

AQA Style

GCSE

PHYSICS

Higher Tier

Physics Paper 2

H

Mark Scheme

Question	Answers	Extra Information	Mark
01.1	the force/mass (applied to the spring)	Accept weight.	1
01.2	Any one from: • use the same spring throughout the investigation • measure the same part of the spring each time i.e. including or excluding loop • unload the spring and check it has not reached its elastic limit each time • make sure the spring is stationary for each measurement • read the measurement at the same angle each time • make sure the masses each weigh the same/equal amounts/100g		1
01.3	10.1 (cm)	An answer of 10.13... scores 1 mark. Accept answer written in the table instead of on the answer line.	2
01.4	the student measured the total length of the spring instead of the extension	Accept student did not calculate/work out extension.	1
01.5	directly proportional		1
01.6	force = spring constant $\times$ extension	Allow any correct rearrangement. Allow $F = k e$	1

Question	Answers	Extra Information	Mark
01.7	$2 = \text{spring constant} \times 0.04$	Values correctly substituted into equation.	1
	$(\text{spring constant}) = \frac{2}{0.04}$	Correct transformation.	1
	50 (N/m)	An answer of 50 (N/m) with no working shown scores 3 marks.	1
		Award 2 marks for $\frac{2}{0.04}$ without the first step.	
Total			10

Question	Answers	Extra Information	Mark
02.1	Level 2: There is a description of the motion of the car in at least two sections of the graph. For four marks, there must be data from the graph included in the answer.		3-4
	Level 1: There are simple statements that describe the motion of the car. Two marks can be given for two valid statements.		1-2
	No relevant content.		0
	Indicative content Between A and B: - the car moves at a constant speed - for 30s/280m/at 9.3m/s (280/30) - away from its starting position Between B and C: - the car is stationary (so) the car's speed is 0 m/s/for 30s Between C and D: - the car is moving at a constant speed - for 30s/260m/at 8.7m/s (260/30) - away from its starting position Between D and E: - the car moves at a constant speed - for 60s/540m/at 9m/s (540/60) - towards its starting position		

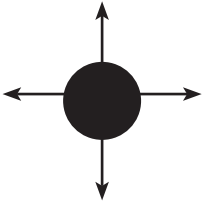
Question	Answers	Extra Information	Mark
02.2	the distance the car travels during the time the braking force acts/braking distance		1
02.3	Any two from: - tiredness - drugs - alcohol - named distractions i.e. use of mobile phone - speed of the car		2
02.4	acceleration = $\frac{\text{change in velocity}}{\text{time taken}}$		1
02.5	(deceleration =) $\frac{17}{3.4}$ = 5 (m/s ²)	An answer of 5 (m/s ²) with no working shown scores 2 marks.	1 1
Total			10

Question	Answers	Extra Information	Mark
03.1	Level 3: There is a clear description of how the electromagnet is made and the number of coils is varied and the paperclips are counted. Steps are logically ordered and could be followed to obtain valid results. For six marks at least one additional detail is included, e.g. control variables or processing data.		5-6
	Level 2: There is a clear description of how the electromagnet is made and the number of coils is varied or the paperclips are counted. For four marks at least one additional detail is included, e.g. control variables or processing data.		3-4
	Level 1: There are simple statements that describe how to make or use the electromagnet. Two marks can be given for two valid statements.		1-2
	No relevant content.		0
	Indicative content Making the electromagnet: - The wire is wrapped around the iron core/nail. - The wire is connected to the power supply/battery. - The power supply is switched on/current flows through the wire. Using the electromagnet: - The electromagnet is used to pick up paperclips. - The number of paperclips that the electromagnet holds is counted or the distance between the electromagnet and the paperclip when it is attracted is measured using a ruler. - The number of turns/coils/times the wire is wrapped around the nail is changed. - At least three different values for the number of turns on the coil are given, e.g. 5 coils, 10 coils, 15 coils.		

Question	Answers	Extra Information	Mark
03.2	motor effect		1
03.3	up/upwards	Accept clockwise.	1
03.4	Any one from: - reverse the current - reverse the magnets		1
03.5	Any two from: - increase the current - use stronger magnets - move the magnets closer together - increase the number of coils - use an iron core	Do not accept bigger magnets.	2
Total			11

Question	Answers	Extra Information	Mark
04.1	the oscillations/vibrations of longitudinal waves are parallel to the direction of energy transfer	Allow direction of travel for energy transfer.	1
	the oscillations/vibrations of transverse waves are perpendicular to the direction of energy transfer	Allow direction of travel.	1
		If no other mark is awarded, allow 1 mark for oscillations/ vibrations of longitudinal waves are parallel and oscillations/ vibrations of transverse waves are perpendicular.	
04.2	yes/correct conclusion		1
	(because) the lily pad was not carried away from the direction of impact		1
	(so) the water was not moving away from the impact site		1
04.3	light travels at a <u>lower</u> speed/ velocity in water	The speed/velocity changes is insufficient for the mark.	1
	so the edge of the wave (front) slows down as it enters the water	Allow wavelength decreases.	1
	but the part of the wave (front) in the air continues at the same/ higher speed/velocity/does not slow down		1

Question	Answers	Extra Information	Mark
04.4	sound waves cause the diaphragm to vibrate		1
	the diaphragm causes the coil/wire to vibrate	Do not accept move up and down.	1
	the coil/wire moves through the magnetic field	Allow the coil/wire cuts the magnetic field lines.	1
	a potential difference is induced in the wire	Allow induced current.	1
04.5	1500×0.056	An answer of 42 (m) with no working scores 3 marks.	1
	= 84 (m)		1
	$\frac{84}{2} = 42\text{m}$	Allow 1 mark for halving an incorrect distance.	1
Total			15

