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Sub- physics.

std- f.y. B.sc

TOPIC- momentum & ENERGY Introduction- Momentum and energy. $E = m c^2$. It expresses the fact that an object at rest has a large amount of **energy** as a result of its mass m . This **energy** is significant in situations where the mass changes, for example in nuclear physics interactions where nuclei are created or destroyed.

Newtonian mechanics, **linear momentum**, **translational momentum**, or simply **momentum** (pl. momenta) is the product of the mass and velocity of an object. It is a vector quantity, possessing a magnitude and a direction. If *m* is an object's mass and **v** is its velocity (also a vector quantity), then the object's momentum is:

In SI units, momentum is measured in kilogram meters per second (kg·m/s). Newton's second law of motion states that the rate of change of a body's momentum is equal to the net force acting on it. Momentum depends on the frame of reference, but in any inertial frame it is a *conserved* quantity, meaning that if a closed system is not affected by external forces, its total linear momentum does not change. Momentum is also conserved in special relativity (with a modified formula) and, in a modified form, in electrodynamics, quantum mechanics, quantum field theory, and general relativity. It is an expression of one of the fundamental symmetries of space and time: translational

Conservation

In a closed system (one that does not exchange any matter with its surroundings and is not acted on by external forces) the total momentum is constant. This fact, known as the *law of conservation of momentum*, is implied by Newton's laws of motion.[4][5] Suppose, for example, that two particles interact. Because of the third law, the forces between them are equal and opposite. If the particles are numbered 1 and 2, the second law states that $F_1 = dp_1/dt$ and $F_2 = dp_2/dt$.

Dependence of reference frame- Momentum is a measurable quantity, and the measurement depends on the motion of the observer. For example: if an apple is sitting in a glass elevator that is descending, an outside observer, looking into the elevator, sees the apple moving, so, to that observer, the apple has a non-zero momentum. To someone inside the elevator, the apple does not move, so, it has zero momentum. The two observers each have a frame of reference, Elastic collision-An elastic collision is one in which no kinetic energy is absorbed in the collision. Perfectly elastic "collisions" can occur when the objects do not touch each other, as for example in atomic or nuclear scattering where electric repulsion keeps them apart. A slingshot maneuver of a satellite around a planet can also be viewed as a perfectly elastic collision. A collision between two pool balls is a good example of an *almost* totally elastic collision, due to their high rigidity, but when bodies come in contact there is always some dissipation.[

n an inelastic collision, some of the kinetic energy of the colliding bodies is converted into other forms of energy (such as heat or sound). Examples include traffic collisions,[10] in which the effect of loss of kinetic energy can be seen in the damage to the vehicles; electrons losing some of their energy to atoms (as in the Franck–Hertz experiment);[11] and particle accelerators in which the kinetic energy is converted into mass in the form of new particles.

Conservation-In Newtonian mechanics, the law of conservation of momentum can be derived from the law of action and reaction, which states that every force has a reciprocating equal and opposite force. Under some circumstances, moving charged particles can exert forces on each other in non-opposite directions.[42] Nevertheless, the combined momentum of the particles and the electromagnetic field is conserved.

THANK YOU