

**Material Physics GCSE AQA Higher Physics Past Papers**  
**Answers**

01.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1	g.p.e. = mass × gravitational field strength × height	accept $E_p = mgh$	1	AO1/1 4.1.1.2
2	$E_p = 50 \times 9.8 \times 20$ 9800 (J)	allow 9800 (J) with no working shown for 2 marks answer may also be correctly calculated using $W = Fs$ ie allow $W = 490 \times 20$ for 1 mark or answer of 9800 (J) using this method for 2 marks	1 1	AO2/1 4.1.1.2
3	7840 (J)	allow ecf from '11.2'	1	AO2/1 4.1.1.2
4	$7840 = \frac{1}{2} \times 50 \times v^2$ $v = \sqrt{\frac{7840}{\frac{1}{2} \times 50}}$ 17.7(0875) (m/s) 18 (m/s)	allow $v^2 = \frac{7840}{(\frac{1}{2} \times 50)}$ for this point  allow ecf from '11.3' correctly calculated for 3 marks allow 18 (m/s) with no working for 2 marks answer may also be correctly calculated using $v^2 - u^2 = 2as$	1 1 1 1	AO2/1 4.1.1.2
5	extension = 35 (m) and conversion of 24.5 kJ to 24500 J $24\,500 = \frac{1}{2} \times k \times 35^2$ 40	allow 40 with no working shown for 3 marks an answer of '16.2' gains 2 marks	1 1 1	AO2/2 4.1.1.2 WS4.3
<b>Total</b>			<b>11</b>	

02.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1	$E_e = 0.5 \times 50 \times 0.12^2$ $E_e = 0.36 \text{ (J)}$  $0.36 = 0.5 \times 0.020 \times v^2$  $v^2 = \frac{0.36}{0.5 \times 0.020}$ <b>or</b> $v^2 = 36$  speed = 6.0  m/s <b>or</b> metres/second	allow a correct substitution of their calculated value of $E_e$  allow a correct rearrangement of their calculated value of $E_e$  allow an answer consistent with their calculated value of $E_e$  Alternative approach: $(F = ke)$ $(F = 50 \times 0.12)$ (maximum) $F = 6.0 \text{ (N) (1)}$  $(F = ma)$ $(6.0 = 0.020 \times a)$ (maximum) $a = 300 \text{ (m/s}^2\text{) (1)}$  mean $a = 150 \text{ (m/s}^2\text{) (1)}$  $(v^2 - u^2 = 2as)$ $v^2 = 2 \times 150 \times 0.12 \text{ (1)}$ <b>or</b> $v^2 = 36$  $v = 6.0 \text{ (1)}$  m/s (1) <b>or</b> metres/second	1 1 1 1 1 1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2	kinetic		1	AO1 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3	increasing the extension of the spring or more elastic potential energy or increase the angle of release (to the horizontal by a small amount)	allow other factors that would increase the horizontal distance travelled eg a tail-wind  ignore factors without a change specified e.g. extension unqualified would not score  ignore changing the spring or changes to the toy aeroplane	1	AO2 4.1.1.1

Total Question		8
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03.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1	<p>spring may become permanently extended</p> <p>or</p> <p>extension of the spring may be too great (so the baby's feet are always on the floor)</p>	<p>ignore reference to limit of proportionality</p> <p>allow the harness / spring / chain may break</p> <p>ignore baby may be injured / harmed / may hit doorframe</p>	1	AO3 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2	<p>(in position <b>A</b>) the baby has gravitational potential energy</p> <p>(as the baby moves down this) is transferred to kinetic energy (of the baby) and / then elastic potential energy (of the spring)</p> <p>(in position <b>B</b>) all the energy is elastic potential energy</p>	<p>allow <math>E_p</math> for gravitational potential energy</p> <p>allow <math>E_k</math> for kinetic energy</p> <p>allow <math>E_e</math> for elastic potential energy</p> <p>ignore energy dissipated to the surroundings</p>	1  1  1	AO1 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3	$e = 0.080 \text{ (m)}$ $4.0 = \frac{1}{2} \times k \times 0.080^2$  $k = \frac{4.0}{(0.5 \times 0.080^2)}$  $k = 1250 \text{ (N/m)}$	<p>allow a correct substitution using an incorrectly / not converted value of <math>e</math></p> <p>allow a correct rearrangement using an incorrectly / not converted value of <math>e</math></p> <p>allow an answer consistent with their value of <math>e</math></p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>AO2 4.1.1.2</p>
Total Question			8	