Collins

AQA GCSE PHYSICS SET B – Foundation Tier

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Answers

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Paper 1

01.1 alpha Only one box 1 A	
ticked	AO1
01.2 gamma Only one box 1 4	4.4.2.1 AO1
ticked	4471
01.3 beta Only one box 1 A	AO1
ticked 4	4.4.2.1
01.4 gamma Only one box 1 A	AO1
ticked 4	4.4.2.1
01.5 alpha Only one box 1 A	AO1
ticked 4	4.4.2.1
01.6 alpha Only one box 1 A	AO1
ticked 4	4.4.2.1
02.1 Two of: Two correct 2 A	AO2
Volume (of hot for 1 mark each	4.1.2.1
reference to	
using 100 cm ³	
of water each	
time)	
lemperature drop/fall (80°C	
to 60°C)	
Use same	
beaker and lid	
Room	
temperature	
02.2 Increasing the number of layers of 1 A	AO3
bubble wrap around the beaker	4.1.2.1
increases the time taken for the	
to 60°C	
Increasing the number of layers of 1	
bubble wrap around the beaker	
decreases the thermal energy	
transferred to the surroundings	
02.3 Additional bar drawn in position 1 A	AO2
1 with height = 220	4.1.2.1
02.4 Expanded polystyrene 1 A	AO3
4	4.1.2.1
03.1 A source of energy that can be 1 A	A01
replenished/will not run out 4	4.1.3
03.2 Any one from: wind; solar; tidal; 1 A	AO1
biotuei; wave; hydroelectric power 4	4.1.3
03.3 National Grid 1 A	A01
	4.2.4.3
U3.4 No Correct line 2 A	AUT
reutral green A maximum	4.2.3.2
of three lines	
earth brown drawn	
03.5 Earth Only one box 1 A	AO1
ticked 4	4.2.3.2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
03.6	Power = 230 × 3.0	1 mark for substitution into correct equation	2	AO2 4.2.4.1
	Power = 690	1 mark for answer		
		Correct answer with no working shown = 2 marks		AO1 4.2.4.1
	Unit: W (accept watt)	1 mark for unit	1	
04.1	1 × 10 ⁻¹⁰ m	Only one box ticked	1	AO1 4.4.1.1
04.2	Ball of positive ch	arge	1	AO1
	Electrons (accept embedded throug	negative charge) ghout the ball	1	4.4.1.3
04.3	Positive charge (a concentrated in s nucleus	ccept mass) mall central	1	AO1 4.4.1.3
	Electrons surroun nucleus	d (orbit) the	1	
04.4	Neutron		1	AO1
	Proton (in either order)		1	4.4.1.3
05.1	a long of the control outer generation of pointed and the control outer a long of balance generation of the control outer a long obtain generation of the control outer a long obtain generation of the control outer band outer generation of the control outer band outer generation of the control outer band outer band outer band outer band outer band outer band outer	1 mark for each correct line A maximum of 3 lines	3	AO1 4.1.1.1
05.2	Elastic potential e	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

