Energy 3

① $E_g = mgh = (10)(9.8)(2) = \boxed{196\ J}$

② a) $E_g = mgh = (0.302)(9.8)(0.74) = \boxed{2.19\ J}$

b) $h = 0.74 - 1.1 = -0.36\ m$

$E_g = mgh = (0.302)(9.8)(-0.36) = \boxed{-1.07\ J}$

③ $E_g = mgh = (55)(9.8)(443) = \boxed{238\ 777\ J}$

④ a) $W_g = F_g \cdot d$

$= (0.15)(-9.8)(9)$

$W_g = \boxed{-13.23\ J}$

b) $\Delta E_g = \boxed{13.23\ J}$

(The E_K of the ball decreases by 13.23 J — since $W = \Delta E_K$. That "lost" energy becomes gravitational P.E. Thus E_g increases by 13.23 J.)

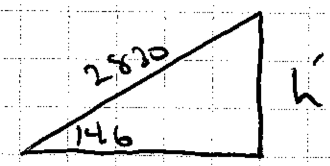
⑤ $\Delta E_g = E_g' - E_g$

$= 0 - mgh$ $\quad w = mg$ = weight

$-3700 = -w(5.8)$

$w = \boxed{637.9\ N}$

(6)



$$\sin 14.6 = \frac{h}{2830}$$

$$h' = 2830 \sin 14.6 = 713.356 \text{ m}$$

$$\Delta E_g = mgh' - mgh$$

$$= (75)(9.8)(713.356) - 0$$

$$\Delta E_g = \boxed{524\ 317 \text{ J}}$$

(7) $F = kx = (120)(0.3) = \boxed{36 \text{ N}}$

(8) $F_g = kx$

$mg = kx$

$$k = \frac{mg}{x} = \frac{(40)(9.8)}{0.12} = \boxed{3267 \text{ N/m}}$$

(9) $E_s = \frac{1}{2}kx^2$

$$k = \frac{2E_s}{x^2} = \frac{2(150)}{(0.08)^2} = \boxed{46\ 875 \text{ N/m}}$$

(10) $$k = \frac{2E_s}{x^2} = \frac{2(0.72)}{(0.15)^2} = \boxed{64 \text{ N/m}}$$

(11) $E_s = \frac{1}{2} kx^2$

$$x = \sqrt{\frac{2E_s}{k}} = \sqrt{\frac{2(3.75)}{120}} = \boxed{0.25\ m}$$

(12) $E_s = \frac{1}{2} kx^2$

$$= \frac{1}{2}(425)(0.47)^2$$

$$E_s = \boxed{46.9\ J}$$

(13) $F_g = kx$

$$k = \frac{F_g}{x} = \frac{mg}{x}$$

$$E_s = \frac{1}{2} kx^2$$

$$= \frac{1}{2}\left(\frac{mg}{x}\right) x^2$$

$$\boxed{E_s = \frac{1}{2} mgx}$$