Collins

AQA

GCSE

PHYSICS

F

SET B – Foundation Tier

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Answers

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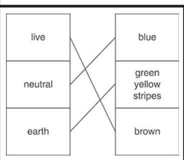
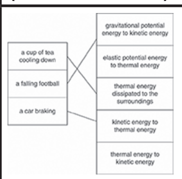
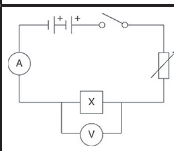
Paper 1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
01.1	alpha	Only one box ticked	1	**AO1** 4.4.2.1
01.2	gamma	Only one box ticked	1	**AO1** 4.4.2.1
01.3	beta	Only one box ticked	1	**AO1** 4.4.2.1
01.4	gamma	Only one box ticked	1	**AO1** 4.4.2.1
01.5	alpha	Only one box ticked	1	**AO1** 4.4.2.1
01.6	alpha	Only one box ticked	1	**AO1** 4.4.2.1
02.1	Two of: Volume (of hot water) (accept reference to using 100 cm^3 of water each time) Temperature drop/fall (80°C to 60°C) Use same beaker and lid Room temperature constant	Two correct control variables for 1 mark each	2	**AO2** 4.1.2.1
02.2	Increasing the number of layers of bubble wrap around the beaker **increases** the time taken for the temperature to drop from 80°C to 60°C. Increasing the number of layers of bubble wrap around the beaker **decreases** the thermal energy transferred to the surroundings each second		1 1	**AO3** 4.1.2.1
02.3	Additional bar drawn in position 1 with height = 220		1	**AO2** 4.1.2.1
02.4	Expanded polystyrene		1	**AO3** 4.1.2.1
03.1	A source of energy that can be replenished/will not run out		1	**AO1** 4.1.3
03.2	Any one from: wind; solar; tidal; biofuel; wave; hydroelectric power		1	**AO1** 4.1.3
03.3	National Grid		1	**AO1** 4.2.4.3
03.4		1 mark for one correct line A maximum of three lines drawn	2	**AO1** 4.2.3.2
03.5	Earth	Only one box ticked	1	**AO1** 4.2.3.2
03.6	Power = 230 × 3.0 Power = 690 Unit: W (accept watt)	1 mark for substitution into correct equation 1 mark for answer Correct answer with no working shown = 2 marks 1 mark for unit	2 1	**AO2** 4.2.4.1 **AO1** 4.2.4.1
04.1	1×10^{-10} m	Only one box ticked	1	**AO1** 4.4.1.1
04.2	Ball of positive charge Electrons (accept negative charge) embedded throughout the ball		1 1	**AO1** 4.4.1.3
04.3	Positive charge (accept mass) concentrated in small central nucleus Electrons surround (orbit) the nucleus		1 1	**AO1** 4.4.1.3
04.4	Neutron Proton (in either order)		1 1	**AO1** 4.4.1.3
05.1		1 mark for each correct line A maximum of 3 lines	3	**AO1** 4.1.1.1
05.2	Elastic potential energy		1	**AO1** 4.1.1.2
05.3	energy stored $= \frac{1}{2} \times 25 \times 0.12^2$ energy stored = 0.18 (J)	1 mark for substitution 1 mark for answer Correct answer with no working shown = 2 marks	2	**AO2** 4.1.1.2
06.1	**Level 2:** A coherent description of the steps required to demonstrate: repulsion between like charges AND attraction between unlike charges. For the maximum mark, the plan should include the initial step involving charging by friction	3–4	4	**AO2** 4.2.5.1

