

Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Mark Schemes

Q1.

Question number	Answer	Additional guidance	Mark
(i)	50.0 to 55.0 mm inclusive		(1)

Question number	Answer	Additional guidance	Mark
(ii)	a description including note the original length (1) note the final length and subtract (1)		(2)

Question number	Answer	Additional guidance	Mark
(iii)	any two from: use a ruler with a smaller/millimetre divisions (1) use interim values of weight (1) add more weights (to increase the range) (1) move the ruler closer to the spring (1) use of pointer (1) repeat and average (1)	ignore more accurate add fixed values of weights eye level / no parallax	(2)

Question number	Answer	Additional guidance	Mark
(iv)	the coils are {pushed together /touching} (1) or spring is fully compressed /cannot be made shorter (1)		(1)

Question Number:	Answer	Additional Guidance	Mark
(i)	<p>a description to include 4 of the following:</p> <ul style="list-style-type: none"> • note position of pointer before current is switched on (1) • measure position of pointer when current in coil (1) • (use an ammeter to) measure current (1) • calculate the extension / stretch of the spring (1) • use force (of attraction) is proportional to extension / stretch (of spring) (1) • repeat with different currents (1) 	<p>measure length of spring before current is switched on</p> <p>how far nail moves</p> <p>calculate force from spring constant and extension</p> <p>calibrate spring</p> <p>increase the current</p> <p>calculate the extension of the spring using new position of pointer minus starting position of pointer is worth 3 marks</p>	<p>(4) AO 2 2</p>

Question Number:	Answer	Additional Guidance	Mark
(ii)	select and substitute (1) $(E =) \frac{1}{2} \times 24 \times 0.12^2$ evaluation (1) $(E =) 0.17 \text{ (J)}$	$\frac{1}{2} \times 24 \times 12^2$ max 1 mark accept answers that round down to 0.17 e.g. 0.1728 POT error (e.g. 1728) max 1 mark award full marks for correct answer without working	(2) AO 2 1

Q3.

Question number	Answer	Additional guidance	Mark
	substitution (1) $0.14 = \frac{1}{2} \times 175 \times x^2$ rearrangement for x^2 (1) $(x^2 =) \frac{0.14 \times 2}{175}$ or $\frac{0.14}{0.5 \times 175}$ evaluation (1) 0.04 (m)	substitution and rearrangement in either order $x^2 = \frac{E}{\frac{1}{2} \times k}$ 1.6×10^{-3} seen gains 2 marks 0.02(m) gains 2 marks 0.028 gains 1 mark award full marks for the correct answer without working	(3)

Q4.

Question number	Answer	Additional guidance	Mark
(i)	selection and substitution (1) (F=) $260 \times 6.2 \times 10^{-3}$ evaluation (1) (F=) 1.612 (N) or 1.61 (N) answer to 2 s.f. (1) 1.6 (N)	award 1 mark only for answer of 1.61(2) to any other power of ten, e.g. 1612 (N) independent mark for any answer given to 2 significant figures allow 2 marks for answer of 1600 (N) with or without working 1.60 scores 2 marks award full marks for correct answer without working.	(3) AO2

Question number	Answer	Additional guidance	Mark
(ii)	<p>a description including</p> <p>read position of top of spring against the ruler (1)</p> <p>read position of top of spring when pressed down (1)</p> <p>subtract the two readings (1)</p> <p>OR</p>	<p>May be seen drawn in figure 7</p> <p>measure length at the start</p> <p>allow value from ruler e.g. 2.9 (cm)</p> <p>measure the length when pressed down</p> <p>allow value from ruler e.g. 2.0 (cm)</p> <p>subtract the two measurements</p> <p>allow find the difference for subtract</p> <p>allow calculated value from diagram e.g. 0.9 (cm)</p> <p>ignore repeat</p>	(3) AO1
	<p>substitution (1)</p> <p>$0.39 = 260 \times \text{change in length}$</p> <p>rearrangement (1)</p> <p>(change in length =) $\frac{0.39}{260}$</p> <p>evaluation (1)</p> <p>1.5 mm</p> <p>unit must be shown</p>	<p>(0).0015m</p> <p>unit must be shown</p>	

Question number	Answer	Additional guidance	Mark
(iii)	<p>description to include</p> <p>change to enable accurate location of top of spring (1)</p> <p>for example: pointer, set square, thin sheet / another ruler (under finger)</p> <p>description of how the change is used (1)</p>	<p>may be seen drawn in Figure 7</p> <p>move ruler closer to spring</p> <p>compress spring with weight rather than finger</p> <p>ignore photographs</p> <p>make measurements from where pointer / set square / thin sheet / other ruler touches the ruler</p> <p>reduce parallax error</p> <p>prevents fluctuations while measuring</p> <p>ignore repeats</p> <p>ignore unqualified references to accuracy or precision</p>	(2) AO3