CHAPTER NINE

WORK, ENERGY AND MACHINES:

- Work is done when an applied force moves through a distance, in the direction of the force.
- In science work is only done if there is movement of the applied force.
- For this reason, a man pulling a track does work, but a man who carries a load and stands at a place does no work.
- Work = Force **x** distance **or**work = mgh,

Where m = mass of the object.

g =acceleration due to gravity.

h =height of the object above the ground.

(Q1) Find the work done when a force of 20N, pulls a block through a distance of 5m.

Soln

Force =20N.

Distance =5m.

Work done=Force **x**distance.

Work done= 20 **x** 5 = 100J.

(Q2) Calculate the work done when a force of 2.5N moves through a distance of 4m.

Soln

Force = 2.5N.

Distance = 4m.

Work done = Force **x** distance = 2.5 **x** 4 = 10J.

NB: If the weight or mass is given in kg, it must be changed into force by multiplying by **'g'** or the acceleration due to gravity **i.e** 10m/s^2.

(Q3) Calculate the work done when a body of mass 5kg moves through a distance of 10m.

Soln

Mass **=** 5kg.

Force **=** 5 **x** 10 **=** 50N.

Distance **=** 10m.

Work **=** Force **x** distance

= 50 **x** 10 **=** 500J.

(Q4) Calculate the work done when a body of weight 0.5kg, moves through a distance of 20m.

Soln

Weight **=** 0.5kg.

Force **=** 0.5 **x** 10 **=** 5N.

Distance **=** 20m.

Work done **=** Force **x** distance **=** 5 **x** 20 **=** 100J.

NB: If weight is given in grams, it must first be converted to kg by dividing by **1000.**

(Q5) A body of mass 400g moves through a distance of 20m. Find the work done

Mass **=**400g **=** 400/1000 **=** 0.4kg.

Force **=** 0.4 **x** 10 **=** 4N.

Work done **=** Force **x** distance

= 4 **x** 20 = 80J.

(Q6) A table of mass 6000g is moved through a distance of 4m. Calculate the work done.

Soln:

Mass = 6000g = 6000/1000 = 6kg.

Since force = mass **x** 'g,'

then force = 6 **x** 10 = 60N.

Distance = 4m.

Work done = Force **x** distance

= 60 **x** 4 = 240J.

NB: If the distance is given in **cm**, we must change it into metres by dividing by **100.**

(Q7) A block of mass 5kg moves through a distance of 300cm. Calculate the work done.

Soln:

Mass = 5kg.

Force = 5 **x** 10 = 50N.

Distance = 300cm = 300/100 = 3m.

Work done = force **x** distance

= 50 **x** 3 = 150J.

(Q8) The distance moved by a force of 50N is 800cm. Find the work done.

Soln:

Distance = 800cm = 800/100 = 8m.

Force = 50N.

Work done = Force **x** distance

= 50 **x** 8 = 400J.

(Q9) A body of mass 600g moved through a distance of 200cm. Find the work done.

Soln:

Mass = 600g = 600/1000= 0.6kg.

Force = 0.6 **x** 10 = 6N.

Distance = 200cm = 200/100 = 2m.

Work done = Force **x** distance = 6 **x** 2 = 12J.

(Q10) Find the distance travelled by a force of 50N, if it does a work of 200J.

Soln:

Force = 50N.

Work done = 200J.

Distance = ?

Since work done = force **x** distance,

then200 = 50 **x** distance, and dividing through using 50 =>

200/50 = 50 **x** distance/50,=>

distance = 4m.

(Q11) Find the distance moved by a force of 10N, if it did work of 50J.

Force = 10N.

Work done = 50J.

Distance =?

Since work done **=** force **x** distance, then

50 **=** 10 **x** distance, and dividing through using 10 =>

50/10 **=** 10 **x** distance/10,

=>5 **=** distance, =>

distance **=** 5m.