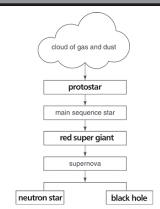
Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
	Level 1: A clear description of steps that demonstrate EITHER: repulsion between like charges, OR attraction between unlike charges For the maximum mark, the plan should include the initial step involving charging by friction	1–2		
	No relevant content	0		
	Indicative content: The rods can be charged by rubbing with a cloth. Rubbing a rod with a cloth transfers electrons (to or from the rod) A charged acetate rod is brought near to the end of a suspended charged acetate rod to show repulsion between like charges. **Or** a charged polythene rod is brought near to the end of a suspended charged polythene rod to show repulsion between like charges. A charged acetate rod is brought near to the end of a suspended charged polythene rod to show attraction between unlike charges. **Or** a charged polythene rod is brought near to the end of a suspended charged acetate rod to show attraction between unlike charges.			
07.1	Radon gas Radioactive rocks in soil and buildings		1 1	**AO3** 4.4.3.1
07.2	5.3		1	**AO3** 4.4.3.1
07.3	${}^{222}_{86}Rn \rightarrow {}^{218}_{84}Po + {}^{4}_{2}He$	1 mark each for the two missing numbers	2	**AO2** 4.4.2.2
07.4	${}^{218}_{84}Po \rightarrow {}^{218}_{85}At + {}^{0}_{-1}e$	1 mark each for the three missing numbers	3	**AO2** 4.4.2.2
08.1	At least one of the free neutrons emitted must cause another uranium nucleus to undergo fission		1 1	**AO1** 4.4.4.1
08.2	Kinetic	Only one box ticked	1	**AO1** 4.4.4.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
08.3	Either: Explosion caused by a nuclear weapon Or: Explosion caused by (nuclear) reactor	Allow 'nuclear bomb'	1	**AO1** 4.4.4.1
08.4	Caesium-137 Krypton-85		1 1	**AO3** 4.4.2.4
08.5	They have the longest half-lives so will be radioactive for a long time/many years causing a hazard to health (and living things in the environment) (unless stored safely)		1 1 1	**AO3** 4.4.2.4
08.6	(nuclear) fusion		1	**AO1** 4.4.4.2
09.1	The energy needed to raise the temperature of 1 kg of a material by 1°C		1	**AO1** 4.1.1.3
09.2	Thermometer C Because it covers the required temperature range / B cannot cover range And has best (smallest) resolution in that temperature range / can measure smaller temperature change than A or D		1 1 1	**AO3** 4.1.1.3
09.3	Temperature rise = 23.0°C (accept 23°C) $21260 = 1.00 \times c \times 23.0$ $c = \frac{21260}{1.00 \times 23.0}$ $c = 924$ (J/kg °C) Answer given to 3 significant figures	1 mark 1 mark for substitution 1 mark for rearranging 1 mark for answer Correct answer with no working shown = 4 marks 1 mark	5	**AO2** 4.1.1.3
10.1	Thermistor		1	**AO1** 4.2.1.1
10.2	The resistance decreases/gets smaller as the temperature increases		1	**AO3** 4.2.1.4
10.3	The total resistance in the circuit decreases (because the resistance of Q decreases). (Since $I = \frac{V}{R}$) the ammeter reading increases.		1 1	**AO2** 4.2.1.4
10.4	400 (Ω)		1	**AO3** 4.2.1.4
10.5	Total resistance = 800 + 400 Total resistance = 1200 (Ω)	1 mark	1	**AO2** 4.2.2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
10.6	Potential difference = current × resistance	Accept $V = I R$	1	**AO1** 4.2.1.3
10.7	$6.0 = I \times 1200$ $I = \frac{6.0}{1200}$ $I = 0.0050$ (A) (accept 0.005)	1 mark for substitution 1 mark for rearranging 1 mark for answer Allow error carried forward from 10.5 Correct answer with no working shown = 3 marks	3	**AO2** 4.2.1.3
10.8	Power = (current)^2 × resistance	Accept $P = I^2R$	1	**AO1** 4.2.4.1
10.9	Power = 0.0050^2 × 800 Power = 0.02 (W) Power = 20 (mW)	1 mark for substitution 1 mark for answer Allow error carried forward from 10.7 1 mark for answer in mW Correct answer (in mW) with no working shown = 3 marks	3	**AO2** 4.2.4.1
11.1		1 mark for ammeter in a complete circuit 1 mark for voltmeter in a complete circuit in parallel with X 1 mark for variable resistor in the main circuit	3	**AO1** 4.2.1.4
11.2	Charge = current × time	Accept $Q = I\ t$	1	**AO1** 4.2.1.2
11.3	Charge = 0.12 × 10 Charge = 1.2 (C)	1 mark for substitution 1 mark for answer Correct answer with no working shown = 2 marks	2	**AO2** 4.2.1.2
11.4	Energy = charge × potential difference	Accept $E = QV$	1	**AO1** 4.2.4.2
11.5	Energy transferred = 1.2 × 0.60 Energy transferred = 0.72 (J)	1 mark for substitution 1 mark for answer Allow error carried forward from 11.3 Correct answer with no working shown = 2 marks	2	**AO2** 4.2.4.2
11.6	Constant up to 0.7 V/0.14 A and then increases EITHER: at least two calculations using $R = \frac{V}{I}$ to obtain resistance values at different currents OR: reference made to trend in the change in current corresponding to a change in potential difference	1 mark 1 mark 1 mark for justification	3	**AO3** 4.2.1.3 4.2.1.4
12.1	Molecules in (liquid) water are much closer together than in water vapour in number of particles per unit volume Water vapour is mostly empty space compared with liquid water Liquid water is denser than water vapour in number of particles per unit volume		1 1 1	**AO3** 4.3.1.1
12.2	**Level 3:** A coherent plan covering all steps presented in a logical order detailing all the apparatus used. The plan could be followed by another person to obtain a valid result for the density of the oil.	5–6	6	**AO2** 4.3.1.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
	Level 2: A clear plan covering most of the major steps presented in a logical order detailing the apparatus used. The plan could be followed by another person to obtain valid results for the mass and volume of the oil.	3–4		
	Level 1: Some relevant statements but the plan could not be followed by another person to obtain valid results.	1–2		
	No relevant content	0		
	Indicative content: Mass of empty measuring cylinder is measured Mass measured with (electronic) balance Oil poured into measuring cylinder Volume of oil in measuring cylinder recorded Mass of measuring cylinder with oil measured (with balance) Mass of oil found by subtracting the mass of the empty measuring cylinder from the mass of the cylinder with oil Density found by dividing the mass of oil by the volume			

