

The Islamic University, Najaf

College of Medical Techniques

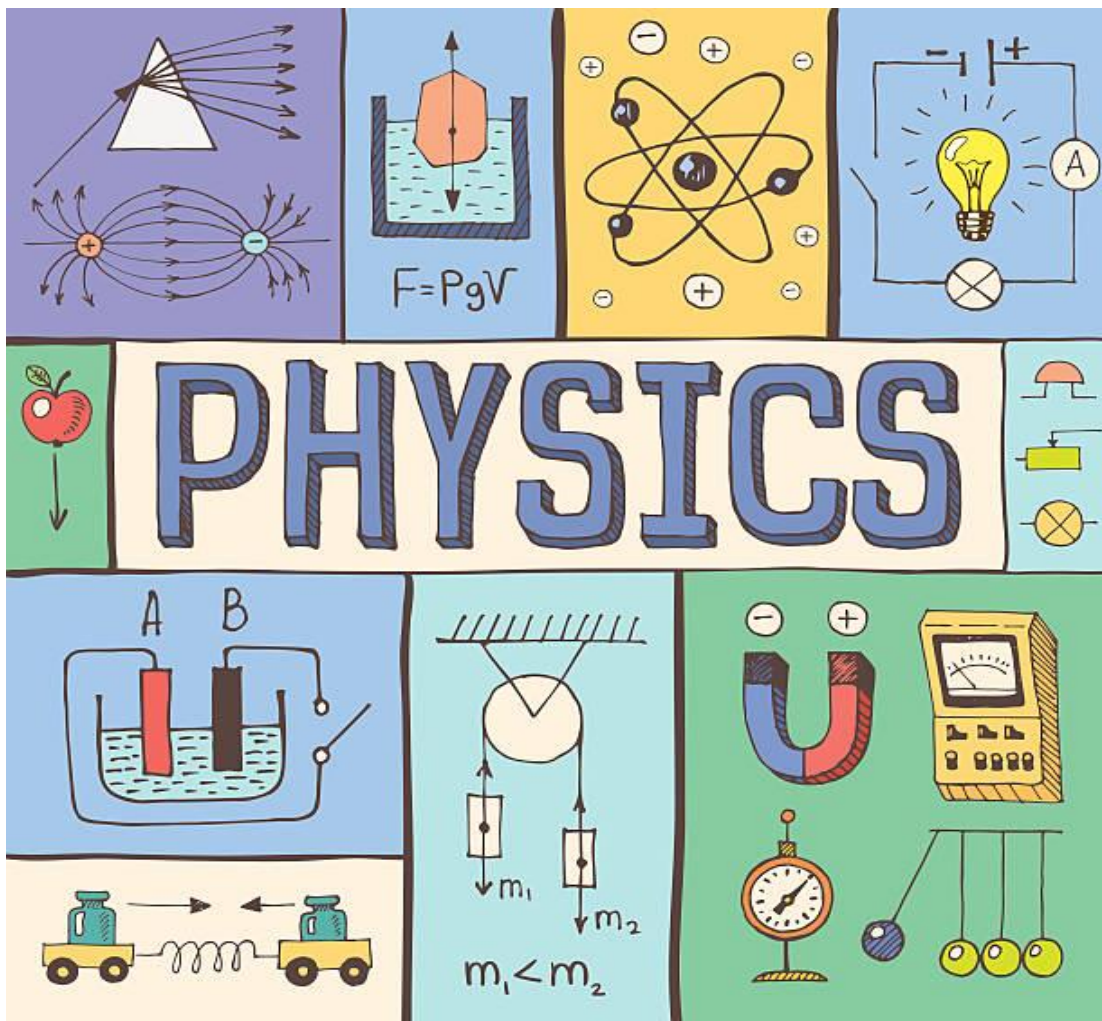
Department of Radiology Techniques



GENERAL PHYSICS

2022-2023

LECTURE (3)