Level 1: A clear demonstrate Errieff: republion between like charges, OR attraction between like charges, OR attraction between like charges, OR attraction between like charges, OR attraction between like charges, OR attraction between like charges, or the maintum mark, the plan should include the initial step involving charges back to a suspended charged acetate rod is brought near to the end of a suspended charged acetate rod is brought near to the end of a suspended charged acetate rod is brought near to the end of a suspended charged acetate rod is brought near to the end of a suspended charged acetate rod is brought near to the end of a suspended charged acetate rod is brought near to the end of a suspended charged acetate rod is brought near to the end of a suspended charged acetate rod is brought near to the end of a suspended charged acetate rod is brought near to the end of a suspended charged acetate rod is brought near to the end of a suspended charged acetate rod is brought near to the end of a suspended charged bolythene rod is brought near to the end of a suspended charged bolythene rod is brought near to the end of a suspended charged bolythene rod is brought near to the end of a suspended charged acetate rod is brought nears to the end of a suspended charges.1 A03 4.3.107.25.31 A03 4.4.3.107.3728 ndon gas 88 no -288	Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.		Question	Answer(s)	Extra info
OR stration between unlike charges For the 		Level 1: A clear description of steps that demonstrate EITHER: repulsion between like charges.	1–2				08.3	Either: Explosion caused by a nuclear weapon Or: Explosion caused by	Allow 'nuclear bomb'
Charges For the maximum mark, the plan should include the initial step involving charging by friction No relevant transfer electrons (to or from the rod) A charged acetater of is brought near to the end of a suspended charged polythene rod is brought near to the end of a suspended charged polythene rod is brought near to the end of a suspended charged polythene rod is brought near to the end of a suspended charged polythene rod is brought near to the end of a suspended charged polythene rod is brought near to the end of a suspended charged polythene rod is brought near to the end of a suspended charged acetater of the drof a suspended charged polythene rod is brought near to the end of a suspended charged acetater of the drof a suspended charged polythene rod is brought near to the end of a suspended charged acetater of a suspended charged polythene rod is brought near to the end of a suspended charged acetater of a suspended charged acetater of a suspended charged acetater of a suspended charged acetater of a 		OR attraction between unlike					08.4	(nuclear) reactor Caesium-137	
Driving mark, the plan should include the initial step involving charging by frictionSo will be radioactive for a long 		charges For the					08.5	Krypton-85 They have the lor	ngest half-lives
Incretevant content0 contentNo relevant content0Indicative content: The rods can be charged by rubbing arod with a cloth transfers electrons (to or from the 		mark, the plan should include the initial step involving charging by friction					08.6	so will be radioac time/many years causing a hazard (and living things environment) (un (nuclear) fusion	tive for a long to health in the less stored safely)
content: Indicative content: The rods can be charged by rubbing arot with a cloth. Rubbing arot 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 acetate rod to show attraction between unlike charges.Imack for answer given to show repulsion between like charged acetate rod to show attraction between unlike charged polythene rod is brought near to the end of a suspended charged polythene rod is brought near to the end of a suspended charged polythene rod is brought near to the end of a suspended charged polythene rod is brought near to the end of a suspended charged acetate rod to show attraction between unlike charges.Imack for answer given to a significant for a charged polythene rod is brow attraction between unlike charges.AO3 the working shown = 4 marks07.1Radio gas maclicative rocks in soil and buildings1AO3 		No relevant	0				09.1	The energy need	ed to raise the
