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Solution 51
Mass, m = 200 kg
Height, h = 2 m
Acceleration due to gravity, g = 9.8 m/s^2
i) Potential energy = m x g x h = 200 x 9.8 x 2 = 3920 J
ii) Work done is against gravity = Potential energy gained by the weights, therefore
Work done W = m x g x h = 200 x 9.8 x 2 = 3920 J
Solution 52
(a) Work is done when a force applied on a body produces motion in it.
Formula for work done:
W = F x s
where W is the work done
F is force applied
S is the displacement of the body in the direction of force
(b) Mass of the person, m = 50 kg
Height of tower, h = 72 m
Acceleration due to gravity = 9.8 m/s^2
Work done W = m x g x h
= 50 x 9.8 x 72 = 35280 J
Solution 53
(a) Work is said to be done when the force applied on a body produces motion in it.
Work done by a body in moving up is given by
W = m x g x h
where W is the work done against the gravity
m = mass of the body
g = acceleration due to gravity
h = height through which the body is lifted above the ground
(b) Force, F = 2 N
Distance, s = 10 cm = 0.1 m
Work done W = F x s = 2 x 0.1 = 0.2 J
Solution 54
(a) When the displacement of a body is at right angles to the direction of foce acting on it, then work done is zero.
(b) Force, F = 50 N
Distance, s = 4 m
Angle between direction of force and direction of motion,

(a) When the displacement of a body is at right angles to the direction of foce acting on it, then work done is zero.

$W = F\cos\theta \times s$
When $\theta = 90°$, $\cos 90° = 0$
$W = 0 \times s = 0$

(b) Force, F = 50 N

Distance, s = 4 m

Angle between direction of force and direction of motion, $\theta = 60^o$

Work done, $W = F\cos\theta \times s$

$= 50 \times \cos 60^o \times 4 = 50 \times 0.5 \times 4 = 100$ J

Solution 55
(a) Energy is the ability to do work. SI unit of energy is Joule.
(b) Various forms of energy are:
1. Kinetic energy

2. Potential energy
3. Chemical energy
4. Heat energy
5. Light energy
6. Sound energy
7. Electrical energy
8. Nuclear energy
(c) Let masses of bodies be m
Velocity of one body, v_1= v
Velocity of another body, v_2 = 2v

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(c) Let masses of bodies be m

Velocity of one body, v_1= v

Velocity of another body, v_2 = 2v

$$KE_1 = \frac{1}{2}mv_1^2 = \frac{1}{2}mv^2$$
$$KE_2 = \frac{1}{2}mv_2^2 = \frac{1}{2}m(2v)^2$$
$$\frac{KE_1}{KE_2} = \frac{v^2}{4v^2} = \frac{1}{4}$$

Solution 56
(a) The energy of a body due to its motion is called kinetic energy
(b) When the velocity becomes zero, the kinetic energy also becomes zero since kinetic energy is directly proportional to square of the velocity.
(c)

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(b) When the velocity becomes zero, the kinetic energy also becomes zero since kinetic energy is directly proportional to square of the velocity.

(c)
Speed horse=Speed of dog=v
Weight of dog=$m_d g$
Weight of horse=$m_h g = 10 \times m_d g$
where, m_h and m_d are the masses of horse and dog respectively.

$$KE_h = \frac{1}{2}m_h v^2$$
$$KE_d = \frac{1}{2}m_d v^2$$
$$\frac{KE_h}{KE_d} = \frac{m_h v^2}{m_d v^2} = \frac{m_h}{m_d} = \frac{m_h g}{m_d g} = \frac{10 \times m_d g}{m_d g} = \frac{10}{1}$$

Solution 57
(a) The energy of a body due to its position or change in its shape is known as its potential energy. E.g. a stretched rubber has potential energy due to change in its shape and water in the overhead tank has potential energy due to its height above the ground.
PE = m x g x h
where, PE is the potential energy of the body,

m is the mass of the body,
g is the acceleration due to gravity,
h is the height above the surface ofearth.
(b) Kinetic energy of a body is due to motion of the body while potential energy is due to position or change in shape of the body. Kinetic energy is zero for a still body, while potential energy may or may not be zero for a still body.
Kinetic energy of a body is directly proportional to its speed while potential energy is directly proportional to the height to which the body is above the ground.
(c) Mass of ball, m = 0.5 kg
Speed v_1 = 5 m/s
Speed v_2 = 3 m/s

$$KE_1 = \frac{1}{2}mv_1^2 = \frac{1}{2} \times 0.5 \times 5^2$$

$$KE_2 = \frac{1}{2}mv_2^2 = \frac{1}{2} \times 0.5 \times 3^2$$

$$\text{Change in KE} = \left(\frac{1}{2} \times 0.5 \times 5^2\right) - \left(\frac{1}{2} \times 0.5 \times 3^2\right)$$

$$= \frac{1}{2} \times 0.5 \times \left(5^2 - 3^2\right) = 0.25 \times 16 = 4\,J$$

Solution 58
(a) The potential energy due to the position of the body above the ground is gravitational potential energy and the potential energy due to change in shape and size of the body is elastic potential energy. E.g. a stretched rubber has elastic potential energy due to change in its shape while water in the overhead tank has gravitational potential energy due to its height above the ground.
(b) Work done, W = 784 J
Mass, m = 20 kg
g = 9.8 m/s^2
W = m x g x h
784 = 20 x 9.8 x h

(b) Work done, W = 784 J

Mass, m = 20 kg

g = 9.8 m/s^2

W = m x g x h

784 = 20 x 9.8 x h

$$h = \frac{784}{20 \times 9.8} = 4m$$

********** END **********