Paper 2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
01.1		1 mark for each correct name in the sequence shown Neutron star and black hole in either order	4	**AO1** 4.8.1.2
01.2	The explosion of a massive star		1	**AO1** 4.8.1.2
02.1	Velocity of an object is its speed in a given/specific direction	Allow 'speed is a scalar, velocity is a vector'	1	**AO1** 4.5.6.1.3
02.2	Distance = 1.5 × 60 Distance = 90 (m)	1 mark for substitution 1 mark for answer Correct answer with no working shown = 2 marks	1 1	**AO2** 4.5.6.1.2
02.3	accelerating	Only one box ticked	1	**AO1** 4.5.6.1.5
02.4	Three different stages in the following order: Constant acceleration, constant velocity, constant deceleration/ negative acceleration **Or** acceleration of 5 m/s^2; constant velocity of 15 m/s; deceleration of 7.5 m/s^2/ acceleration of $-7.5\ m/s^2$ **Or** time intervals specified for acceleration, constant velocity, deceleration	1 mark each, must be in the order shown	3	**AO3** 4.5.6.1.5
03.1	diffuse	Only one box ticked	1	**AO1** 4.6.2.6
03.2	opaque	Only one box ticked	1	**AO1** 4.6.2.6
03.3	black	Only one box ticked	1	**AO1** 4.6.2.6
03.4	speed	Only one box ticked	1	**AO1** 4.6.2.6
03.5	black	Only one box ticked	1	**AO1** 4.6.2.6
04.1	Distance travelled by the car during the driver's reaction time.		1	**AO1** 4.5.6.3.1
04.2	One from: Tiredness Drugs Alcohol (A named source of) distraction (such as mobile phone)	Any one for 1 mark	1	**AO1** 4.5.6.3.2
04.3	Distance travelled by the car while the brakes are being applied		1	**AO1** 4.5.6.3.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
04.4	One from: Wet road Icy road Condition of tyres Condition of brakes Gradient of road Surface of road	Any one for 1 mark	1	**AO1** 4.5.6.3.3
04.5	Thinking distance: increases steadily with increasing speed Braking distance: increases with increasing speed (Braking distance:) at an increasing rate		1 1 1	**AO3** 4.5.6.3.1
04.6	Thinking distance = 16 m (accept 15-17) Braking distance = 42 m (accept 41-43) Stopping distance = 58 (m) (accept 56-60)	1 mark 1 mark 1 mark Correct answer with no working 3 marks	3	**AO2** 4.5.6.3.1
04.7	Kinetic energy to thermal energy	Only one box ticked	1	**AO1** 4.5.6.3.4
04.8	Temperature of brakes rises Or Brakes become worn	Accept either statement for 1 mark	1	**AO1** 4.5.6.3.4
05.1	Red-shift is the observed increase in wavelength of the light from distant galaxies	Only one box ticked	1	**AO1** 4.8.2
05.2	The speed at which a galaxy recedes gets larger as the distance gets larger Speed of galaxy receding is directly proportional to distance	1 mark for a basic conclusion Or 2 marks for a more specific conclusion	2	**AO3** 4.8.2
05.3	Hot and very dense	Only one box ticked	1	**AO1** 4.8.2
06.1	gravity		1	**AO1** 4.8.1.3
06.2	The greater the distance from the Sun, the lower the orbital speed		1	**AO3** 4.8.1.3
06.3	13 km/s	Only one box ticked	1	**AO2** 4.8.1.3
06.4	Europa	Only one box ticked	1	**AO3** 4.8.1.3