Description09.209.30.209.30.209.30.2 <td></td> <td>content Indicative conten</td> <td>l t:</td> <td></td> <td></td> <td></td> <td>05.1</td> <td>temperature of 1</td> <td>kg of a material</td>		content Indicative conten	l t:				05.1	temperature of 1	kg of a material
Reduction Reduction Reduction Reduction Reduction Reduction Reduction 		The rods can be c	harged by oth				09.2	Thermometer C	
A charged acetate rod is brought near to the end of a suspended charged acetate rod is brought near to the end of a suspended charged polythene rod is brought near to the end of a suspended charged polythene rod is to show repulsion between like 		Rubbing a rod wi transfers electron	th a cloth is (to or from the					Because it covers temperature rang cover range	the required ge / B cannot
Prepulsion 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 charges 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.1Mark for 		A charged acetate near to the end o charged acetate r	e rod is brought of a suspended rod to show					And has best (sm. in that temperatu measure smaller t change than A or	allest) resolution ure range / can temperature · D
$\begin{array}{ c c c c } \hline C A charged acetate rod is brought near to the end of a suspended charged polythene rod to show attraction between unlike charges. \\ \hline Or a charged polythene rod is brought near to the end of a suspended charged acetate rod to show attraction between unlike charges. \\ \hline Or a charged acetate rod to show attraction between unlike charges. \\ \hline Or. 1 Radon gas Radioactive rocks in soil and buildings \\ \hline Or. 2 5.3 \\ \hline Or. 2 5.3 \\ \hline Or. 3 \\ \frac{222}{86} Rn \rightarrow \frac{218}{84} Po + \frac{2}{2} He I mark each for the two missing numbers \\ \hline Or. 4 \\ \frac{218}{84} Po \rightarrow \frac{218}{85} At + \frac{0}{-1}e I mark each for the three missing numbers \\ \hline Or. 4 \\ \frac{218}{84} Po \rightarrow \frac{218}{85} At + \frac{0}{-1}e I mark each for the three missing numbers \\ \hline Or. 4 \\ \frac{218}{84} Po \rightarrow \frac{218}{85} At + \frac{0}{-1}e I mark each for the three missing numbers \\ \hline Or. 4 \\ \frac{218}{84} Po \rightarrow \frac{218}{85} At + \frac{0}{-1}e I mark each for the three missing numbers \\ \hline Or. 4 \\ \frac{218}{84} Po \rightarrow \frac{218}{85} At + \frac{0}{-1}e I mark each for the three missing numbers \\ \hline Or. 4 \\ \frac{218}{84} Po \rightarrow \frac{218}{85} At + \frac{0}{-1}e I mark each for the three missing numbers \\ \hline Or. 4 \\ \frac{218}{84} Po \rightarrow \frac{218}{85} At + \frac{0}{-1}e I mark each for the three missing numbers \\ \hline Or. 4 \\ \frac{218}{84} Po \rightarrow \frac{218}{85} At + \frac{0}{-1}e I mark each for the three missing numbers \\ \hline Or. 4 \\ \frac{218}{84} Po \rightarrow \frac{218}{85} At + \frac{0}{-1}e I mark each for the three missing numbers \\ \hline Or. 4 \\ \frac{218}{84} Po \rightarrow \frac{218}{85} At + \frac{0}{-1}e I mark each for the three missing numbers \\ \hline Or. 4 \\ \frac{218}{84} Po \rightarrow \frac{218}{84} Po + \frac{0}{2} He I mark each for the three missing numbers \\ \hline Or. 4 \\ \frac{10.4}{400} (\Omega) \\ \hline Or. 4 \\ \frac{10.4}{400} (\Omega) \\ \hline Or. 4 \\ \frac{10.4}{400} (\Omega) \\ \hline Or. 5 \\ \hline Or. 5 \\ \frac{10.4}{10.4} Po \\ \frac{10.4}{10.5} \hline Or. 6 \\ \frac{10.4}{10$		Or a charged poly brought near to t suspended charge to show repulsion	ythene rod is the end of a ed polythene rod n between like				09.3	Temperature rise = 23.0°C (accept 23°C) 21260 = 1.00 ×	1 mark 1 mark for
Interference charges.Interference charges.Interference answerOr a charged polythene rod is brought near to the end of a suspended charged acetate rod to show attraction between unlike charges.Answer given to 3 significant figuresAnswer given to 3 significant figuresInterference answer Correct answer with no working shown = 4 marks07.1Radioactive rocks in soil and buildings1AO3 4.4.3.1Interference answer07.25.31AO3 4.4.3.1Interference 4.4.3.1Interference the two missing numbers07.3 $2222_{86}Rn \rightarrow 218_{80} + \frac{4}{2}He$ $84^{4}Po \rightarrow \frac{218}{85}At + \frac{0}{-1}e$ 1AO3 4.4.2.2Interference the two missing numbers07.4 $218_{84}Po \rightarrow \frac{218}{85}At + \frac{0}{-1}e$ 11AO2 4.4.2.2Interference 4.4.2.207.4 $218_{84}Po \rightarrow \frac{218}{85}At + \frac{0}{-1}e$ 11AO1 4.4.4.1Interference 4.4.2.208.1At least one of the free neutrons must cause another uranium nucleus to undergo fission1AO1 4.4.4.1Interference answer08.2KineticOnly one box ticked1AO1 4.4.4.1Interference answer1		A charged acetate near to the end o charged polythen attraction betwee	e rod is brought of a suspended ne rod to show en uplike					$c = \frac{21260}{1.00 \times 23.0}$ c = 924 (J/kg °C)	1 mark for rearranging 1 mark for
