AQA GCSE Physics

Practice answers

	Answers	Extra information	Mark	AO / Specification reference
01.1	force: newtonmeter **or** amount of masses/weights on end of spring extension: ruler		1 1	AO2 4.5.3
01.2	measure the length of the spring with the ruler apply a known force/ (hang up the spring and) hang a known weight on it measure the length again find the extension by subtracting the original length from the stretched length.		1 1 1 1	AO2 AO3 4.5.3
01.3	to get more accurate/precise measurements		1	AO2 AO3 4.5.3
01.4	repeat it/ignore it when they are calculating the mean		1	AO2 AO3 4.5.3
01.5	line graph the data are continuous/all numbers and no words/names		1 1	AO2 4.5.3
02.1	non-contact – weight/force of the Earth on the wood contact force – upthrust/upwards force of the water on the wood		1 1	AO1 AO2 4.5.1.2
02.2	the forces are equal in magnitude and opposite in direction		1 1	AO1 AO2 4.5.1.1 4.5.1.4

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02.3	water resistance contact force		1 1	AO1 AO2 4.5.1.2
03.1	work done = force × distance	accept W = Fs	1	AO1 4.5.2
03.2	work done = 20 × 30 = 600 (Nm or J)	accept 600 (Nm or J) with no working for two marks	1 1	AO2 4.5.2
03.3	newton metres (Nm) joules (J)		1	AO1 4.5.2
03.4	friction		1	AO1 4.5.2
03.5	chemical energy store will decrease (food/oxygen) thermal energy store (of the surrounding) will increase	do not accept answers involving changes in kinetic energy store (at constant speed, the kinetic energy store will stay at constant level)	1 1	AO2 4.5.2
04.1	any sensible suggestion, e.g., difficult to see the undeflected position of the ruler to measure from, difficult to see the extension		1	AO3 4.5.3
04.2	ignore the outlier 17 average of the other two readings = $\frac{10+12}{2}$ = 11		1	AO2 4.5.3

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04.3	one mark for correct plotting of four points two marks for correct plotting of all points one mark for curved line of best fit one mark for appropriate y-axis label and scale		4	AO2 AO3 4.5.3
04.4	no the line is not straight/linear (through origin)		1 1	AO3
05.1	the first column is should be labelled mass in grams and not weight which would be in newtons (N) they should convert g to kg and then to N using weight = mass (in kg) x g		1 1	AO2 4.5.1.3
05.2	one mark for correct values of force converted from g one mark for correct plotting of at least four points one mark for labelled axes one mark for appropriate line of best fit		4	AO2 4.5.1.3 4.5.3
05.3	original length = intercept on x axis/when force on sample is zero = 3.0 cm	allow answers between 2.5 cm and 3.5 cm	1 1	AO3 4.5.3
05.4	as the force increases the material becomes less stiff/easier to stretch **or** the same increase in force produces a bigger increase in length		1	AO2 AO3 4.5.3
05.5	it would not be suitable the extension if not proportional to the force		1 1	AO3 4.5.3

<table>
<tr><th></th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Specification reference</th></tr>
<tr><td>06.1</td><td>the force of the hand on the bag</td><td>or words to that effect</td><td>1</td><td>AO2
4.5.3</td></tr>
<tr><td>06.2</td><td>inelastic deformation is deformation where the object does not return to its original size and shape when the force is removed</td><td></td><td>1</td><td>AO1
4.5.3</td></tr>
<tr><td>06.3</td><td><table><tr><th>Statement</th><th>Correct</th></tr><tr><td>the graph for the plastic bag shows a non-linear relationship between force and extension</td><td>✓</td></tr><tr><td>the graph for the plastic bag shows that is proportional to extension</td><td></td></tr><tr><td>a graph that is a straight line is likely to be for a spring</td><td>✓</td></tr><tr><td>the material that produced a linear graph has been inelastically deformed</td><td></td></tr></table></td><td>one mark for each correct row</td><td>2</td><td>AO3
4.5.3</td></tr>
<tr><td>06.4</td><td>extension = stretched length - unstretched length
= 3 cm - 2 cm/0.03 - 0.02
= 1 cm/0.01 m</td><td></td><td>1
1</td><td>AO2
4.5.3</td></tr>
<tr><td>07.2</td><td>force = spring constant × extension</td><td>allow F = ke</td><td>1</td><td>AO1
4.5.3</td></tr>
</table>

	Answers	Extra information	Mark	AO / Specification reference
07.3	$2 = k \times 0.01$ $k = \frac{2}{0.01} = 200$ N/m		1 1	AO2 4.5.3
07.4	energy = 0.5 × spring constant × extension^2 $= 0.5 \times 200 \times 0.01^2$ = 0.01 J	allow E = 0.5 ke^2 accept 0.01 (J) with no working for two calculation marks	1 1	AO2 4.5.3
07.5	0.01 J the work done on the spring is equal to the elastic energy stored in the spring		1 1	AO2 4.5.3
08.1	up arrow: force of the workbench on the tub down arrow: force of the Earth on the tub down arrow should be larger than the up arrow	accept 'normal' or 'reaction' accept 'weight' do not accept 'gravity' one mark for two equal length arrows pointing in opposite directions	3	AO2 4.5.1.4
08.2	the weight can be resolved into two components, one down the ramp and one at 90 degrees to the ramp there is a force of friction opposing the component of weight down the ramp which is smaller than the component of the weight (so there is a resultant force down the ramp and the tub accelerates)		1 1 1	AO2 4.5.1.4
08.3	one mark for correct x and y labels one mark for horizontal line		2	AO3

