Collins

AQA

GCSE

PHYSICS

F

SET A – Foundation Tier

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Answers

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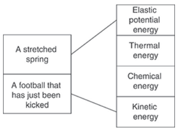
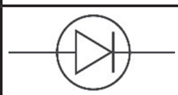
Paper 1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
01.1	electrons are transferred from the ruler to the cloth a deficit/lack of negative electrons on the ruler makes it positively charged		1 1	**AO1** 4.2.5.1
01.2	the cloth becomes negatively charged		1	**AO1** 4.2.5.1
01.3	at least 4 radial lines drawn from the ball all arrows drawn on the radial lines are directed outwards		1 1	**AO1** 4.2.5.2
01.4	the particle of dust would move towards the ball attractive force between ball and dust particle		1 1	**AO1** 4.2.5.1
02.1	two of: particles become (slightly) further apart arrangement of particles becomes less ordered particles can move around passing each other speed of vibration / kinetic energy of particles increases as solid heats up, until melting point speed / kinetic energy of particles remains same while oil is changing state from solid to liquid (at melting point)	any two for 1 mark each	2	**AO1** 4.3.1.1
02.2	E = 0.40 x 250 000 thermal energy = 100 000 unit: J (or joule)	1 mark for substitution 1 mark for answer correct answer with no working shown = 2 marks 1 mark for unit	2 1	**AO2** 4.3.2.3 **AO1** 4.3.2.3
02.3	24 (°C)		1	**AO3** 4.3.2.3
02.4	time taken = 230 – 30 time taken = 200 (s)		1	**AO3** 4.3.2.3
03.1	**Level 2:** A coherent plan covering all major steps presented in a logical order detailing the apparatus used. The plan could be followed by another person to obtain valid results.	3–4	4	**AO2** 4.3.1.1
	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		
	Indicative content: • mass of block measured • (electronic) balance used to measure mass • length, width and height of block measured • dimensions measured using a rule (or Vernier callipers if the block will fit inside the callipers) • volume calculated from $L \times W \times H$ • substitute the mass and volume data into the density equation			
03.2	A: steel B: zinc C: nickel		1 1 1	**AO3** 4.3.1.1
04.1	element with a nucleus that has same number of protons but different number of neutrons		1 1	**AO1** 4.4.1.2
04.2	protons: 53 neutrons 74 electrons 53		1 1 1	**AO1** 4.4.1.2
04.3	(nucleus is unstable) and emits radiation to become more stable		1 1	**AO1** 4.4.2.1
04.4	(high speed) electron is ejected from the nucleus as a neutron turns into a proton		1 1	**AO1** 4.4.2.1
04.5	time for count-rate to fall by half for one pair of values, e.g. from 200→100: 8 days time for count-rate to fall by half for another pair of values, e.g. from 100→50: 8 days average = 8 days	maximum 2 marks for determining half-life from only one section of graph allow 1 mark for correct answer with no working shown	1 1 1	**AO3** 4.4.2.3

