Assess Quizzes from the o-book – Explanations for the answers.

Chapter 13 Review – Support

Q	Reason
1	$E_K = \frac{1}{2}mv^2 = \frac{1}{2}\times 10\times 2^2 = 20\,J$
2	The ball is moving horizontally and there is no motion in the direction of the force of gravity (vertically). So, no work is done in the vertical (gravity) direction.
3	Momentum is the product of a vector and a scalar.
4	$E_{P(initial)} = mgh = 5\times 9.8\times 10 = 490\,J$ $E_{P(final)} = mgh = 5\times 9.8\times 0 = 0\,J$ $\Delta E_P = E_{P(final)} - E_{P(initial)} = 0 - 490 = -490J\,(close\,to\,500J)$ Note: energy is not a vector quantity so we can ignore the – sign.
5	There is no change in vertical height, so no change in GPE. Note that GPE is not a vector quantity so there is no change in direction involved either.
6	Loss of KE means it is inelastic.
7	$E_P = mgh = F_W \times h = 10\times 250 = 2500\,J$
8	$P = \dfrac{W}{t} = \dfrac{1J}{1s} = 1\,J\,s^{-1}$
9	$P = \dfrac{W}{t} = \dfrac{mgh}{t} = \dfrac{80\times 9.8\times 7}{9} = 609\,W\,(\approx 610\,W)$
10	$E_P = mgh = 200\times 9.8\times 1.5 = 2940\,J$ $P = \dfrac{W}{t} = \dfrac{2940}{3} = 980\,W$

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Chapter 13 Review – Consolidate

Q	Reason
1	$E_{K(M)} = E_{K(H)}$ $\frac{1}{2} m_M {v_M}^2 = \frac{1}{2} m_H {v_H}^2$ $m_M {v_M}^2 = m_H {v_H}^2$ [delete the $\frac{1}{2}$ from both sides] $80 {v_M}^2 = 320 {v_H}^2$ $\frac{{v_M}^2}{{v_H}^2} = \frac{320}{80} = 4$ $\sqrt{\frac{{v_M}^2}{{v_H}^2}} = \sqrt{4}$ $\frac{v_M}{v_H} = 2$ $v_M = 2 v_H$
2	$v^2 = u^2 + 2as$ $= 0 + 2 \times -9.8 \times -6$ $= 115.2$ $v = \sqrt{115.2} = 11 m\, s^{-1}$ Alternatively, using conservation of mechanical energy (this chapter's topic): $\Delta E_P = \Delta E_K$ $\cancel{m} gh = \frac{1}{2} \cancel{m} v^2$ $9.8 \times 6 = \frac{1}{2} v^2$ $115.2 = v^2$ $v = \sqrt{115.2} = 11 m\, s^{-1}$
3	$\Delta E_K = \Delta E_P$ $\frac{1}{2} \cancel{m} v^2 = \cancel{m} gh$ $\frac{1}{2} \times 20.0^2 = 9.8 h$ $h = \frac{200}{9.8} = 20.4 m$

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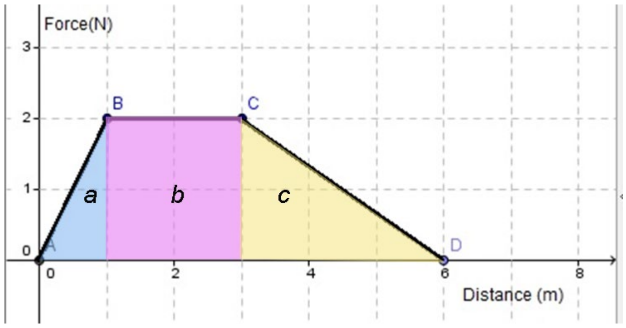
4	$E_K = \Delta E_P$ $= mgh$ $= 10 \times 9.8 \times 5$ $= 490\,J$
5	$W = Fs\,(area\,under\,curve)$ $=$ area a + area b + area c $= \frac{1\times 2}{2} + 2\times 2 + \frac{3\times 2}{2}$ $= 1+4+3$ $= 8\,J$ 

Chapter 13 Review – Extend

Q	Reason
1	$\Delta E_K = \Delta E_P + \Delta E_K$ $\frac{1}{2}\cancel{m}v^2 = \cancel{m}gh + \frac{1}{2}\cancel{m}v^2$ $\frac{1}{2}\times 20^2 = 9.8\times 15 + \frac{1}{2}v^2$ $200 = 147 + \frac{1}{2}v^2$ $\frac{1}{2}v^2 = 200 - 147 = 53$ $v^2 = 106$ $v = 10\,m\,s^{-1}$
2	$\Delta E_{K1g} = \Delta E_{K4g}$ $\frac{1}{2}\times 1 {v_{1g}}^2 = \frac{1}{2}\times 4 {v_{4g}}^2$ ${v_{1g}}^2 = 4{v_{4g}}^2$ $v_{1g} = 2v_{4g}$ $1:2$

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3	$E_{Ki} = E_{Kf}$ $\frac{1}{2}m_A u_A^2 + \frac{1}{2}m_B u_B^2 = \frac{1}{2}m_A v_A^2 + \frac{1}{2}m_B v_B^2\ (elastic)$ $u_A^2 + u_B^2 = v_A^2 + v_B^2$ $0.5^2 + (-0.3)^2 = v_A^2 + v_B^2$ $0.25 + 0.09 = v_A^2 + v_B^2$ $0.34 = v_A^2 + v_B^2$ A had a + velocity before the collision and now must have a – velocity afterwards. B had a – velocity before the collision and now must have a + velocity afterwards. Hence, the answer will have velocities of +, – in that order (B, A) We also know that when objects of equal mass collide elastically, they swap their velocities: so the answer must be +0.5, and –0.3 m s^{-1}.
4	$p_i = p_f$ $m_1u_1 + m_2u_2 = (m_1 + m_2)v\ [coupled]$ $m2v + 2m(-v) = 3mv_f$ $2v + 2(-v) = 3v_f$ $2v + (-2v) = 3v_f$ $0 = 3v_f$ $v_f = 0$ $E_{K(final)} = \frac{1}{2}mv^2 = \frac{1}{2}m \times 0^2 = 0\,J$ $Lost\ all\ (100\%)\ of\ its\ KE$
5	$\Delta E_P = mgh$ $= 250 \times 9.8 \times 20 = 49000\,J$ $P_{out} = \frac{49000}{120} = 408\,W$ $\eta = \frac{P_{out}}{P_{in}} \times 100\%$ $= \frac{408}{750} \times 100\%$ $= 54\%$