Chapter 4: Work and Energy

Section A

1. Newton-metre is the unit of

   a) Power *b)* Work *c)* Momentum
   a) Gravitational Intensity

2. A body is moved through a distance of 3 m in the following different ways. In which case is the maximum work done?

   a) When pushed over an inclined plane
   b) When lifted vertically upward
   c) When pushed over smooth rollers
   d) When pushed on a plane horizontal surface.

3. No work is done when

   a) a donkey is carrying a load on its back
   b) on engine is pulling a train
   c) a sail boat is moving due to wind energy
   d) a wind mill is lifting water from a well.

4. What is the work done by a boy in pushing a book with a force of 5 N and displacing it through 20 cm along the push?

   a) 1J *b)* 2J *c)* 1.5 J *d)* 3J

Section B

1. Define work. Is it scalar or vector quantity?
2. What is the condition for a force to do work on a body?
3. A man is rowing a boat upstream, but his boat remains at rest with respect to the shore. Is he doing any work?
4. Give an example where the displacement of a particle is in the direction opposite to force acting on this particle.
5. What happens to the work done when the displacement of a body is at right angles to the direction of force acting on it? Explain your answer.

Section C

1. A ball of mass 1 kg thrown upwards, reaches a maximum height of 5 m. Calculate the work done by the force of gravity during this vertical displacement.
2. A person pulls a body on a horizontal surface by applying a force of 5 N at an

angle of 30º with the horizontal. Find the work done by this force in displacing the body through 2 m. (cos 30º =√3/2)

3. A horizontal force of 50 N displaces on object of mass 100 kg. Calculate the distance moved and work done by the force in 8 seconds.

4. A car of mass 2500 kg travelling at a speed of 40 m/s stops after covering a distance of 50 m when brakes are applied. Calculate (a) the force exerted on it by the brakes (b) work done by brakes.

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Section A

1. The kinetic energy of a body depends

   a) on its mass only
   b) on its speed only
   c) on its mass as well as on its speed
   d) neither on its mass nor on its speed.

2. A body of mass 10 kg is dropped from a height of 2m. If g is taken to be 10 m/s^2, the kinetic energy of the body just before striking the ground will be

   a) 400J *b)* 4J *c)* 40J *d)* none

3. A ball is thrown upwards from a point A. it reaches up to the highest point B and returns at the same point. Which of the following statement is correct:

   a) Kinetic energy at A = kinetic energy at B
   b) Potential energy at A = potential energy at B
   c) Potential energy at B = kinetic energy at B
   d) Potential energy at B = kinetic energy at A

4. When the speed of a particle is doubled, its kinetic energy

   a) remains the same *b)* gets doubled *c)* becomes half
   d) becomes 4 times.

5. When the speed of a body is doubled, the ratio of kinetic energy to its momentum.

   a) gets doubled *b)* remains the same *c)* becomes half
   d) becomes 4 times.

6. Two bodies of unequal masses are dropped from a cliff. At any instant, they have equal

   a) momentum *b)* acceleration *c)* kinetic energy
   d) potential energy.

Section B

1. Differentiate between work, power and energy. Also state their S.I. units.

2. Define kinetic energy. Give one example also.
3. By what factor does the kinetic energy of a particle of mass m increase if the speed is increased by factor of 3?
4. Does the kinetic energy of a body depend on its direction of motion?
5. By how much will the kinetic energy of a body increase if

   i) Speed is doubled *ii)* Speed is halved.
6. Deduce the formula of kinetic energy of a body moving with velocity, v

Section C

1. A ball of mass 0.5 kg slows down from a speed of 5m/s to that of 3m/s. Calculate change in kinetic energy of the ball.
2. A block is thrown upwards with a K.E. of 2J. If it goes up to a maximum height of 2m, find the mass of the block.
3. The mass of a ball A is double the mass of Ball B. The ball A moves at half the speed of ball B. Calculate the ratio of K.E. of A to K. E. of B.
4. A body A of mass 3 kg and body B of mass 2 kg are dropped simultaneously from a height of 14.9 m. Calculate

   a) Their momenta *b)* their kinetic energies

   When they are 5 m above the ground

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Section A

1. A body is dropped form a certain height above the ground when it is half way down, it possesses

   a) Only kinetic energy *b)* Only potential energy
   c) Both kinetic and potential *d)* no energy at all energy
2. A flying aeroplane possesses

   a) Only P.E. *b)* Only K. E.
   c) both potential and kinetic energy
   d) Neither potential nor kinetic energy.
3. In which of the following cases is the potential energy of a spring minimum?

   a) When it is compressed
   b) When it is extended
   c) When it is at its natural length
   d) When it is at its natural length but kept at a height above ground.
4. When a body roller down an inclined plane,

a) Only K.E *b)* only P.E
c) both K.E and P.E *d)* neither K.E. nor P.E.

5) kWh is unit of

a) Power *b)* momentum *c)* impulse *d)* energy

6) The unit of power is

a) Watt *b)* joule *c)* newton *d)* kg

7) No. of joules in kWh is

a) 36×10^{3} *b)* 36×10^{-4} *c)* 36×10^{2} *d)* 3.6×10^{6}

Section B

1. Differentiate between work, power and energy. Also state their SI units.
2. Define potential energy. Give one example.
3. Which of the following are examples of potential energy?

a) A boy at the top of a slide *b)* a stretched catapult
c) a hot iron *d)* a stretched bow

e) the arrow in stretched bow

4. State the principle of conservation of energy.

Section C

1. A ball is dropped from a height H. When it reached the ground, its velocity is 50 m/s. Find height H.
2. A body of mass 100 kg is lifted up by 10 m. Find

i) Amount of work done
ii) Potential energy of the body at that height (value of g = 10 m/s^2)

3. A boy weighing 40 kg carries a box weighing 20 kg to the top of building 15 m high in 25 sec. Calculate the power. (g = 10 m/s^2)
4. Two persons do the same amount of work in 10s and 20 s respectively. What is the ratio of the power used by first person to that by second person?
5. Calculate the power developed by a 110 kg mass climbing up a vertical staircase at the rate of 2m/s. (g= 9.8 m/s^2)