CHAPTER EIGHT

WORK, ENERGY AND MACHINES

- When we apply a force which moves through a distance, then work is said to have been done.
- In science work is only done where there is movement of the applied force, and for this reason if we apply a force and there is no movement, then there is no work done.
- For example if we push or apply a force to or towards a stone and the stone does not move, then there is no work done no matter how long the force is applied, or how great the force is.
- Also a man pulling a car does no work if the car does not move.
- Work = force x distance.

Question 1
Find the work done when a force of 20N, pulls a block through a distance of 5m.
Solution
Force = 20N.
Distance = 5m.
Work = force x distance
Work = 20 x 5 = **100J.**
N/B: The unit of work is the joule which is represented by J.

Question 2
Calculate the work done when a force of 2.5N moves through a distance of 4m.
Solution
Force = 2.5N.
Distance = 4m.
Work done = force x distance.
Work done = 2.5 x 4 = **10J.**

Question 3
A man applies a force of 20N in pulling an object. If the object moves through a distance of 10m, calculate the work done.
Solution
Force = 20N.
Distance = 10m.
Work done = force x distance.
Work done = 20 x 10 = **200J.**

Question 4

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

Solution
Force = 50N
Work done = 200J.
Since work done = force x distance,
=>200 = 50 x distance.
Divide through using 50 =>

$$\frac{200}{50} = \frac{50 \text{ x distance}}{50}$$

=> distance = 4m.

Question 5
Find the distance moved by a force of 10N, if it did a work of 50J.

Solution
Force = 10N.
Work done = 50J.
Distance = ?
Since work done = Force x distance,
=> 50 = 10 x distance.
Divide through using 10 =>

$$\frac{50}{10} = 10 \text{ x } \frac{\text{distance}}{10}$$

=> distance = 5m.

POWER:
This is defined as the rate of doing work.

$$\text{Power} = \frac{\text{Word done}}{\text{Time taken}}$$

The unit of power is J/S (i.e. joules per second) or the watt (W).

Question 1
The work done by a boy by moving up a staircase is 240J. If the time taken to move up the staircase is 10 seconds, calculate the power.

Solution

Work done = 240J.
Time = 10 seconds.
Power = Work done = 240
          Time taken   10
= 24J/S or 24W.

Question 2
A man applied a force of 20N to cause the movement of an object, through a distance of 10m within 40 seconds. Calculate the power.

Solution
Force = 20N.
Distance = 10M.
Work done = force x distance.
Work done = 20 x 10 = 200J.
Time = 40 seconds.
Power = work done = 200 = 50W.
          Time   40

ENERGY:
Energy is the ability to do work, or what we must have in order to be able to do work.
- For without energy, we cannot perform activities such as walking, dancing, jumping or writing.
- Human beings and animals get their energy from the food that they eat.
- This food contains a type of energy called chemical energy.
- The energy needed to move a car comes from the petrol we put into it, which also contains chemical energy.

SOURCES OF ENERGY:
Some of the sources of energy are:
- Water.
- The sun.
- Wind.
- Petroleum.

FORMS OF ENERGY:
There are various forms of energy and some of these are:
(1) Solar Energy:
This refers to the energy from the sun which provides us with light and heat.
(2) Electrical Energy:

This is the type of energy we get from generators and batteries.

(3) Chemical Energy:

This is the type of energy that we get from food and chemicals such as petrol.

(4) Heat Energy:

This is the form of energy which flows from the hot to the cold part of a body.

(5) Nuclear Energy:

This is the energy we get from atoms.

If an atom is divided into two parts, we get this type of energy.