

Physics 11 - Practice Questions  
Unit: 6.2 Energy – Mechanical Energy

1. How much kinetic energy does an 80 kg penguin have sliding down a ramp, when it is two-thirds of the way down the ramp. The vertical height of the ramp is 60.0m

$$E_p = E_k \quad E_p = mgh \quad m = 80 \text{ kg}$$

$$E_p = (80)(9.8)(60) \quad g = 9.8 \text{ m/s}^2$$

$$E_p = 47040 \text{ J} \quad h = 60.0 \text{ m}$$

$$E_p = 47040 \text{ J}$$

$$\frac{2}{3} E_k + \frac{1}{3} E_p = 47040 \times \frac{2}{3} = \boxed{31000 \text{ J}}$$

$$\frac{2}{3} E_k = 31000 \text{ J} \quad \boxed{E_k = 46500 \text{ J}}$$

2. How much potential energy is gained when a 75 kg bear takes a ski lift up a mountain for 600m?

$$E_p = mgh$$

$$m = 75 \text{ kg}$$

$$g = 9.8 \text{ m/s}^2$$

$$h = 600 \text{ m}$$

$$E_p = (75)(9.8)(600)$$

$$E_p = 441000 \text{ J}$$

$$\boxed{E_p = 440000 \text{ J}}$$

3. A 65 kg duck is running with a speed of 2.5 m/s, how much kinetic energy does she have?

$$E_k = \frac{1}{2} mv^2$$

$$m = 65 \text{ kg}$$

$$v = 2.5 \text{ m/s}$$

$$E_k = \frac{1}{2} (65)(2.5)^2$$

$$E_k = 203.125$$

$$\boxed{E_k = 200 \text{ J}}$$

4. The duck from Q.3 grabs onto a rope that is hanging from a tree and swings – how high off the ground will she swing?

$$E_k = E_p \quad 200 \text{ J} = mgh$$

$$200 = (65)(9.8)(h)$$

$$200 = 637(h)$$

$$0.313 = h$$

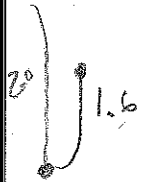
$$\boxed{0.310 \text{ m} = h}$$

$$m = 65 \text{ kg}$$

$$g = 9.8$$

$$h = ?$$

5. A rubber ball falls from a height of 2.0 m, bounces off the floor and goes back up to a height of 1.6 m. What percentage of its initial gravitational potential energy has been lost?



$$\frac{1.6}{2.0} \times 100$$

$$mgh = mgh$$

$$\text{or } \frac{0.4}{2.0} = 0.20$$

80% Energy retained (kept)  $\therefore$

20%  $E_p$  was lost [friction & air resistance]

6. How much work must be done to increase the speed of a 12 kg bicycle ridden by a 68 kg monkey from 8.2 m/s to 12.7 m/s?

$$E_k = \frac{1}{2} m v^2$$

$$m = 80 \text{ kg}$$

$$v = 4.5 \text{ m/s}$$

$$E_k = \frac{1}{2} (80) (4.5)^2$$

$$E_k = 810 \text{ J}$$