IN TEXT QUESTIONS

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1. A force of 7 N acts on an object. The displacement is, say 8 m, in the direction of the force (Fig. 11.3). Let us take it that the force acts on the object through the displacement. What is the work done in this case?

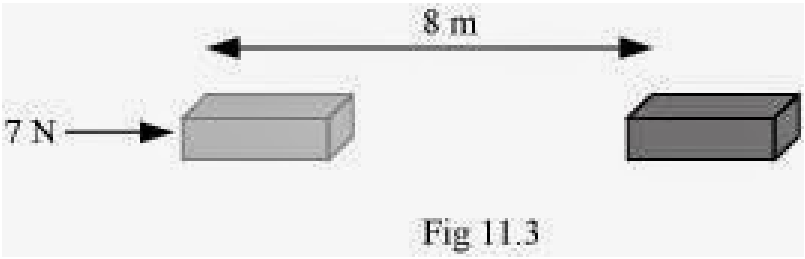

Fig 11.3

Answer: When a force F acts on an object to displace it through a distance S in its direction, then the work done W on the body by the force is given by:
Work done = Force × Displacement
W = F × S
Where,
F = 7 N
S = 8 m
Therefore, work done, W = 7 × 8
= 56 Nm
= 56 J

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1. When do we say that work is done?
Answer: Work is done whenever the given conditions are satisfied:

- A force acts on the body.
- There is a displacement of the body caused by the applied force along the direction of the applied force.

2. Write an expression for the work done when a force is acting on an object in the direction of its displacement.
Answer: When a force F displaces a body through a distance S in the direction of the applied force, then the work done W on the body is given by the expression:
Work done = Force × Displacement
W = F x s

3. Define 1 J of work.
Answer: 1 J is the amount of work done by a force of 1 N on an object that displaces it through a distance of 1 m in the direction of the applied force.

4. A pair of bullocks exerts a force of 140 N on a plough. The field being ploughed is 15 m long. How much work is done in ploughing

the length of the field?
Answer:
Work done by the bullocks is given by the expression:
Work done = Force x Displacement
W= F x d
Where,
Applied force, F = 140 N
Displacement, d = 15 m
W = 140 x 15 = 2100 J
Hence, 2100 J of work is done in ploughing the length of the field.

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1. What is the kinetic energy of an object?
Answer: The energy possessed by a body by the virtue of its motion is called kinetic energy. Every moving object possesses kinetic energy. A body uses kinetic energy to do work. Kinetic energy of hammer is used in driving a nail into a log of wood, kinetic energy of air is used to run wind mills, etc.

2. Write an expression for the kinetic energy of an object.
Answer: If a body of mass mis moving with a velocity v, then its kinetic energy Ekis given by the expression,
$E_k = 1/2\ mv^2$
Its SI unit is Joule (J).

3. The kinetic energy of an object of mass, m moving with a velocity of 5 m s–1 is 25 J. What will be its kinetic energy when its velocity is doubled? What will be its kinetic energy when its velocity is increased three times?
Answer:
K.E. of the object= 25 J
Velocity of the object, v= 5 m/s
since K.E.= $1/2\ mv^2$
$\Rightarrow m = 2 \times K.E./v^2$
$\Rightarrow m = 2 \times 25 / 25 = 2$ kg
If velocity is double, $v = 2 \times 5 = 10$ m/s
$\therefore$ K.E. (for $v = 10$ m/s)= $1/2\ mv^2 = 1/2 \times 2 \times 100 = 100$ J
If velocity is tripled, $v = 3 \times 5 = 15$ m/s
$\therefore$ K.E. (for $v = 10$ m/s)= $1/2\ mv^2$ $1/2 \times 2 \times 225 = 225$ J

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1. What is power?
Answer:
Power is the rate of doing work or the rate of transfer of energy.
If W is the amount of work done in time t, then power is given by the expression,
Power = Work / Time
= Energy / Time
P = W/T
It is expressed in watt (W).

2. Define 1 watt of power.
Answer: A body is said to have power of 1 watt if it does work at the rate of 1 joule in 1 s, i.e.,1 W = 1J / 1s

3. A lamp consumes 1000 J of electrical energy in 10 s. What is its power?
Answer:
Power = Work Done / Time
Work done = Energy consumed by the lamp = 1000 J
Time = 10 s
Power = 1000 / 10 = 100 Js^{-1}=100 W

4. Define average power.

Answer: The average Power of an agent may be defined as the total work done by it in the total time taken.
Average Power= Total Work Done / Total time taken

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