07.1Radon gas Radioactive rocks in soil and buildings1AO3 4.4.3.107.25.31AO3 4.4.3.107.3 $222_{86}^{222}Rn \rightarrow \frac{218}{84}Po + \frac{4}{2}He}{R6}^{2}$ 1mark each for the two missing numbers2AO2 4.4.2.207.4 $218_{PO} \rightarrow \frac{218}{85}At + \frac{0}{-1}e$ 1mark each for the three missing numbers3AO2 4.4.2.207.4 $218_{PO} \rightarrow \frac{218}{85}At + \frac{0}{-1}e$ 1mark each for the three missing numbers3AO2 4.4.2.208.1At least one of the free neutrons emitted must cause another uranium nucleus to undergo fission1AO1 4.4.4.110.5Total resistance = 1200 (Ω)08.2KineticOnly one box ticked1AO1 4.4.4.1AO1 4.4.4.11		charges. Or a charged poly brought near to t suspended charge show attraction b charges.	ythene rod is the end of a ed acetate rod to between unlike					Answer given to 3 significant figures	answer Correct answer with no working shown = 4 marks 1 mark
Natioactive focks in solitarid14.4.3.107.25.31AO3 4.4.3.107.3 ${}^{222}_{86}Rn \rightarrow {}^{218}_{84}Po + {}^{2}_{2}He}_{86}Rn \rightarrow {}^{218}_{84}Po + {}^{2}_{2}He}$ 1 mark each for the two missing numbers2AO2 4.4.2.207.4 ${}^{218}_{84}Po \rightarrow {}^{218}_{85}At + {}^{-1}e$ 1 mark each for the three missing numbers3AO2 4.4.2.207.4 ${}^{218}_{84}Po \rightarrow {}^{218}_{85}At + {}^{-1}e$ 1 mark each for the three missing numbers3AO2 4.4.2.208.1At least one of the free neutrons emitted must cause another uranium nucleus to undergo fission1AO1 4.4.4.108.2KineticOnly one box ticked1AO1 4.4.4.1	07.1	Radon gas Radioactivo rocks	in coil and	1	AO3		10.1	Thermistor	
07.25.31AO3 4.4.3.107.3 ${}^{222}_{86}Rn \rightarrow {}^{218}_{84}Po + {}^{4}_{2}He}_{84}$ 1 mark each for the two missing numbers2AO2 		buildings			4.4.5.1		10.2	The resistance de	creases/gets
07.3 $222_{86}^{222}Rn \rightarrow \frac{218}{84}Po + \frac{4}{2}He}{86}$ 1 mark each for the two missing numbers2AO2 4.4.2.210.3The total resistance in the circuit decreases (because the resistance of Q decreases). (Since $I = \frac{V}{R}$) the ammeter reading increases.07.4 $218_{84}^{18}Po \rightarrow \frac{218}{85}At + \frac{0}{-1}e$ 1 mark each for the three missing numbers3AO2 4.4.2.208.1At least one of the free neutrons emitted nucleus to undergo fission1AO1 4.4.4.110.5Total resistance = 800 + 400 Total resistance = 1200 (\Omega)08.2KineticOnly one box ticked1AO1 4.4.4.110.5Total resistance = 1200 (\Omega)	07.2	5.3		1	AO3 4.4.3.1			smaller as the ten increases	nperature
07.4 $2^{18}_{84}\text{Po} \rightarrow 2^{18}_{85}\text{At} + \frac{0}{-1}\text{e}$ 1 mark each for the three missing numbers3AO2 4.4.2.208.1At least one of the free neutrons emitted must cause another uranium nucleus to undergo fission1AO1 	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		10.3	The total resistan decreases (becaus of Q decreases).	ce in the circuit se the resistance
08.1 At least one of the free neutrons emitted must cause another uranium nucleus to undergo fission 1 AO1 4.4.2.2 08.2 Kinetic Only one box ticked 1 AO1 4.4.1	07.4	${}^{218}_{84} Po \rightarrow {}^{218}_{85} At + {}^{0}_{-1} e$	1 mark each	3	AO2	1		(Since $I = \frac{1}{R}$) the a increases.	ammeter reading
08.1 At least one of the free neutrons emitted 1 AO1 must cause another uranium nucleus to undergo fission 1 4.4.4.1 08.2 Kinetic Only one box ticked 1			missing numbers		4.4.2.2		10.4	400 (Ω)	
Nucleus to undergo fission Total resistance 08.2 Kinetic Only one box ticked 1 AO1 4.4.4.1	08.1	At least one of th emitted	e free neutrons	1	AO1 4.4.4.1		10.5	Total resistance = 800 + 400	1 mark
08.2 Kinetic Only one box 1 AO1 = 1200 (Ω) ticked 4.4.4.1 4.4.4.1 4.4.4.1 4.4.4.1 4.4.4.1		nucleus to underg	go fission					Total resistance	
	08.2	Kinetic	Only one box ticked	1	AO1 4.4.4.1			= 1200 (<i>\1)</i>	<u> </u>