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
07.1	Weight = mass × gravitational field strength	Accept $W = mg$	1	**AO1** 4.5.1.3
07.2	500 g converted to 0.5(00) kg Weight = 0.5(00) × 9.8 = 4.9 (N)	1 mark for unit conversion 1 mark for substitution and answer Correct answer with no working shown = 2 marks	2	**AO2** 4.5.1.3
07.3	According to Newton's **Third** Law, the bench exerts a force on the book equal in size to the book's **weight**. The force of gravity is a **non-contact** force.	1 mark for each correctly substituted word	3	**AO1** 4.5.6.2.3 4.5.1.2
07.4	Work done = force × distance moved	Accept $W = F\,d$	1	**AO1** 4.5.2
07.5	100 cm converted to 1(.00) m Work done = 4.9 × 1(.00) = 4.9 (N m)	1 mark for unit conversion 1 mark for substitution and answer Correct answer with no working shown = 2 marks	2	**AO2** 4.5.2
07.6	Gravitational potential energy store	Only one box ticked	1	**AO1** 4.1.1.2
08.1	Demonstrate that nail is attracted to the core/electromagnet when switch closed/current flowing. Observe nail fall/cease to be attracted when switch opened		1 1	**AO1** 4.7.2.1
08.2	Total weight = 2.2 (N)		1	**AO2** 4.7.2.1
08.3	**Level 2:** A clear plan covering all steps presented in a logical order. The plan could be followed by another person to obtain valid results	3–4	4	**AO2** 4.7.2.1
	Level 1: Some relevant statements but the plan could not be followed by another person to obtain valid results.	1–2		
	No relevant content	0		

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
	Indicative content: Close the switch Adjust the variable resistor to set the current to a chosen value Record ammeter reading Choose an ammeter with an appropriate resolution for the range of current readings (use trial runs as necessary) Gradually add masses in small increments to the bar Until the bar falls Care should be taken to avoid injury (e.g. to the feet) when the iron bar and masses fall By placing soft material below the electromagnet Add the weight of the bar to the weight of the masses attached to the bar to get the attractive force exerted by the electromagnet Repeat the procedure and calculate an average total weight for that current Repeat with several different current values To produce several data sets of current and total weight/ attractive force			
08.4	To minimise effect of (random) errors Or To help spot anomalous data Or To check results are repeatable	1 mark for either statement	1	**AO3** 4.7.2.1
08.5	4.2 5.2	1 mark if both values are correct	1	**AO2** 4.7.2.1
08.6	Two points correctly plotted Straight line of best fit drawn that passes through the origin	1 mark if both points correctly plotted 1 mark for suitable line of best fit	2	**AO2** 4.7.2.1
08.7	Increasing the current increases the strength of the electromagnet And either: The strength is directly proportional to the current Or: Doubling the current doubles the strength	1 mark for a basic conclusion Or 2 marks for a detailed conclusion referring to direct proportionality	2	**AO3** 4.7.2.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
09.1	gamma		1	**AO1** 4.6.2.1
09.2	ultraviolet		1	**AO1** 4.6.2.4
09.3	gamma		1	**AO1** 4.6.2.3
09.4	infrared		1	**AO1** 4.6.3.1
09.5	(Wave) speed = frequency × wavelength	Accept: $v = f\lambda$	1	**AO1** 4.6.1.2
09.6	3.0×10^8= frequency × 2.0 × 10^{-10} frequency = $\frac{3.0 \times 10^8}{2.0 \times 10^{-10}}$ Frequency = 1.5×10^{18} Unit: Hz	1 mark for substitution 1 mark for rearranging 1 mark for answer Correct answer with no working shown = 3 marks 1 mark for unit	3 1	**AO2** 4.6.1.2 **AO1** 4.6.1.2
09.7	Two of: X-ray procedures are a risk to health / can cause (fatal) cancer X-ray procedures on different parts of the body present different sized risks Lower doses give lower risk (of fatal cancer) The higher the (X-ray) dose, the longer the equivalent period of background radiation Some X-ray procedures have doses comparable with background radiation levels The risk of any single X-ray procedure is less than the risk of a 2-week period of background radiation	Any two conclusions for 1 mark each Accept any other sensible conclusion consistent with the data	2	**AO3** 4.6.2.3
10.1	acceleration = $\frac{\text{change in velocity}}{\text{time}}$ or Acceleration = (change in velocity) ÷ time	Accept $a = \frac{\Delta v}{t}$ Accept a = *(v-u)/t*	1	**AO1** 4.5.6.1.5

