Q1. $P.E. = mgh$

$= 0.3 \times 10 \times 1.5$

$= 4.5\,J$

Q2. $E_i = E_f$

$PE_i + kE_i = PE_f + kE_f$

$mgh_i + \frac{1}{2}mv_i^2 = mgh_f + \frac{1}{2}mv_f^2$

$gh_i + \frac{v_i^2}{2} = gh_f + \frac{v_f^2}{2}$

$v_i = 0$ because the ball is dropped

$h_f = 0$ because ball hit the ground

$10 \times 12 + 0 = 0 + \frac{v_f^2}{2}$

$v_f = \sqrt{10 \times 12 \times 2} = 15.49\ m/s$

Q3 $E_i = E_f$

$PE_i + kE_i = PE_f + kE_f$

$mgh_i + \frac{1}{2}mv_i^2 = mgh_f + \frac{1}{2}mv_f^2 \Rightarrow gh_i + \frac{v_i^2}{2} = gh_f + \frac{v_f^2}{2}$ —①

Ball hit the ground $\Rightarrow h_f = 0$

Ball is dropped $v_i = 0$

$10 \times 12 + 0 = 0 + \frac{v_f^2}{2} \Rightarrow v_f^2 = \sqrt{10 \times 12 \times 2} = 15.49\ m/s$

Q4 a) From above question, eq. ①

$gh_i + \frac{v_i^2}{2} = gh_f + \frac{v_f^2}{2}$

Ball hit the ground $h_f = 0$; Ball is dropped $v_i = 0$

$gh_i + 0 = 0 + \frac{v_f^2}{2} \Rightarrow v_f^2 = 2gh_i \Rightarrow v_f = \sqrt{2gh_i}$

$v_f = \sqrt{2 \times 10 \times 12} = 15.49\ m/s$

b) $h_i = 6$

$v_f = \sqrt{2 \times 10 \times 6} = 10.95\ m/s$.

Q5 From above question, eq ①

$$gh_i + \frac{v_i^2}{2} = gh_f + \frac{v_f^2}{2}$$

$v_i = 0$ Ball starts from rest

$h_f = 0$ Ball hit the bottom.

$$gh_i + 0 = 0 + \frac{v_f^2}{2}$$

$$v_f = \sqrt{2gh_i} = \sqrt{2 \times 10 \times 3} = 7.75 \text{ m/s}$$

Q6 From above question eq ①

$$gh_i + \frac{v_i^2}{2} = gh_f + \frac{v_f^2}{2}$$

$v_i = 0$ Ball starts from rest

$h_f = 0$ Ball hit the bottom.

$$gh_i + 0 = 0 + \frac{v_f^2}{2} \Rightarrow v_f = \sqrt{2gh_i} = \sqrt{2 \times 10 \times 5} = 10 \text{ m/s}$$

Q7. From above question eq ①

$$gh_i + \frac{v_i^2}{2} = gh_f + \frac{v_f^2}{2}$$

$v_i = 4 \text{ m/s}$

$h_f = 0$ Ball hit the bottom.

$$[10 \times 5] + \frac{(4)^2}{2} = 0 + \frac{v_f^2}{2} \Rightarrow \frac{v_f^2}{2} = 58$$

$$v_f = \sqrt{2 \times 58} = 10.77 \text{ m/s}$$

Q8 a) From above ~~eq~~ question eq ①

$$gh_i + \frac{v_i^2}{2} = gh_f + \frac{v_f^2}{2}$$

$v_i = 5 \text{ m/s}$; $h_i = 12 \text{ m}$

$h_f = 0$ Ball hit the bottom.

$$(10 \times 12) + \frac{(5)^2}{2} = 0 + \frac{v_f^2}{2} \Rightarrow \frac{v_f^2}{2} = \frac{265}{2}$$

$$v_f = \sqrt{265} = 16.28 \text{ m/s}$$

b) $gh_i + \frac{v_i^2}{2} = gh_f + \frac{v_f^2}{2}$

$v_i = 5\,m/s$; $h_i = 6\,m$

$h_f = 0$ = Ball hit the bottom.

$(10 \times 6) + \frac{(5)^2}{2} = 0 + \frac{v_f^2}{2} \Rightarrow \frac{v_f^2}{2} = \frac{145}{2}$

$v_f = \sqrt{145} = 12.04\,m/s$

c) • Answer in a & b does Not depend on Whether the ball is thrown horizontal or straight up because we have to calculate displacement.

Q9 $gh_i + \frac{v_i^2}{2} = gh_f + \frac{v_f^2}{2}$

$v_i = 0$; $h_i = ?$; $h_f = 0$; $v_f = 25\,m/s$

$10h_i + 0 = 0 + \frac{(25)^2}{2}$

$h_i = \frac{(25)^2}{2 \times 10} = 31.25\,m.$

Q10 $gh_i + \frac{v_i^2}{2} = gh_f + \frac{v_f^2}{2}$

$v_i = 3\,m/s$; $h_i = ?$; $h_f = 0$; $v_f = 20\,m/s$

$10h_i + \frac{(3)^2}{2} = 0 + \frac{(20)^2}{2} \Rightarrow 10h_i = \frac{(20)^2}{2} - \frac{(3)^2}{2}$

$h_i = 19.95\,m.$

Q11 a) $gh_i + \frac{v_i^2}{2} = gh_f + \frac{v_f^2}{2}$

$v_i = 3\,m/s$; $h_i = 30\,m$; $h_f = 0$; $v_f = ?$

$(10 \times 30) + \frac{(3)^2}{2} = 0 + \frac{v_f^2}{2} \Rightarrow \frac{v_f^2}{2} = \frac{609}{2}$

$v_f = \sqrt{609} = 24.68\,m/s$

b) $gh_i + \frac{v_i^2}{2} = gh_f + \frac{v_f^2}{2}$

$v_i = 3\,m/s$; $h_i = 30$; $h_f = 25\,m$; $v_f = ?$

$(10 \times 30) + \frac{(3)^2}{2} = (10 \times 25) + \frac{v_f^2}{2} \Rightarrow \frac{v_f^2}{2} = \frac{109}{2}$

$v_f = \sqrt{109} = 10.44\,m/s$