Mark(s)

1

1

1

1

1

1

1

1

1

1

1

5

AO/Spec

ref

A01

AO3

AO3

A01 4.4.4.2

AO1

4.1.1.3

AO3 4.1.1.3

AO2 4.1.1.3

A01

4.2.1.1

4.2.1.4 AO2

4.2.1.4

AO3 4.2.1.4 AO2

4.2.2

AO3

1

1

1

1

1

1

4.4.2.4

4.4.2.4

4.4.4.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec	Question	Answer(s)	Extra info	Mark(s)	AO/Spec
10.6	Potential difference = current × resistance	Accept V = I R	1	AO1 4.2.1.3	11.5	Energy transferred = 1.2 × 0.60	1 mark for substitution 1 mark for	2	AO2 4.2.4.2
10.7	$6.0 = l \times 1200$ $l = \frac{6.0}{1200}$ $l = 0.0050 \text{ (A)}$ (accept 0.005)	1 mark for substitution 1 mark for rearranging 1 mark for answer	3	AO2 4.2.1.3		Energy transferred = 0.72 (J)	answer Allow error carried forward from 11.3 Correct answer with no working shown = 2 marks		
		Allow error carried forward from 10.5 Correct answer with no working shown = 3 marks			11.6	Constant up to 0.7 V/0.14 A and then increases EITHER:	1 mark 1 mark 1 mark for	3	AO3 4.2.1.3 4.2.1.4
10.8	Power = (current) ² × resistance	Accept $P = l^2 R$	1	AO1 4.2.4.1		at least two calculations using $R = \frac{V}{I}$	justification		
10.9	Power = 0.0050 ² × 800 Power = 0.02 (W)	1 mark for substitution 1 mark for answer	3	AO2 4.2.4.1		resistance values at different currents			
	Power = 20 (mW)	Allow error carried forward from 10.7 1 mark for				reference made to trend in the change			
		answer in mW Correct answer (in mW) with no working shown			12.1	corresponding to a change in potential difference	;-))		402
11.1		1 mark for ammeter in a complete circuit	3	AO1 4.2.1.4	12.1	water vapour in r per unit volume	ther than in umber of particles	1	4.3.1.1
	v v	1 mark for voltmeter in a complete circuit in parallel with X				Water vapour is r space compared v Liquid water is de water vapour in r particles per unit	nostly empty with liquid water enser than number of volume	1	
		1 mark for variable resistor in the main circuit			12.2	Level 3: A coherent plan covering all steps presented in a	5–6	6	AO2 4.3.1.1
11.2	Charge = current × time	Accept $Q = It$	1	AO1 4.2.1.2		logical order detailing all the			
11.3	Charge = 0.12×10	1 mark for substitution 1 mark for answer	2	AO2 4.2.1.2		apparatus used. The plan could be followed by another person			
	Charge = 1.2 (C)	Correct answer with no working shown = 2 marks				result for the density of the oil.			
11.4	Energy = charge × potential difference	Accept <i>E</i> = <i>QV</i>	1	AO1 4.2.4.2					

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.	Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
	Level 2: A clear plan covering	3–4			02.2	Distance = 1.5 × 60	1 mark for substitution	1	AO2
	most of the major steps					Distance = 90 (m)	1 mark for answer	1	4.5.0.1.2
	logical order detailing the apparatus used.						Correct answer with no working shown = 2 marks		
	be followed by another person				02.3	accelerating	Only one box ticked	1	AO1 4.5.6.1.5
	to obtain valid results for the mass and volume				02.4	Three different stages in the following order:	1 mark each, must be in the order shown	3	AO3 4.5.6.1.5
	Level 1: Some relevant statements but the plan could not be followed by another	1–2				Constant acceleration, constant velocity, constant deceleration/ negative acceleration			
	valid results.	0				Or acceleration of 5 m/s ² ; constant velocity			
	Indicative content Mass of empty me is measured	i : easuring cylinder				of 15 m/s; deceleration of 7.5 m/s ² / acceleration of			
	Mass measured with balance Oil poured into mit Volume of oil in mit recorded	ith (electronic) easuring cylinder ieasuring cylinder				Or time intervals specified for acceleration, constant velocity, deceleration			
	Mass of measuring measured (with ba	g cylinder with oil alance)			03.1	diffuse	Only one box ticked	1	AO1
	Mass of oil found the mass of the en	by subtracting npty measuring mass of the			03.2	opaque	Only one box ticked	1	AO1 4.6.2.6
	cylinder with oil	dividing the mass			03.3	black	Only one box ticked	1	AO1 4.6.2.6
	of oil by the volum	ne			03.4	speed	Only one box ticked	1	AO1
Paper 2 Question	Answer(s)	Extra info	Mark(s)	AO/Spec	03.5	black	Only one box ticked	1	AO1 4.6.2.6

