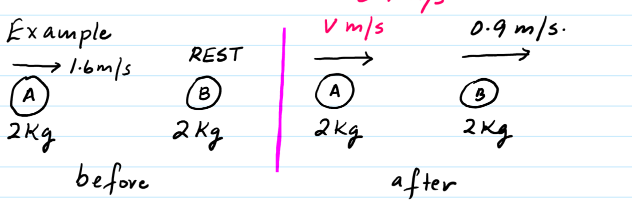
In-Elastic collision (Properties)

- Momentum of system remains conserved
- Total Energy of system remains conserved
- Since there is a "Loss" of K.E ∴ K.E of the system NOT conserved OR K.E (after collision) < K.E (before collision)
- S.O.A ≠ S.O.S

Example



(i) Cal the value of v ?

Principle of Conservation of momentum

$\overset{+}{\rightarrow}$ $(2)(1.6) + (2)(0) = (2)(v) + (2)(0.9)$

$v = 0.7\ m/s$

(ii) Show that this is an In Elastic Collision

In terms of K.E

① K.E of system before collision $\frac{1}{2}(2)(1.6)^2 + 0 = 2.56\ J$

② K.E of system after collision $\frac{1}{2}(2)(0.7)^2 + \frac{1}{2}(2)(0.9)^2 = 1.3\ J$

Since K.E is lost ∴ In Elastic collision

OR

Speed of approach before collision = 1.6 m/s
Speed of seperation after collision = 0.2 m/s
(0.9 − 0.7)

Since S.O.A ≠ S.O.S ∴ InElastic Collision

Ex.2

Given that the particles join up after collision & they move with a common velocity "v" calculate (v) & determine whether the collision is elastic or inelastic ?

- Principle of Conservation of momentum

$\overset{+}{\rightarrow}$ $(5)(20) + (2)(0) = (5+2)v$

$100 + 0 = 7v$

$v = 14.3\ m/s.$

- Nature of collision ?

S.O.A before collision = 20 m/s.

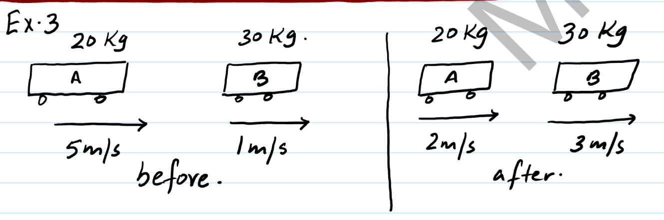
S.O.S after collision = 0 m/s
(since they have joined up ∴ seperation not possible hence Zero)

S.O.A ≠ S.O.S hence InElastic.

Note :- Whenever two objects Join up & move together with a Common velocity we can conclude (without working) that the nature of collision will be In Elastic.

"Stop till here"

Ex.3



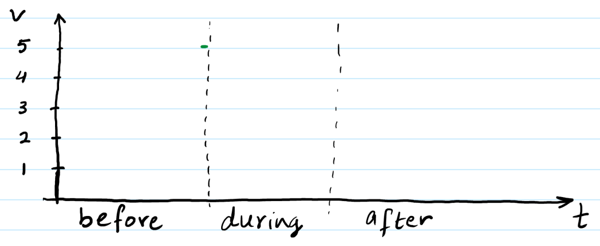
(i) Cal ΔP_A

(ii) Cal ΔP_B

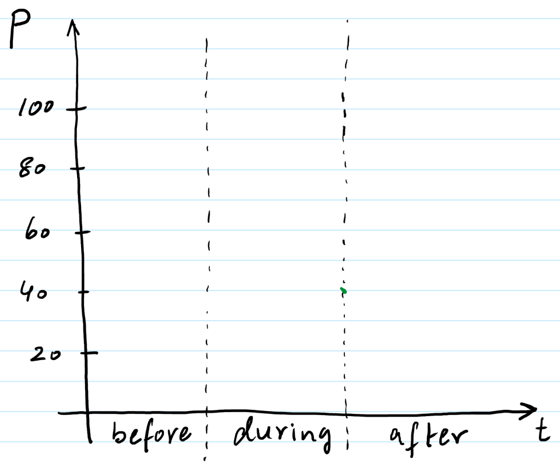
(iii) from above answers how can we conclude that momentum of the system remains conserved ?

Ans :- loss in momentum of A is equal to gain in momentum of B.
OR
in mathematical terms
$\Delta P_A = -\Delta P_B$
[Change in momentum of A is equal and opposite to change in momentum of B].

(iv) Sketch v/t graph before, during & after collision for A and B.



(v) Sketch momentum vs time graph before, during & after collision

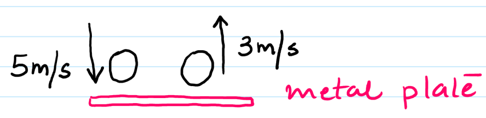


(vi) Show that during collision, force which A applies on B is equal & opposite to force which B applies on A.

Ans.

$F_A = -F_B$ PROVED

Example Q's :- A ball falls vertically and strikes a metal plate. It rebounds from the plate as shown



Exp. how Principle of Conservation of momentum applies in this case (3 marks)

- The ball losses momentum upon impact i.e momentum of the ball changes
- This loss in momentum of the ball is transfered / gained by the metal plate
- ∴ according to the Law of Conservation of momentum, the total momentum of the System remains conserved

Newton's 3rd Law :-

To every action there is an Equal and opposite Reaction

AS - Level

- The two forces are equal in magnitude.
- The two forces are opposite in direction
- The two forces act on different bodies while the force acts on "A" the other force acts on "B"

$F_A = -F_B$