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
10.2	$10 = \frac{\text{change in velocity}}{2.0}$ Initial velocity = 0 Final velocity = 10 × 2.0 Velocity = 20 (m/s)	1 mark for substitution 1 mark for indication that initial velocity = 0 and for rearranging 1 mark for answer Correct answer with no working shown = 3 marks	3	**AO2** 4.5.6.1.5
10.3	Resultant force = 240 (N)		1	**AO2** 4.5.6.1.5
10.4	Resultant force = mass × acceleration	Accept $F = m\,a$	1	**AO1** 4.5.6.2.2
10.5	240 = 60 × acceleration Acceleration = $\frac{240}{60}$ Acceleration = 4.0 (m/s^2) (accept 4)	1 mark for correct substitution 1 mark for rearranging 1 mark for answer Correct answer with no working shown = 3 marks	3	**AO2** 4.5.6.2.2
10.6	Resultant force = 0 (N)		1	**AO2** 4.5.6.1.5
10.7	B	Only one box ticked	1	**AO3** 4.5.6.1.5
10.8	D	Only one box ticked	1	**AO3** 4.5.6.1.5
11.1	**Level 3:** A detailed and coherent plan covering all steps presented in a logical order. The plan could be followed by another person to obtain sufficient valid results to confirm the law of reflection. Procedures to ensure and assess accuracy are considered.	5–6	6	**AO2** 4.6.1.3
	Level 2: A clear plan covering the major steps presented in a logical order. The plan could be followed by another person to obtain valid results.	3–4		
	Level 1: Some relevant statements but the plan could not be followed by another person to obtain valid results.	1–2		
	No relevant content	0		
	Indicative content: Position a plane mirror vertically on a piece of paper Draw a line on the paper along the front edge of the mirror Remove the mirror, and, using a protractor, draw a line at 90° to the first line (the normal) Use a protractor to draw a line at a specific angle to the normal and label this line 'incident ray' Replace the mirror on the paper along the original line Direct a ray of light from a ray box along the line marked incident ray Mark a series of dots along the middle of the reflected ray Join the dots (with a pencil) to show the path of the reflected ray. Measure the angle of reflection with the protractor Repeat for at least 3 different incident angles Repeat for each chosen angle of incidence to assess the accuracy/repeatability of the measurements			
12.1	Independent variable: (resultant) force Dependent variable: acceleration Control variable: mass (of glider) (accept: same glider or same air track set up)		1 1 1	**AO3** 4.5.6.2.2
12.2	(Standard) weights (attached to the string)		1	**AO1** 4.5.6.2.2
12.3	Glider moves freely/more smoothly / accelerates easily Because friction removed/reduced		1 1	**AO1** 4.5.6.2.2
12.4	$0.20^2 - 0.10^2 = 2$ × acceleration × 0.50 acceleration = $\frac{0.20^2 - 0.10^2}{(2 \times 0.50)}$ Acceleration = 0.030 (m/s^2) (accept 0.03)	1 mark for substitution 1 mark for rearranging 1 mark for answer Correct answer with no working = 3 marks	3	**AO2** 4.5.6.1.5
12.5	Take measurements for a range of different forces. Plot a graph of acceleration against force.		1 1	**AO2** 4.5.6.2.2