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
01.1	ebud of gas and dust protostar main sequence star	1 mark for each correct name in the sequence shown	4	AO1 4.8.1.2
	red super giant	and black hole in either order		
01.2	The explosion of	a massive star	1	AO1
				4.8.1.2
02.1	Velocity of	Allow 'speed is	1	AO1
	an object is its speed in a given/specific direction	a scalar, velocity is a vector'		4.5.6.1.3

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5 Physics Set B - Answers

1

1

1

A01

A01

A01

4.5.6.3.1

4.5.6.3.1

4.5.6.3.2

Distance travelled by the car

One from:

Tiredness

Drugs Alcohol (A named source of) distraction (such as mobile phone)

during the driver's reaction time.

Distance travelled by the car while

the brakes are being applied

Any one for

1 mark

04.1

04.2

04.3

	Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.	Question	Answer(s)	Extra info
	04.4	One from: Wet road	Any one for 1 mark	1	AO1 4.5.6.3.3	07.1	Weight = mass × gravitational field strength	Accept W = mg
		Condition of tyres				07.2	500 g converted to 0.5(00) kg Weight =	1 mark for unit conversion 1 mark for
		Condition of brakes Gradient of					0.5(00) × 9.8 = 4.9 (N)	substitution and answer Correct answer
	04.5	road Surface of road		1	403			with no working shown
	04.5	steadily with incr Braking distance: increasing speed	easing speed increases with	1	4.5.6.3.1	07.3	According to Newton's Third Law, the bench	1 mark for each correctly substituted
		(Braking distance increasing rate	:) at an	1			exerts a force on the book equal in size	word
Υ.	04.6	Thinking distance = 16 m (accept 15-17) Braking	1 mark	3	AO2 4.5.6.3.1		to the book's weight. The force of	
		distance = 42 m (accept 41-43)	THIAK			07.4	gravity is a non- contact force. Work done =	Accept $W = E d$
		Stopping distance = 58	1 mark Correct				force × distance moved	
		56-60)	answer with no working 3 marks			07.5	100 cm converted to 1(.00) m	1 mark for unit conversion 1 mark for
סוצגע	04.7	Kinetic energy to thermal energy	Only one box ticked	1	AO1 4.5.6.3.4		Work done = 4.9 × 1(.00) = 4.9 (N m)	substitution and answer
	04.8	Temperature of brakes rises Or	Accept either statement for 1 mark	1	AO1 4.5.6.3.4			Correct answer with no working shown = 2 marks
םפ		Brakes become worn				07.6	Gravitational potential energy store	Only one box ticked
	05.1	Red-shift is the observed increase in wavelength of the light from distant galaxies	ticked	1	4.8.2	08.1	Demonstrate that to the core/electr switch closed/cur Observe nail fall/ attracted when s	t nail is attracted omagnet when rent flowing. cease to be witch opened
	05.2	The speed at which a galaxy	1 mark for a basic conclusion	2	AO3 4.8.2	08.2	Total weight = 2.	2 (N)
		larger as the distance gets larger Speed of galaxy receding is directly proportional to distance	Or 2 marks for a more specific conclusion			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	3–4
	05.3	Hot and very dense	Only one box ticked	1	AO1 4.8.2		results Level 1: Some	1–2
	06.1	gravity		1	AO1 4.8.1.3		relevant statements but the plan	
	06.2	The greater the c Sun, the lower th	listance from the e orbital speed	1	AO3 4.8.1.3		could not be followed by	
	06.3	13 km/s	Only one box ticked	1	AO2 4.8.1.3		another person to obtain valid	
	06.4	Europa	Only one box ticked	1	AO3 4.8.1.3		No relevant content	0
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Mark(s)

