Work, Energy & Power
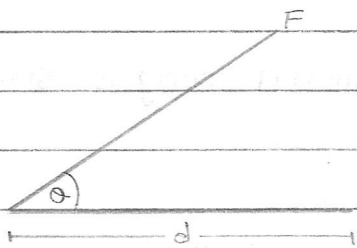
Q-1) What is work done?

> Work done is the product of force and the distance moved in direction of the force.

WORK DONE = FORCE × DISTANCE

$$W.D = F \times d.$$

$$WD = F\cos\theta \times d.$$

* IF F is not constant, then WD = Area under graph.

Work Done = Energy transferred.

1 Joule = 1 Newton × 1 metre

1 J = 1 Nm.

Q-2) Work done in expansion of a gas at constant pressure.

A = area of cross-section,   s = distance moved

$$F = \text{pressure} \times \text{area}.$$
$$= P \times A$$

$$W.D = F \times d = P \times A \times S.$$
$$= P \times (\text{increased volume}).$$
$$= P \times dV$$
$$= P \times \Delta V$$
$$= \text{pressure} \times \text{change in volume}.$$

Q-3) Potential energies?

> Potential energy is the energy possessed by a body due to its position or shape.

> Gravitational potential energy is the energy possessed by a mass when placed in a gravitational field.

$$g.p.e = F \times d$$
$$\Delta gpe. = m \times g \times h.$$

> Elastic p.e is the energy possessed when a body is stretched or compressed.

> Electric p.e. is the energy possessed by a charge when placed in an electric field.

Q-4) Kinetic energy?

> Kinetic energy is the energy possessed by a body due to its motion.

$$v^2 = u^2 + 2as \quad \multimap u = 0$$
$$v^2 = 2as$$
$$v^2/2 = as$$
$$\multimap \text{multiply both sides by m.}$$
$$\tfrac{1}{2}mv^2 = mas \quad \multimap ma = F$$
$$\tfrac{1}{2}mv^2 = FS \quad \multimap FS = W.D.$$
$$WD = \tfrac{1}{2}mv^2$$

WD = energy transferred as k.e.

$$\Delta k.e = \tfrac{1}{2}mv^2$$

Q-5) ~~Power~~ what is power?

> Power is the rate at which work is done.

$$Power = \frac{work\ done}{time.}$$

$$1w = \frac{1J}{1s.} \quad (1\ Joule\ per\ second).$$

Q-6) Conservation of energy.

> Energy can neither be created nor destroyed.

It can only be converted from one form to another.

It is constant in the universe.

$$\%\ efficiency = \frac{useful\ output\ energy.}{total\ energy\ input} \times 100.$$