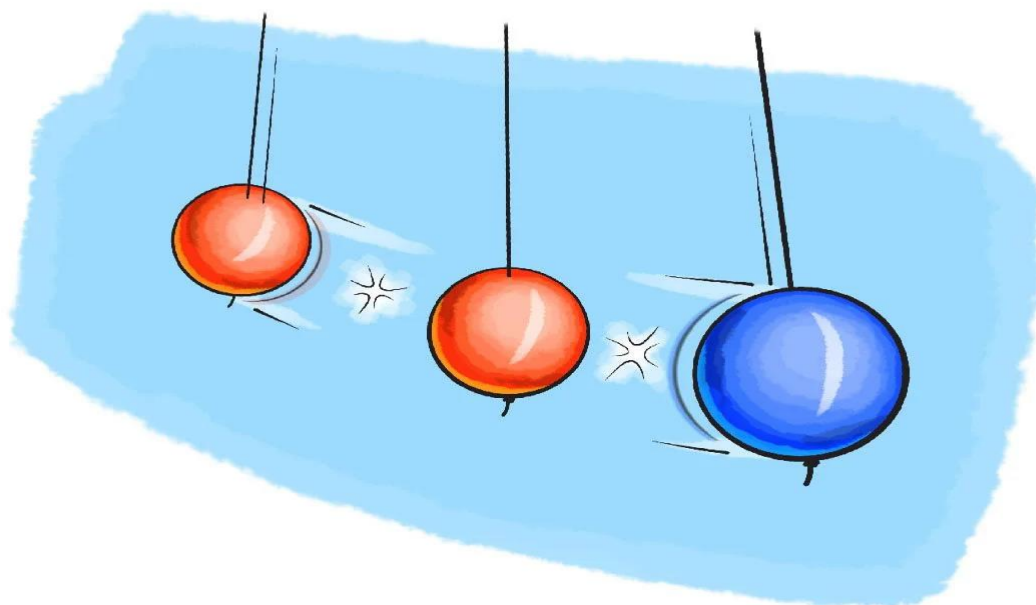


FORCE AND MOMENTUM

Even though both these physical quantities look alike but there is a difference between force and momentum. Force is generally the external action upon a body whether it is a pulling or pushing action. Momentum on the other hand is the representation of the amount of motion within a moving body.

Difference between Force and Momentum

The major relation would be that force results in change in momentum. According to the newton's second law, the change of momentum of any object is also called force which is given by mass times acceleration. Momentum changes with the change in velocity whereas force changes with the change in acceleration.



Difference Between Force and Momentum

Force	Momentum
The direction depends on acceleration	The direction depends upon the direction of velocity
The increase in time decreases the amount of force provided the momentum is constant	The increase in time results in increase in momentum
A force exists for a stationary object	The momentum is zero for a stationary object
Force can be result of actually touching between objects and without physical contact also	Momentum is the result of any unbalanced force acting on a body
Force= mass× acceleration	Momentum= mass×velocity

Linear Momentum: A large, fast-moving object has greater momentum than a smaller, slower object. Linear momentum is defined as the product of a system's mass multiplied by its velocity. In symbols, linear momentum is expressed as:

$$\vec{p} = m\vec{v}$$

Radiology techniques Department Theoretical general physics Lec3

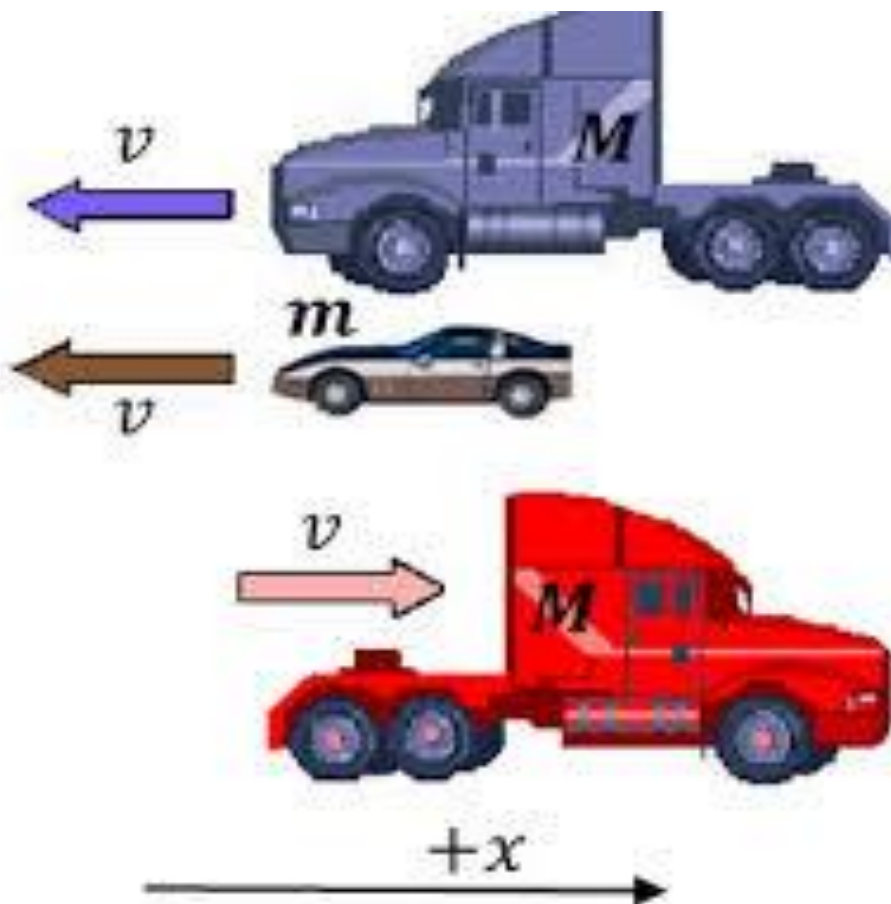
Asst.let Alaa Aziz

Asst.let Murtadha Ali Hamoozi

Asst.let Ali Hatif Shomraan

Asst.let Ali Saeed

Momentum is directly proportional to the object's mass and also its velocity. Thus, the greater an object's mass or the greater its velocity, the greater its momentum. Momentum is a vector having the same direction as the velocity. The SI unit for momentum is. $p \text{ v sec / kgm}$



Momentum and Newton's Second Law

Momentum was deemed so important that it was called the quantity of motion. Newton actually stated his second law of motion in terms of momentum: The net external force equals the change in momentum of a system divided by the time over which it changes. Using symbols, this law is:

$$F_{net} = \frac{dp}{dt}$$

where: F_{net} is the net external force, dp is the change in momentum, and dt is the change in time.

Example

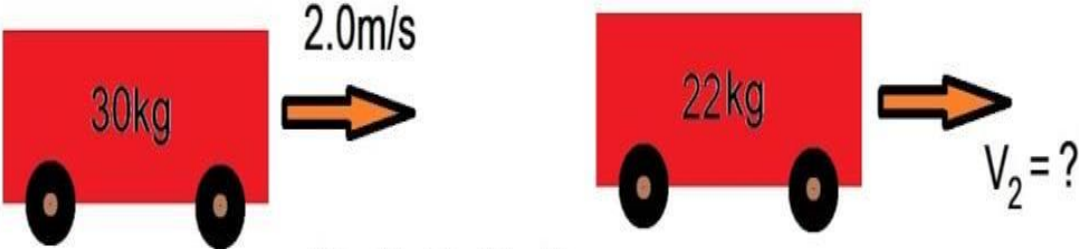


Diagram illustrating a collision between two red carts. The first cart has a mass of 30kg and is moving to the right at 2.0m/s. The second cart has a mass of 22kg and is moving to the right with velocity $V_2 = ?$.

Calculations:

$$P = m v$$

$$P = 30\text{kg} \cdot 2.0\text{m/s}$$

$$P = 60\text{kgm/s}$$

$$m_1 \cdot v_1 = m_2 \cdot v_2$$

$$30\text{kg} \cdot (+2.0\text{m/s}) = 22\text{kg} \cdot v_2$$

$$v_2 = +2.73\text{m/s}$$