	Answers	Extra information	Mark	AO / Specification reference
08.4	any sensible suggestion, e.g., • as the mass increases, the frictional force increases • as the mass increases the component of the weight down the slope also increases, so the two effects cancel out		1	AO3
09.1	free body diagram e.g., up arrow: normal/reaction left arrow: driving force/18 000N right arrow: resistive force/12 000 N down arrow: weight/15 kN right arrow should be longer than all the other arrows	one mark for arrow left labelled driving force/18 000 N one mark for arrow right labelled resistive force/12 000N one mark for arrow downwards labelled weight/15 kN one mark for arrow upwards labelled normal force weight and normal arrows the same length, driving force arrow longer than resistive force arrow	4	AO2 4.5.1.1 4.5.1.2 4.5.1.4
09.2	horizontally: resultant = 18 000 - 12 000 = 6000 N to the left vertically: resultant = 15 000 - 15 000 = 0 N		1 1 1	AO2 4.5.1.4

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09.3	weight = 15 000 N weight = mass x gravitational field strength 15 000 = mass x 9.8 mass = $\frac{15000}{9.8}$ = 1531kg		1 1 1 1	AO2 4.5.1.3
09.4	both vertical arrows would change slightly in length but still cancel out / be the same size the horizontal arrows would not change		1 1 1	AO3 4.5.1.2 4.5.1.3 4.5.1.4
10.1	appropriate scale diagram e.g., 1 cm = 10 N answer = 153 N	accept answers from 148 N to 158 N one mark for clear scale one mark for parallelogram drawn one mark for correct answer	3	AO3 4.5.1.4
10.2	(if angle increases) cos (angle) decreases so that tension increases so that the component of the tension stays the same/so that the resultant of the 2 tension forces stays the same		1 1	AO3 4.5.1.4

	Answers	Extra information	Mark	AO / Specification reference
10.3	the angle between the vertical component of tension and the string = 60° but the vertical component is T sin60 2T sin60 = W =153 T = 88N which is less than in arrangement A		1 1 1 1 1	AO3 4.5.1.4
11.1	moment = force × distance	accept M = Fd	1	AO1 4.5.4
11.2	moment = 8 × 1000 = 8000 Nm	accept 8000 (Nm) with no working	1 1	AO2 4.5.4
11.3	clockwise moments = anticlockwise moments if the crane is balanced counterbalance weight × distance from pivot = moment of load counterbalance weight × 4 = 8000 counterbalance weight = $\frac{8000}{4}$ = 2000 N	one mark for evidence of using law of moments	1 1 1 1	AO1 AO2 4.5.4
11.4	low, high	both answers required for the mark	1	AO1 4.5.4
12.1	force for spring 1 = 30 N, force for spring 2 = 20 N the force for spring 1 is $\frac{30}{20}$ = 1.5 times bigger		1 1	AO2 4.5.3

	Answers	Extra information	Mark	AO / Specification reference
12.2	spring 1 would feel stiffer than spring 2 it takes a bigger force to extend it by the same length		1 1	AO3 4.5.3
12.3	force (applied to a spring) = spring constant × extension	accept F = ke	1	AO1 4.5.3
12.4	spring 1: 48 = k_1 × 0.08 k_1 = 600 N/m spring 2: 32 = k_2 × 0.08 k_2 = 400 N/m	accept any correct pair of values from the graph	1 2 1 2	AO2 4.5.3
13.1	force = spring constant × extension	accept F = ke	1	AO1
13.2	extension = final length - original length = 20.14 - 20.00 = 0.14 m		1	AO2
13.3	weight of climber = mass × g = 80 × 9.8 = 784 N using force = spring constant × extension 784 = spring constant × 0.14 spring constant = $\frac{784}{0.14}$ = 5600 N/m	answer is given to two significant figures	1 1 1 1 1	AO1 AO2 4.5.1.3 4.5.2

	Answers	Extra information	Mark	AO / Specification reference
13.4	the weight stays the same so the spring constant will be smaller	accept units of k are N/m so if weight (N) remains same and more metres then k is smaller	1 1	AO3 4.5.1.4
14.1	weight = mass × gravitational field strength	accept W = mg	1	AO1 4.5.1.3
14.2	weight = 140 × 9.8 = 1372 N	accept 1372 (N) with no working for the two calculation marks	1 1	AO2 4.5.1.3
14.3	the centre of mass	accept centre of gravity	1	AO1 4.5.1.3
14.4	(weight = mass × gravitational field strength) = 140 × 3.8 = 532 (N) difference = 1372 - 532 = 840 N **or** $\frac{1372}{532} = 2.6$ the difference in weight is 840 N or the weight on Earth is 2.6 times bigger	accept 532 (N) with no working for two calculation marks evidence of calculating difference or ratio with relevant comment for three marks	1 1 1 1	AO2 4.5.1.3
14.5	non-contact the objects do not ned to be in contact for the force to act		1 1	AO1 4.5.1.3

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