Question	Answers	Extra Information	Mark
05.1	air resistance/drag/friction/ resistive forces act in the opposite direction to thrust the resistive forces are 15000N/ equal thrust upthrust acts in the opposite direction to weight upthrust is 24000N/equal to weight	Allow buoyancy or contact force with the water.	1 1 1 1
05.2	weight and upthrust arrows are drawn equal in size and opposite in direction the resistive forces arrow is larger than the thrust arrow arrows are correctly labelled upthrust/buoyancy/ contact force with water air resistance/ friction / drag thrust weight 	Allow absence of thrust arrow.	1 1 1
05.3	correct parallelogram drawn value of resultant force in the range 192 000N to 196 000N		1 1
Total			9

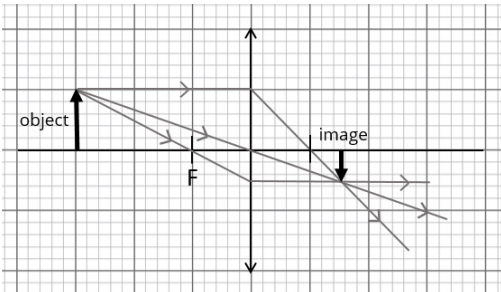
Question	Answers	Extra Information	Mark
06.1	ultraviolet	Allow UV.	1
06.2	microwaves		1
06.3	radio waves	Answers in this order only.	1
	gamma rays		1
06.4	x-rays are absorbed by bones or teeth		1
	but pass through soft tissues or gaps in bones		1
	low-energy x-rays will not destroy/damage cells		1
06.5	$\frac{300\,000\,000}{20}$ = 15 000 000	15 000 000Hz with no working shown scores 3 marks.	1
		15 000 000 without correct units scores 2 marks.	1
	Hz	Accept conversion to 15 000kHz or 15MHz if correct units are given.	1
06.6	Any two from: • electrons (in the aerial) vibrate • inducing an alternating current (in the aerial) • which causes oscillations in the receiver • with the same frequency as the radio wave		2
Total			12

Question	Answers	Extra Information	Mark
07.1	total momentum before (firing the cannon) is equal to total momentum after (firing the cannon)	Accept the momentum of the cannon and the cannonball is conserved.	1
	before the cannon is fired, the momentum of the cannon and the cannonball is zero	Accept total momentum before = 0.	1
	when the cannon is fired, the cannonball has forward momentum so the cannon must have (equal) momentum backwards/in the opposite direction		1
07.2	$10 \times 67.5 = 1500 \times v$	An answer of (-)0.45 with no working shown scores 3 marks.	1
	$v = \frac{675}{1500} \quad \text{or} \quad \frac{6.75 \times 10}{1500}$		1
	0.45 (m/s)		1
Total			6

Question	Answers	Extra Information	Mark
08.1	Any one from: • it absorbs all of the radiation incident on it • it does not reflect radiation • it does not transmit radiation • the best possible emitter of radiation		1
08.2	expansion due to fusion energy is in equilibrium with gravitational collapse	Allow 1 mark for the forces are balanced/in equilibrium/forces inwards equal forces outwards if neither of the other marks are awarded.	1 1
08.3	O5 because it has the highest temperature		1 1

Question	Answers	Extra Information	Mark
08.4	Level 3: There is an accurate description that contains each stage of the life cycle in the correct order and at least one additional fact about what happens in at least three of the stages or a detailed description of two stages.		5-6
	Level 2: There is a description of each stage of the life cycle in the correct order. For four marks, there is at least one piece of additional information.		3-4
	Level 1: There are simple statements that describe some stages in the life cycle. Two marks can be given for two valid statements.		1-2
	No relevant content.		0
	Indicative content Cloud of dust and gas/nebula → protostar: • pulled together by gravity • gets hotter and denser Protostar → main sequence star: • nuclear fusion begins • hydrogen → helium • releasing energy/heat/light Main sequence star → red giant: • hydrogen/fuel is used up • expands • surface temperature decreases • luminosity/brightness increases Red giant → white dwarf: • contracts (under gravity) • surface temperature increases • luminosity/brightness decreases/the star gets dimmer White dwarf → black dwarf: • energy is emitted to the surroundings • luminosity/brightness decreases/the star gets dimmer		

Question	Answers	Extra Information	Mark
08.5	gravity causes the satellite to (constantly) accelerate (towards Earth)	Allow satellite is (constantly) accelerating.	1
	the acceleration causes a change in direction	Do not allow acceleration causes a change in speed.	1
	the velocity changes because the direction changes		1
08.6	the satellites need to travel at the right speed to stay in the same position above the Earth		1
	the speed of the satellite affects the radius of the orbit		1
	so the satellites will all be at the same distance from Earth		1
Total			17

Question	Answers	Extra Information	Mark
09.1	16cm = 0.16m 3×0.16 = 0.48 (Nm)	An answer of 0.48 (Nm) with no working shown scores 3 marks. An answer of 48 scores 2 marks.	1 1 1
09.2	Any two construction lines: - a line travelling parallel to the principle axis and then refracted through the principal focus on the right - a line passing straight through the centre of the lens - a line travelling through the principal focus on the left and then refracted to travel parallel to the principle axis one arrow from the object to the image on any ray inverted image drawn in correct location 	If more than two construction lines are drawn, subtract one mark for each incorrect line. Do not award less than 0 marks. Conflicting arrowheads negate this mark.	2 1 1

Question	Answers	Extra Information	Mark
09.3	both images are diminished/ smaller (than the object) a convex lens produces a real image, a concave lens produces a virtual image the convex lens produces an inverted/upside down image, the concave lens image is the right way up		1 1 1
Total			10