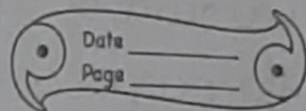


Assignment 1



1) Calculate the potential energy

a) A stone weighing 2 kg placed at a height of 8 m above the ground.

Ans) Mass (m) = 2 kg

Height (h) = 8 m

Acceleration due to gravity (g) = 9.8 m/s^2

P.E = $mgh = 2 \times 9.8 \times 8 = 16 \times 9.8 = 156.8 \text{ J}$

b) A cat weighing 5 kg sitting on a roof of 10 m above the ground.

Ans) $M = 5 \text{ kg}$

$H = 10 \text{ m}$

Acceleration due to gravity (g) = 9.8 m/s^2

P.E = $mgh = 5 \times 9.8 \times 10 = 490$

2) A water pump can lift 60 kg of water per minute to a tank. If the potential energy of a water stored is 21.6 kJ. compute the height of the water stored tank.

Ans) Mass = 60 kg

P.E = 21.6 kJ = $21.6 \times 10^3 =$

P.E = mgh

$h = \frac{\text{P.E}}{mg} = \frac{21.6 \times 10^3}{60 \times 10} = \frac{21.6 \times 10}{6} = \frac{216}{6}$

Hence height is 36 m

= 36 m

3) Calculate the work done in pushing the cart through a distance of 10 m ~~with~~ when the force applied on it is equal to 120 N

$$\text{Ans} \rightarrow \text{Work} = \text{Force} \times \text{displacement} \\ = 120 \text{ N} \times 10 \text{ m} = 1200 \text{ joules.}$$

4) If 1000 J of work is done by a machine to move a body through a distance of 20 m, then find the force applied on the body.

$$\text{Ans} \rightarrow W = F \times d$$

$$W = 1000 \text{ J}$$

$$d = 20 \text{ m}$$

$$F = ?$$

$$1000 = F \times 20$$

$$F = \frac{1000}{20} = 50 \text{ N}$$

\therefore Force applied on the body = 50 N

5) Calculate the K.E of a body weighing 600 kg moving at a velocity of 30 m/s.

$$\text{Ans} \rightarrow \text{K.E} = \frac{1}{2} m v^2 \text{ J}$$

$$= \frac{1}{2} \times 600 \times 30^2 \text{ J} = 300 \times 30 \times 30 \text{ J} \\ = 3000 \times 900 \text{ J} = 270000 \text{ J}$$

64 Calculate the P.E of a stone weighing 2.5 kg placed at a height of 6m.

Ans) $M = 2.5 \text{ kg}$

$H = 6 \text{ m}$

Acceleration due to gravity (g) = 9.8 m/s^2

P.E = $mgh = 2.5 \times 9.8 \times 6 = 147 \text{ joules}$.

74 Calculate the work done by a boy in lifting a 10 kg laptop from the ground and keeping it on a shelf 1.5m high.

Ans) $w = mgh = 10 \times 9.8 \times 1.5 = 147 \text{ joule}$.

84 A person does 5000 J of work in climbing a tree of height 5m. Calculate the mass of the person.

Ans) ~~w~~ $w = mgh$

$$m = \frac{w}{gh} = \frac{5000}{10 \times 5} = \frac{5000}{50} = 100 \text{ kg}$$

94 A 900 kg of compact car is moving at a certain speed. If its kinetic energy is 3,20,000 J. Find the velocity at which the car is travelling.

Ans) Mass of the car, $m = 900 \text{ kg}$

Velocity of the car, $v = ?$

K.E of the car = 3,20,000 J

~~K.E~~

$$K.E = \frac{1}{2} m v^2$$

$$320,000 \text{ J} = \frac{1}{2} \times (400 \text{ kg}) v^2$$

$$v^2 = 711.11 \text{ m}^2/\text{s}^2$$

or

$$v = 26.67 \text{ m/s}$$

104 Two bodies of equal masses move with uniform velocities v and $3v$ respectively. Find the ratios of their kinetic energies.

Ans \rightarrow For body 1

mass = m

velocity = v

$$\text{Kinetic energy, } (K.E)_1 = \frac{1}{2} m v^2$$

For body 2

mass = m

velocity = $3v$

$$\text{Kinetic energy, } (K.E)_2 = \frac{1}{2} m \times (3v)^2 = \frac{9}{2} m v^2$$

$$\text{Ratio of their kinetic energies} = \frac{(K.E)_1}{(K.E)_2} = \frac{\frac{1}{2} m v^2}{\frac{9}{2} m v^2} = \frac{1}{9}$$