Materials GCSE AQA Higher Physics Past Papers Answers

01.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	accept any value between 12 (mm) and 13(mm) inclusive		1	AO2/2 4.5.3
01.2	to reduce the error in measuring the extension of the spring as the ruler at an angle would make the measured extensions shorter	accept length for extension throughout	1 1	AO3/3a 4.5.3
01.3	1 (N) to 6 (N)	accept from 0 (N) to 6 (N)	1	AO2/2 4.5.3
01.4	gives a straight line through the origin		1	AO3/1a 4.5.3
01.5	any practical technique that would improve the accuracy of length measurement eg use a set square to line up the bottom of the spring with the ruler scale **or** attach a horizontal pointer to the bottom of the spring (1) so that the pointer goes across the ruler scale (1)		 1 1	AO3/3b 4.5.3
01.6	the spring has been inelastically deformed because it went past its limit of proportionality	 accept elastic limit for limit of proportionality accept it does not go back to its original length when the weights are removed	1 1	AO3/2a AO2/2 4.5.3
Total			**9**	

02.

Question	Answers	Mark	AO/ Spec. Ref
02.1	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO1 4.5.3
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content set up a clamp stand with a clamp hang the spring from the clamp use a second clamp and boss to fix a (half) metre ruler alongside the spring record the metre ruler reading that is level with the bottom of the spring hang a 2 N weight from the bottom of the spring record the new position of the bottom of the spring calculate the extension of the spring measure the extension of the spring add further weights to the spring so the force increases 2 N at a time up to 10 N		
	record the new position of the bottom of the spring calculate the extension of the spring measure the extension of the spring add further weights to the spring so the force increases 2 N at a time up to 10 N for each new force record the position of the bottom of the spring and calculate / measure the extension **possible source of inaccuracy** not fixing the ruler in position but simply holding the ruler next to the spring not clamping the ruler vertical misjudging the position of the bottom of the spring parallax error allow any other sensible suggestion that could reasonably lead to inaccuracy in the data allow a description that would increase accuracy repeating the measurements is insufficient		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	to identify any anomalous results **or** to reduce the effect of random error	allow calculate an average for the spring constant allow (more) accurate to obtain an average is insufficient to be able to draw a graph is insufficient	1	AO3 4.5.3
02.3	both points plotted correctly correct line of best fit drawn	 to pass through (0,0) and (10,20)	1 1	AO2 4.5.3
02.4	force = spring constant × extension	allow F = ke	1	AO1 4.5.3
02.5	 extension = 0.2 $10 = k \times 0.2$ $k = \frac{10}{0.2}$ k = 50	an answer of 50 scores **4** marks allow 0.035 / 0.08 / 0.125 / 0.16 force value must match extension this mark may be awarded if e is in cm allow correct transformation of their chosen values this mark may be awarded if e is in cm an answer 0.5 scores **3** marks	 1 1 1 1	 AO2 AO2 AO2 AO2 4.5.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	the line is straight and passes through the origin	allow the line does not curve this mark is dependent on scoring the first mark allow a correct description of direct proportionality for **2** marks ignore the line shows they are directly proportional	1 1	AO3 4.5.3
Total			**16**	

03.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1	the (perpendicular) distance from the pivot / hinge to (the line of action of) the force is greater	allow distance from the rope to the pivot / hinge is greater (than distance between handle and pivot / hinge)	1	AO2/1 4.5.4
	so a smaller force is required	this mark is dependent on scoring the 1st mark an answer a smaller force is required at the rope to produce the same moment scores **2** marks	1	
2		an answer of 770 scores **6** marks		AO2/1 4.5.4 4.5.3
	$924 = F \times 0.15$		1	
	$F = 6160$ (N)		1	
	$6160 = k \times 0.25$	allow use of $E = \frac{1}{2} F e$ instead of $k = F \div e$ and $E = \frac{1}{2} \times k \times e^2$ allow their calculated $F = k \times 0.25$	1	
	$k = \frac{6160}{0.25}$ **or** $k = 24640$ (N/m)	allow a value for k calculated using their calculated F	1	
	$E = \frac{\frac{1}{2} \times 6160 \times 0.25 \times 0.25}{0.25}$	allow $E = \frac{1}{2} \times$ their calc. $k \times 0.25^2$	1	
	$E = 770$ (J)	allow an answer consistent with their calculated k	1	
Total			**8**	