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
05.1	they generate heat / they contain a heating element		1	**AO1** 4.2.4.2
05.2	energy (transferred) = power × time (Accept power = energy transferred / time)		1	**AO1** 4.2.4.2
05.3	5 hours = 5 × 60 × 60 = 18 000 s energy transferred = 50 × 18 000 energy transferred = 900 000 (J)	1 mark for correct conversion of hours to seconds 1 mark for substitution 1 mark for answer correct answer with no working shown = 3 marks	3	**AO2** 4.2.4.2
05.4	900 000 × 7 = 6 300 000 (J)	allow error carried forward from 05.2	1	**AO2** 4.2.4.2
06.1		1 mark for each correct line No more than 2 lines	2	**AO1** 4.1.1.1
06.2	kinetic energy = store of kinetic energy = 0.5 × 50 × 6^2 = 900 J	1 mark for substitution 1 mark for answer correct answer with no working shown = 2 marks	1 1	**AO2** 4.1.1.2
06.3	gravitational potential energy = mass × gravitational field strength × height		1	**AO1** 4.1.1.2
06.4	gravitational potential energy = 50 × 9.8 × 10 increase in gravitational potential energy store = 4900 (J)	1 mark for substitution 1 mark for answer correct answer with no working shown = 2 marks	1 1	**AO2** 4.1.1.2
06.5	kinetic energy = store of kinetic energy = 0.5 × mass × $(\text{speed})^2$ kinetic energy = 0.5 × 50 × 8^2 store of kinetic energy = 1600 (J)	1 mark for substitution 1 mark for answer correct answer with no working shown = 2 marks	1 1	**AO2** 4.1.1.2
06.6	energy dissipated = 4900 – 1600 energy dissipated = 3300 (J)	allow error carried forward from 06.4 or 06.5	1	**AO2** 4.1.2.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
07.1	($\Delta E = mc\Delta\theta$) ΔE = 0.10 × 4200 × 10 increase in thermal energy of water = 4200 (J)	1 mark for substitution into correct equation 1 mark for answer correct answer with no working shown = 2 marks	1 1	**AO2** 4.1.1.3
07.2	ΔE = 0.10 × 500 × 70 decrease in thermal energy of block = 3500 (J)	1 mark for substitution 1 mark for answer correct answer with no working shown = 2 marks	1 1	**AO2** 4.1.1.3
07.3	either: Some (thermal) energy is transferred to the beaker. or: Some (thermal) energy is transferred to the surroundings.	Either statement for 1 mark	1	**AO1** 4.1.2.1
08.1	independent: length dependent: resistance control: thickness		1 1 1	**AO3** 4.2.1.3
08.2	**Level 2:** A detailed and coherent plan covering all the major steps is provided. The steps are presented in a logical order that could be followed by another person to obtain valid results.	3–4	4	**AO2** 4.2.1.3
	Level 1: Simple statements relating to relevant apparatus or steps are made but may not follow a logical sequence. The plan would not enable another person to obtain valid results.	1–2		
	No relevant content	0		

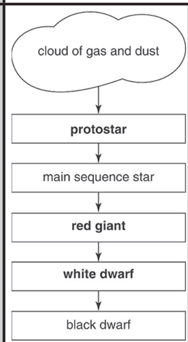
Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
	Indicative content • the length of wire between the crocodile clips is measured with a metre rule • the switch is closed • the reading on the ammeter is recorded • the reading on the voltmeter is recorded • the voltmeter reading is divided by the ammeter reading to determine the wire's resistance • switch opened to stop wire overheating • the measurements are repeated for different lengths of wire • plot a graph of resistance against length			
08.3	random error	no other box ticked	1	**AO3** 4.2.1.3
08.4	straight line, positive gradient, through the origin		1	**AO2** 4.2.1.3
08.5	length = $\frac{1}{11} \times 2.2$ length = 0.2 (m)	1 mark for correct method of calculation 1 mark for answer correct answer with no working shown = 2 marks	2	**AO2** 4.2.1.3
09.1	small, well separated circles drawn randomly in the box		1	**AO1** 4.3.1.1
09.2	moving around randomly / in all directions		1 1	**AO1** 4.3.3.1
09.3	internal energy		1	**AO1** 4.3.2.1
09.4	increasing the temperature increases the speed of the gas particles increasing the temperature increases the gas pressure	no more than two boxes ticked	1 1	**AO1** 4.3.3.1 4.3.2.1
09.5	200 000 × 2000 = p × 2500 $p = \frac{(200\,000 \times 2000)}{2500}$ new pressure = 160 000 (Pa)	1 mark for substitution into correct equation 1 mark for rearranging 1 mark for answer correct answer with no working shown = 3 marks	1 1 1	**AO2** 4.3.3.2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
10.1	The potential difference across each resistor has the same value. The resistors are connected in series.	no more than two boxes ticked	2	**AO1** 4.2.2
10.2	total resistance = 5.0 + 5.0 + 5.0 total resistance = 15.0 (Ω)		1	**AO2** 4.2.2
10.3	potential difference = current × resistance	allow $V = IR$	1	**AO1** 4.2.1.3
10.4	1.5 = I × 15 $I = \frac{1.5}{15}$ current = 0.10 (A) (accept 0.1)	1 mark for substitution 1 mark for rearranging 1 mark for answer correct answer with no working shown = 3 marks	1 1 1	**AO2** 4.2.1.3
10.5	charge = current × time	allow $Q = I\,t$	1	**AO1** 4.2.1.2
10.6	time = 5 × 60 = 300 s charge = 0.10 × 300 charge = 30 (C)	1 mark for conversion of minutes to seconds 1 mark for substitution 1 mark for answer	1 1 1	**AO2** 4.2.1.2
10.7	current directly proportional to pd (or voltage) or resistance is constant as current changes or labelled sketch or description of current against potential difference as straight line graph through origin		1	**AO1** 4.2.1.4
10.8			1	**AO1** 4.2.1.1
10.9	any two from: • allows current to flow in only one direction • the current in the reverse direction is zero • the resistance is very large in one direction and not in the other / much larger in one direction than the other		2	**AO3** 4.2.1.4
11.1	**Wood** is an example of a biofuel. Either **natural gas**, **coal** or **oil** is an example of a fossil fuel.		1 1	**AO1** 4.1.3