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AO/Spec

A01

AO2

A01

4.5.6.2.3

4.5.1.2

A01 4.5.2

AO2

4.5.2

A01

A01

AO2

AO2 4.7.2.1

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4.1.1.2

4.5.1.3

4.5.1.3

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.	Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
	Indicative conten	t:			09.1	gamma		1	AO1
	Close the switch								4.6.2.1
	Adjust the variab	le resistor to set			09.2	ultraviolet		1	AO1
	the current to a c	hosen value							4.6.2.4
	Record ammeter	reading			09.3	gamma		1	AO1
	Choose an amme	ter with an							4.6.2.3
	range of current	readings (use			09.4	Infrared		1	A01
	trial runs as neces	sary)			09.5	(Maya) speed		1	4.6.3.1
	Gradually add ma increments to the	isses in small e bar			09.5	= frequency × wavelength	Accept: $v = t\lambda$		4.6.1.2
	Until the bar falls				09.6	3.0 × 10 ⁸ =	1 mark for	3	AO2
	Care should be ta injury (e.g. to the iron bar and mass	ken to avoid feet) when the ses fall				frequency × 2.0 × 10^{-10} frequency =	substitution 1 mark for rearranging		4.6.1.2
	By placing soft m electromagnet	aterial below the				$\frac{3.0 \times 10^8}{2.0 \times 10^{-10}}$	1 mark for answer		
	Add the weight o	of the bar to the				Frequency = 1.5×10^{18}	Correct		
	weight of the ma	sses attached to				Unit: Hz	answer with		
	exerted by the el	ectromagnet					shown =		A01
	Repeat the proce	dure and					3 marks		4.0.1.2
	calculate an avera	age total weight					1 mark for unit	1	
	Repeat with seve	ral different			09.7	Two of:	Any two	2	AO3
	current values					X-ray procedures	1 mark each		4.6.2.3
	To produce severa	al data sets				health / can	Accept any		
	of current and to	tal weight/				cause (fatal)	other sensible		
08.4	To minimise	1 mark	1	AO3			consistent with		
	effect of	for either		4.7.2.1		on different	the data		
	(random) errors	statement				parts of the			
	Ur Ta haln snat					different sized			
	anomalous data					risks			
	Or					Lower doses give			
	To check results					lower risk (of fatal cancer)			
	are repeatable					The higher the			
08.5	4.2 F 2	1 mark if both values are	1	AO2		(X-ray) dose,			
	5.2	correct		4.7.2.1		the longer the			
08.6	Two points	1 mark if both	2	AO2		period of			
	plotted	points correctly		4.7.2.1		background			
	Straight line of	1 mark for				Fadiation			
	best fit drawn	suitable line of				procedures			
	that passes through the	best fit				have doses			
	origin					comparable with			
08.7	Increasing	1 mark for a	2	AO3		radiation levels			
	the current	basic conclusion		4.7.2.1		The risk of any			
	strength of the	for a detailed				single X-ray			
	electromagnet	conclusion				than the risk of			
	And either:	referring to direct				a 2-week period			
	is directly	proportionality				ot background radiation			
	proportional to	,			10.1	acceleration =	Δυ	1	AO1
	the current					change in velocity	Accept $a = t$		4.5.6.1.5
	Or: Doubling the					time	Accept $a = (y-y)/t$		
	the strength					or Acceleration = (change in			
						velocity) ± time			

