

Forces and Elasticity

Mark Scheme

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.5 Forces
Sub-Topic	Forces and Elasticity
Difficulty Level	Silver Level
Booklet	Mark Scheme

Time Allowed: 33 minutes

Score: /33

Percentage: /100

Grade Boundaries:

M1.(a) (i) any **two** from:

- length of coils increased
- coils have tilted
- length of loop(s) increased
- increased gap between coils
- *spring has stretched / got longer*
- *spring has got thinner*

2

(ii) remove mass

accept remove force / weight

1

observe if the spring returns to its original length / shape (then it is behaving elastically)

1

(b) (i) 8.0 (cm)

1

extension is directly proportional to force (*up to 4 N*)

for every 1.0 N extension increases by 4.0 cm (up to 4 N)

evidence of processing figures eg 8.0 cm is half way between 4.0 cm and 12.0 cm

1

allow spring constant (k) goes from to $\frac{1}{4}$ to $\frac{5}{22}$

1

(ii) any value greater than 4.0 N and less than or equal to 5.0 N

1

*the increase in extension is greater than 4 cm per 1.0 N (of force) added
dependent on first mark*

	1
(c) (i) elastic potential energy	1
(ii) misread stopwatch	1
timed too many complete oscillations	1
(iii) 4.3 (s) accept 4.33 (s)	1
(iv) stopwatch reads to 0.01 s	1
reaction time is about 0.2 s or <i>reaction time is less precise than stopwatch</i>	1
(v) use more masses	1
smaller masses eg 50 g <i>not exceeding limit of proportionality</i>	1
	[17]

M2.	(a)	(i)	B C <i>either order</i>	1
		(ii)	elastic <u>potential</u> (energy) <i>accept strain for elastic</i>	1
	(b)	(i)	<i>mark both parts together</i>	1
			measured / recorded the length of the spring (and not extension) <i>accept measured A–C (and not B–C)</i> <i>accept did not work out/measure the extension</i>	
			extension does not equal zero when force = 0 <i>accept line should pass through the origin</i>	1
		(ii)	point marked at 5.5 (N) <i>accept any point between 5.0 and 5.6 inclusive</i>	1
			up to that point force and extension are (directly) proportional <i>accept it's at the end of the straight part (of the graph line)</i> <i>accept past that point force and extension are no longer (directly) proportional</i> <i>accept the line starts to curve</i>	1
	(c)	1.8	<i>allow 1 mark for correct substitution, ie 25×0.072 provided no subsequent step shown</i> <i>an answer 1800 gains 1 mark</i> <i>an incorrect conversion from mm to m with a subsequent correct calculation gains 1 mark</i>	2

- M3.** (a) weight or gravity or gravitational
for 1 mark 1
- (b) (i) only force A acts / force A > air resistance / gravity / weight
for 1 mark 1
- (ii) force A > force B
for 1 mark 1
- (iii) force C > force A
for 1 mark
(Forces A, B and C need not be used, description of forces are OK) 1
- (c) (i) graph points all correct \pm little square
gains 2 marks
one point wrong
gains 1 mark
2+ points wrong
gains 0 mark
appropriate line – good freehand OK
gains 1 mark
Bar chart gets 0, but if points clear can get 2 3
- (ii) 16 or candidates own intercept should be 16 m in range 1-19
if no kinks on graph line
for 1 mark 1