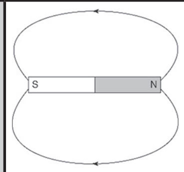
Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
11.2	either: efficiency = $\frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$ Or: efficiency = $\frac{\text{useful power output}}{\text{total power input}}$		1	**AO1** 4.1.2.2
11.3	efficiency = $\frac{720}{1200} \times 100 = 60\%$ or efficiency = $\frac{720}{1200} = 0.6$	1 mark for substitution 1 mark for answer Allow final answer as % or decimal correct answer with no working shown = 2 marks	2	**AO2** 4.1.2.2
11.4	**Level 3:** Coherent and detailed account with several comparisons of reliability and environmental effects and including both advantages and disadvantages.	5–6	6	**AO3** 4.1.3
	Level 2: Clear account with some valid comparisons of reliability and environmental effect.	3–4		
	Level 1: Some relevant comments regarding reliability and environmental effects but comparisons may not be made. The descriptions are vague and lack sufficient detail.	1–2		
	No relevant content	0		

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
	Indicative content: **Advantages of wind power**: • renewable • does not cause (atmospheric) pollution • no greenhouse gas emissions • does not contribute to climate change • usually windy somewhere in the UK **Disadvantages of wind power:** • unpredictable • not reliable (depends on weather) • possible noise disturbance • possible hazard to birds • may be considered to have a negative visual impact **Advantages of coal power:** • reliable (always available, able to generate continuously) • not dependent on the weather • significant coal reserves worldwide **Disadvantages of coal power:** • not renewable • creates atmospheric pollution (soot, sulfur dioxide) which may cause health problems / harm living things in environment / cause acid rain • produces greenhouse gas emissions • which contribute to climate change / global warming • environmental pollution, loss of habitat in areas where coal is mined • mining can be dangerous			