	Question	Answer(s)	Extra info	Mark(s)	AO/Spec		Question	Answer(s)	Γ
	Question	Allswei(s)		IVIAI K(S)	ref.		Question	Allswei(s)	
	10.2	to change in velocity	1 mark for	3	AO2			Level 1: Some	Ŀ
		$10 = \frac{2.0}{2.0}$	substitution	_	45615			relevant	
		– 0	1 mark for		4.5.0.1.5			statements	
			indication that					but the plan	
		$r_{10} = 2.0$	initial velocity					could not be	
		10×2.0	= 0 and for					followed by	
		velocity = 20 (11/s)	rearranging					another person	
			1 mark for					results.	
			answer					No relevant	
			Correct					content	Ľ
			answer with					Indicative conten	t:
			no working					Position a plane r	n
			3 marks					of paper	
	10.3	Resultant force =	240 (N)	1	AO2			Draw a line on th	e
					45615			edge of the mirro	or
	10.4	Resultant	Accept $F = m a$	1	AO1			Remove the mirro	or
		force = mass ×	, ceeper ma		45622			draw a line at 90°	• 1
		acceleration			4.3.0.2.2			normal)	
	10.5	240 = 60 ×	1 mark for	3	AO2			Use a protractor	tc
		acceleration	correct		4.5.6.2.2			angle to the norn	na
2		Acceleration =	substitution					'incident ray'	
		240	1 mark for					Replace the mirro	or
Ī		60	rearranging					original line	
		Acceleration	1 mark for					Direct a ray of lig	h
2		$= 4.0 (m/s^{2})$	answer					the line marked i	n
-		(accept 4)	Correct answer					Mark a series of c	dc
5			with no					the reflected ray	
2			= 3 marks					Join the dots (wit	:h
	10.6	Resultant force =	0 (N)	1	AO2			path of the relied	
2					4.5.6.1.5			Measure the angl	le
1	10.7	В	Only one box	1	AO3			Popoat for at loa	-+
5		-	ticked		45615			angles	sι
5	10.8	D	Only one box	1	4.5.0.1.5			Beneat for each (۰h
5		-	ticked		45615			to assess the accu	ira
5	11 1		5_6	6	4.5.0.1.5			measurements	
	11.1	detailed and	5 0		1612		12.1	Independent vari	а
		coherent plan			4.0.1.5			force	
		covering all						Dependent varial	ol
2		steps presented						Control variable:	m
		in a logical						(accept: same glic	de
		plan could be						track set up)	
		followed by					12.2	(Standard) weigh	ts
		another person						uie suing)	
		to obtain					12.3	Glider moves free	ely
		sufficient						smoothly / accele	ra
		confirm the law						Because triction r	e
		of reflection.					12.4	$0.20^2 - 0.10^2 = 2$	
		Procedures to						$\times 0.50$	
		ensure and						acceleration -	
		assess accuracy						$0.20^2 - 0.10^2$	ן ן
		are considered.		4				(2 × 0.50)	
		plan covering	5-4					Acceleration	ן <u>י</u>
		the maior steps						= 0.030 (m/s ²)	Ι,
		presented in a						(accept 0.03)	`
		logical order.							[=
		The plan could					12.5	Take measuremer	nt
		be followed by						different forces.	
		to obtain valid						Plot a graph of a	cc
		results.						against force.	

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
	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		
	Position a plane r of paper Draw a line on th	a piece front		
	edge of the mirro Remove the mirro draw a line at 90° normal)			
	Use a protractor f angle to the norm 'incident ray'			
	original line Direct a ray of lig			
	Mark a series of c the reflected ray			
	Join the dots (wit path of the reflec	h a pencil) to show ted ray.	w the	
	Measure the angl protractor Repeat for at leas			
	angles Repeat for each o	hosen angle of ind	cidence of the	
12.1	measurements Independent vari	able: (resultant)	1	AO3
	force Dependent varial	ole: acceleration	1	4.5.6.2.2
	Control variable: (accept: same glic track set up)	mass (of glider) ler or same air	1	
12.2	(Standard) weigh the string)	ts (attached to	1	AO1 4.5.6.2.2
12.3	Glider moves free smoothly / accele	ly/more rates easily	1	AO1 4.5.6.2.2
12.4	Because friction r $0.20^2 - 0.10^2 = 2$	emoved/reduced 1 mark for	1	AO2
	$ x acceleration x 0.50 acceleration = \frac{0.20^2 - 0.10^2}{(2 \times 0.50)} $	substitution 1 mark for rearranging 1 mark for answer		4.5.6.1.5
	Acceleration = 0.030 (m/s ²) (accept 0.03)			
12.5	Take measuremen different forces.	nts for a range of	1	AO2 4.5.6.2.2
	Plot a graph of a against force.	cceleration	1	