FORCE AND LAWS OF MOTION

CHAPTER NO.9

SUB: PHYSICS

FORCE AND LAWS OF MOTION

LEARNING OBJECTIVE

Students will be able to

- Define momentum

- State the Newton's 2nd law of motion
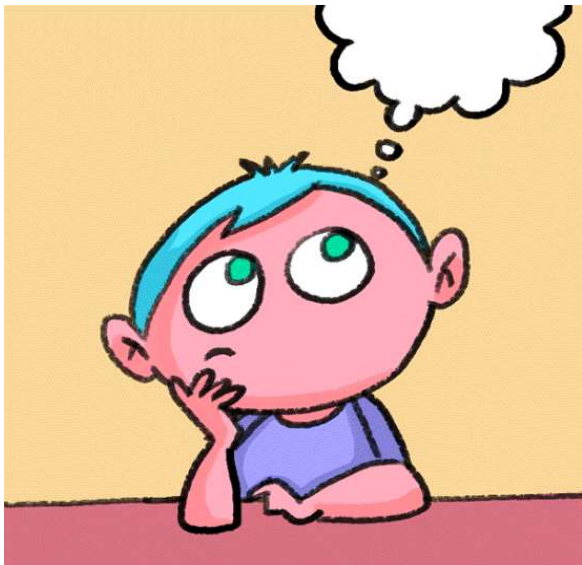
Momentum

- Momentum can be defined as "mass in motion". All objects have mass; so if an object is moving, then it has momentum - it has its mass in motion.

- The momentum, p of an object is defined as the product of its mass, m and velocity, v. That is, momentum p=mv

- Momentum has both direction and magnitude so it is a vector quantity. Its direction is the same as that of velocity, v.

- The SI unit of momentum is kilogram-metre per second (kg m s^{-1}).

Now, 1 unit force is defined as the force applied on an object of mass 1kg to produce the acceleration of $1m/s^2$.

Thus, 1 unit of force = k ×1kg ×1m/s2

$\implies$ k = 1

By putting the value of k=1 in equation (ii), we get:
    F = ma

i.e., Force = Mass × Acceleration

The SI unit of Force

SI unit of force is Newton (N).

Since Force = Mass x Acceleration

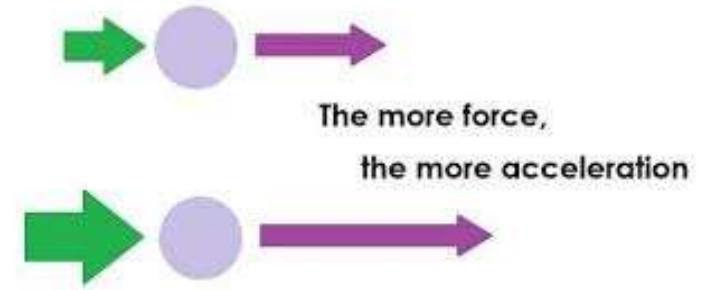The unit of mass = kg and The unit of acceleration = m/s^2

If force, mass and acceleration is taken as 1 unit.

Therefore,

1 Newton (N) = 1kg x $1m/s^2$

Thus, Newton (N) = kg m/s^2

Thus, one unit of force is defined as the amount that produces an acceleration of 1 m/s^2 in an object of mass 1 kg.

The more force,
the more acceleration

Newton's second law of motion

The rate of change of momentum of a body is directly proportional to the applied force and takes place in the direction in which the force acts.
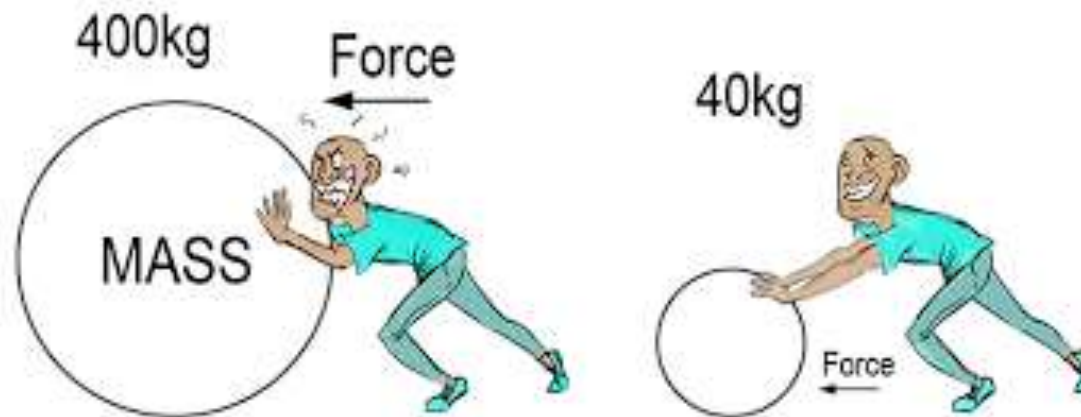
HOME ASSIGNMENT

1.What is the momentum of a man of mass 75kg when he walks with a uniform velocity of 2m/s.

2.Calculate the momentum of: a) an elephant of mass 2000kg moving with a speed of 5m/s.

b) A bullet of mass 0.02kg moving with a speed of 400 m/s.

3.What is the change in momentum of a car weighing 1500 kg when its speed increases from 36km/h to 72 km/h.

THANKING YOU
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