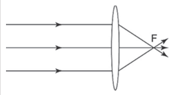
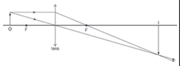
Paper 2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
01.1	(force of) gravity / gravitational attraction		1	**AO1** 4.8.1.1
01.2		1 mark for each correct name in the correct box If a box is left empty or an incorrect answer is given in a box, marks can still be given to other answers that are correct provided they are in the correct sequence.	3	**AO1** 4.8.1.2
01.3	A smaller B greater		1 1	**AO3** 4.8.1.2
02.1	5.0 Hz	only one box ticked	1	**AO2** 4.6.1.2
02.2	wavelength	only one box ticked	1	**AO1** 4.6.1.2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
02.3	speed = 3.0 × 4.0 speed = 12 (cm/s)	1 mark for substitution 1 mark for answer correct answer with no working shown = 2 marks	1 1	**AO2** 4.6.1.2
02.4	independent variable: depth dependent variable: speed		1 1	**AO3** 4.6.1.2
02.5	The wave travels faster in deeper water. Wave speed is not directly proportional to depth of water.	Only two boxes ticked	1 1	**AO3** 4.6.1.2
03.1	force displacement	only two boxes ticked	1 1	**AO1** 4.5.1.1 4.5.6.1.1
03.2	three of: at first the car speeds up / accelerates in the middle of the journey, the car moves with a steady speed near the end of the journey the car slows down / decelerates the car stops at the end of the journey	1 mark for each correct statement, maximum 3 marks	3	**AO3** 4.5.6.1.4
03.3	60 (m)		1	**AO2** 4.5.6.1.4
03.4	average speed = $\frac{60}{4}$ average speed =15 m/s	1 mark for substitution 1 mark for answer correct answer with no working shown = 2 marks	2	**AO2** 4.5.6.1.2 4.5.6.1.4
04.1	The north pole of a magnet exerts **an attractive force** on the south pole of another magnet. The north pole of a magnet exerts **an attractive force** on a piece of magnetic material such as iron The north pole of a magnet exerts **a repulsive force** on the north pole of another magnet. The south pole of one magnet exerts **a repulsive force** on the south pole of another magnet.		1 1 1 1	**AO1** 4.7.1.1
04.2	a non-contact force	only one box ticked	1	**AO1** 4.7.1.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
04.3	An induced magnet becomes a magnet only when it is placed in a magnetic field (e.g. of a permanent magnet) and loses its magnetism when removed from the magnetic field. A permanent magnet retains its magnetism		1 1	**AO1** 4.7.1.1
04.4		1 mark for one arrow on each line pointing from N to S maximum 2 marks	2	**AO1** 4.7.1.2
04.5	**Level 2:** A clear, detailed plan covering all steps presented in a logical order. The plan could be followed by another person to complete the task as required.	3–4	4	**AO2** 4.7.1.2
	Level 1: Some relevant statements but the plan could not be followed by another person to complete the task.	1–2		
	No relevant content	0		
	Indicative content: • place the bar magnet on a piece of paper and draw around the magnet • place the compass close to (one end of) the magnet • use a pencil to mark a dot at the point that the needle (of the compass) is pointing • move the compass so that its centre is over the dot just made • put another dot at the point that the needle (of the compass) is now pointing • remove the compass and join the dots with an arrow from the first dot to the 2nd dot • continue in the same way until a complete line is drawn from one point on the magnet to another			
05.1	The resultant force on a stationary object is zero. The resultant force on an object moving with constant velocity is zero.	only two boxes ticked	1 1	**AO1** 4.5.6.2.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
05.2	E	only one box ticked	1	**AO1** 4.5.6.2.1
05.3	F G	1 mark for each correct letter No more than two boxes ticked	2	**AO1** 4.5.6.2.1
05.4	Acceleration $\frac{14-10}{2.5}$ Acceleration = 1.6 Unit: m/s^2	1 mark for substitution 1 mark for answer correct numerical answer with no working shown = 2 marks 1 mark	2 1	**AO2** 4.5.6.1.5 **AO1** 4.5.6.1.5
05.5	resultant force = mass × acceleration	accept $F = ma$	1	**AO1** 4.5.6.2.2
05.6	resultant force = 4000 × 1.6 resultant force = 6400 (N)	1 mark for substitution 1 mark for answer correct answer with no working shown = 2 marks	2	**AO2** 4.5.6.2.2
05.7	resistive force = 8000 – 6400 resistive force = 1600 (N)	1 mark for substitution 1 mark for answer correct answer with no working shown = 2 marks	2	**AO2** 4.5.1.4
06.1	air molecules collide with the surface		1	**AO1** 4.5.5.2
06.2	pressure = normal force ÷ (surface) area	accept $p = \frac{F}{A}$	1	**AO1** 4.5.5.1.1
06.3	$100\,000 = \frac{\text{force}}{1.8}$ force = 100 000 × 1.8 force = 180000 (N)	1 mark for substitution 1 mark for rearranging 1 mark for answer correct answer with no working shown = 3 marks	3	**AO2** 4.5.5.1.1
06.4	as height (above sea level) increases, atmospheric pressure decreases		1	**AO3** 4.5.5.2
06.5	pressure and height data correctly selected for two different heights, one double the other conclusion that the student's suggestion is incorrect		2 1	**AO3** 4.5.5.2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
06.6	at sea level there is more air above the person either: the greater weight of air above the person exerts more force or: there are more molecules colliding with a person's surface at sea level		1 1	**AO1** 4.5.5.2
07.1		1 mark for each of the three correct rays 1 mark for correct position of F	3 1	**AO1** 4.6.2.5
07.2	distance from the centre of a lens to its principal focus		1	**AO1** 4.6.2.5
07.3		1 mark each for each complete ray drawn as shown. 1 mark for correct image labelled I	2 1	**AO1** 4.6.2.5
07.4	measure the height / diameter of the object (actual cross-wire) using a rule / ruler / digital callipers measure the height/diameter of the image of the cross-wire divide the image height/diameter by the object height / diameter		1 1 1 1	**AO2** 4.6.2.5
07.5	3.0 (accept 3)		1	**AO2** 4.6.2.5
07.6	the greater the focal length, the greater the magnification (for a constant object distance)		1	**AO3** 4.6.2.5
07.7	get data for a greater number of lenses use lenses with a greater range of focal lengths plot data on a graph / chart of magnification versus focal length	any two of the first three for 1 mark each additional 1 mark if graph axes specified	3	**AO3** 4.6.2.5
08.1	the distance from the hinge / pivot to the handle is greater for handle position A than for position B for a bigger distance, the moment / turning effect is greater		1 1	**AO1** 4.5.4
08.2	moment = force × distance	Accept $M = F d$	1	**AO1** 4.5.4
08.3	convert cm to m moment = 2.0 × 0.75 moment = 1.5 (N m)	1 mark for unit conversion 1 mark for substitution 1 mark for answer correct answer with no working shown = 3 marks	3	**AO2** 4.5.4

