Match the following (more than one and non-unique matches are possible). Answer will be considered as correct only if all matches are correct:

- (a) Kinetic energy of the system is conserved
- (p) Elastic collision
- (b) Kinetic energy of the system is not conserved (q) Inelastic collision
- (c) Linear momentum of the system is conserved (r) No net external force
- (d) Position of centre of mass remains unchanged (s) Isolated two large bodies system in space in which both bodies are initially at rest (t) Uniform circular motion

## Answer/Solution

(a)-(p),(t)

Kinetic energy of a system is conserved in elastic collision. When there is no net external force, the kinetic energy need not be conserved as internal forces can do work and change kinetic energy. It is constant in uniform circular motion but in the case of isolated system of large bodies, since the bodies are large, we must consider gravitational force between them which can change kinetic energy.

## (b)-(q),(s)

In inelastic collision, kinetic energy of the system is not conserved. In case of isolated system of large bodies, the kinetic energy will change due to the gravitational force which is an internal force.

## (c)-(p),(q),(r),(s)

Linear momentum is conserved whenever there is no net external force, irrespective of the type of collision.

## (d)-(s)

Note that the option says "position" of centre of mass. When bodies are moving in elastic or inelastic collision centre of mass is moving and hence its position if not fixed. When there is no net external force, even then centre of mass can move with constant velocity and hence its position does not have to be fixed. In uniform circular motion, centre of mass does not necessarily have a fixed position.