Judge by eye. Do **not** accept any arrows pointing inwards.	1
02.7	there is a potential difference between the dome and the earthed sphere	Do **not** accept the dome is charged.	1
	which causes electrons/charges to move from the earthed sphere/to the metal dome		1
Total			**11**

Question 3

Question	Answers	Extra information	Mark
03.1	**Level 3:** There are descriptions of the particles in both solids **and** gases and these are linked to at least one property of each state.		5-6
	Level 2: There are descriptions of the spacing and movement in both solids and gases **or** a description of the spacing and movement of particles in one of the states, linked to the properties of that state of matter.		3-4
	Level 1: There are simple statements that describe the particles in either solids or gases. Two marks can be given for any two valid statements.		1-2
	No relevant content.		0
	Indicative content: **Solids** • particles are close together • (so) there is no room for the particles to move closer/be squashed/compressed • vibrate about a fixed point • (so) it keeps its own shape **Gases** • particles are far apart • (so) the space between the particles makes it easy to compress/ squash • particles move randomly • (so) spread out in all directions to fill the container		

03.2	80		1
03.3	pressure would increase because the particles (of gas) would have more (average) kinetic energy (so) would exert a greater force on the walls of the container **or** there would be more frequent collisions with the walls of the container	Allow any value of pressure above 1Pa. Allow higher (average) speed.	1 1 1
03.4	80 × 1.2 = 96 96 = 120 x p p = 0.8 (Pa)	 Allow $p = \frac{80 \times 1.2}{120}$ for the first two marking points. An answer of 0.8 (Pa) with no working scores **3** marks.	1 1 1
03.5	work is done on the air (in the balloon) (so) the temperature (of the air) increases	 Allow the (average) kinetic energy of the particles increases.	1 1
Total			**15**

Question 4

Question	Answers	Extra information	Mark
04.1	**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:** • measure the mass using balance/scales • calculate density using density = $\frac{\text{mass}}{\text{volume}}$ (allow $\rho = \frac{m}{v}$) **Regular objects:** • 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:** • 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		

04.2	when the water is cooled the density increases/is higher because the particles have less/decreased kinetic energy so are closer together the water is now denser than the ball (so the ball floats on the water)	Accept converse argument. Accept the ball is less dense than the water. Do **not** accept an answer that implies the ball has changed in density.	1 1 1 1
Total			**10**

Question 5

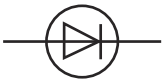
Question	Answers	Extra information	Mark
05.1	neutron		1
05.2	additional neutrons collide with nuclei causing further fission/splitting	Accept particle named in **05.1.** Accept particle **X.**	1
05.3	the mass stays the same		1
05.4	14 7	Answers in this order only. Both answers required for the mark.	1
05.5	Y		1
05.6	atoms of the same element that have a different number of neutrons	Allow the same number of protons.	1 1
05.7	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
05.8	all points plotted correctly curve of best fit	Allow ± ½ a small square. Allow **1** mark for 3 or 4 points plotted correctly. Do not award the mark if a straight line has been drawn. Allow correct curve of best fit for incorrectly plotted points.	2 1

05.9	4 (hours)	Allow **1** mark for evidence of finding half-life on **Figure 12.**	2
05.10	1:8		1
Total			**14**

Question 6

Question	Answers	Extra information	Mark
06.1	chemical	Answers in this order only.	1
	kinetic		1
	gravitational potential		1
06.2	energy transferred = power × time	Allow E = Pt Allow any correct rearrangement.	1
06.3	15 × 60 = 900 (s)	An answer of 4320 (J) with no working scores **3** marks.	1
	4.8 × 900		1
	4320 (J)	An answer of 72 (J) scores **2** marks.	1
06.4	it is transferred to the surroundings		1
06.5	$\frac{1920}{3200}$	An answer of 0.6 with no working scores **2** marks.	1
	0.6	Allow 60%	1
06.6	Any **one** from: • 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 7

Question	Answers	Extra information	Mark
07.1			1
07.2	15mA (15mA ÷ 1000 =) 0.015A		1 1
07.3	0.7 = 0.015 × R $\frac{0.7}{0.015}$ 46.7 (Ω)	Allow error carried forward from **07.2.** 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
07.4	0 (A) at 0.5V the current through component **Y**/the diode is 0 in a series circuit the current through all the components is the same		1 1 1
07.5	connect the lamp in parallel (so) the total resistance will be less than the resistance of the component with the least resistance **or** (so) the current has an extra path it can take	Allow reverse argument that adding the lamp in series would increase resistance because total resistance would be equal to the sum of the resistance of each lamp.	1 1
Total			**11**

Question 8

Question	Answers	Extra information	Mark
08.1	a current that repeatedly changes direction		1
08.2	230**V**	Unit is required for the mark.	1
08.3	the (brown) wire is live (so) there is a risk of electric shock/ electrocution (if someone touched the case)	 **Do not** allow the case would become live.	1 1
08.4	(step-up transformers) increase voltage/ potential difference (which) reduces current (which) reduces energy loss from the cables	 Accept increases the efficiency of energy transfer.	1 1 1
Total			**7**

Question 9

Question	Answers	Extra information	Mark
09.1	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

09.2	**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
	Indicative content: • 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	

09.3	$(E_k =) 0.5 \times 1000 \times (20)^2$ $= 200\,000$ (J) $200\,000 = 1000 \times 9.8 \times h$ $\frac{200\,000}{1000 \times 9.8}$ or $\frac{200\,000}{9800}$ $= 20.4$ (m)	 200 000 (J) with no working shown scores **2** marks. Allow their $E_k = 1000 \times 9.8 \times h$ Allow $\frac{\text{their } E_k}{1000 \times 9.8}$ or $\frac{\text{their } E_k}{9800}$ 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 1 1 1 1
Total			**12**