04.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
	1.50 cm = 0.015 m		1	AO2 4.5.3
	2.88 = k × 0.015	this mark may be awarded if distance is incorrectly/not converted	1	
	k = 2.88 / 0.015	this mark may be awarded if distance is incorrectly/not converted	1	
	k = 192 (N/m)	allow a correctly calculated answer using an incorrectly/not converted distance	1	

05.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
☐	Any **two** from: • increase the current (in the solenoid / circuit) • add more turns to the solenoid • use a spring with a lower spring constant	 allow any sensible suggestion for increasing the current such as increasing the p.d. / power of the battery **OR** using lower resistance wire in the solenoid do **not** allow increase the number of coils allow use a weaker spring	2	AO3 4.7.2.1
Total			**14**	

06.

Question	Answers	Extra information	Mark	AO/ Spec. Ref
1	will return to its original shape/length		1	AO2 4.5.3
	when the force is removed	allow (when) the child gets off the second mark is dependent on scoring the first mark	1	
2	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.		5–6	AO1 4.5.3
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.		3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	
	No relevant content		0	
	Indicative content • set up a clamp stand with a clamp • hang the spring from the clamp • use a second clamp and boss to fix a (half) metre rule alongside the spring • record the ruler reading that is level with the bottom of the spring • hang a 1 N / a known weight from the bottom of the spring • record the new position of the bottom of the spring • calculate the extension of the spring • measure the extension of the spring • add further weights to the spring so the force increases 1 N at a time up to 5 N • for each new force record the position of the bottom of the spring and calculate / measure the extension			

	Risk Assessment Hazard: Clamp (stand, boss and masses) might fall off desk Risk: injury to feet Precaution: Use clamp to fix apparatus to the bench **or** Ensure that the slotted masses hang over the base/foot of the stand **or** Ensure that the boss is screwed tightly into the stand and clamp **or** Put (heavy) masses on the base/foot of the stand **or** Stand up so that you can move out of the way Hazard: Spring could break / come loose Risk: damage eye Precaution: Wear safety goggles If a risk assessment / hazard is not given, the answer can still reach level 3, but not full marks. Full marks may be awarded for alternative feasible methods.			

3	force = spring constant × extension		1	AO1 4.5.3

4	5.00 0.125	allow any correct pair of values from the graph	1	AO2 4.5.3
	$k = \frac{5.00}{0.125}$	allow a misread value(s) from the graph	1	
	$k = 40$ (N/m)	allow a correct calculation using their incorrect value(s)	1	

5	the line is straight	allow the line does not curve allow a constant gradient	1	AO3 4.5.3
	and passes through the origin		1	

6	$e = 0.20$ m $E_e = 0.5 \times 13 \times 0.20^2$ $E_e = 0.26$ (J)	 allow an incorrectly / not converted value of e use of two incorrectly/not converted values scores a maximum of 1 mark	1 1 1	AO2 4.5.3

Total			**17**

07.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1	the point from which weight may be considered to act **or** the point where the mass appears to be concentrated	allow the point through which the line of action of the weight acts allow the point at which the mass is concentrated	1	AO1 4.5.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2	mass of 5 tomatoes = 0.425 (kg)		1	AO2 4.5.1.3
	mass of 1 tomato = 0.085 (kg)	allow an incorrect and / or not converted reading correctly divided by 5	1	
	$W = (0.085 \times 9.8) = 0.833$ (N)	allow a correct calculation using their value of mass	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3	$6.0 = k \times 0.015$		1	AO2 4.5.3
	$k = \frac{6.0}{0.015}$	allow correct rearrangement using an incorrectly calculated value of e	1	
	$k = 400$ (N/m)	allow a correct calculation using an incorrectly calculated value of e	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4	deforms elastically (so) will return to its original length / shape (after force is removed) **OR** compression is directly proportional to the force (applied) (1) (so) gives a linear scale (1)	 allow easy to calibrate	1 1	AO3 4.5.3

Total Question 4		**9**