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
08.4	an anticlockwise moment		1	**AO1** 4.5.4
08.5	moment = 200 × 0.4 moment = 80 (N m)	1 mark for substitution 1 mark for answer correct answer with no working shown = 2 marks	2	**AO2** 4.5.4
08.6	clockwise		1	**AO1** 4.5.4
08.7	80 (N m)		1	**AO2** 4.5.4
08.8	force × (1.30 + 0.40) = 80 force = 47 (N)	1 mark for substitution into correct equation 1 mark for answer correct answer with no working showbn = 2 marks 1 mark for answer given to 2 s.f.	3	**AO2** 4.5.4
09.1	**Level 3:** A coherent plan covering all steps presented in a logical order. The plan could be followed by another person to obtain valid results. Procedures ensure accurate data is obtained.	5–6	6	**AO2** 4.5.3
	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: • the length of the unstretched spring is measured using the metre rule • a standard / known weight is attached to the spring • the length of the spring is indicated by the pointer attached to the bottom of the spring • the length of the stretched spring is measured using the metre rule • extension is found by subtracting the unstretched length from the stretched length • to minimise errors: ∘ view the pointer from the same horizontal level ∘ take repeat readings and average			
09.2	C		1	**AO3** 4.5.3
09.3	A		1	**AO3** 4.5.3
09.4	C		1	**AO3** 4.5.3
09.5	B		1	**AO2** 4.5.3