State the principle of impulse and momentum. And clearly difference between impulse and impact.

Solution:

a) principle of impulse and momentum

In order to establish the Principle of Impulse and Momentum, we begin with Newton's Second Law for a particle of mass m written as

$$F = m\frac{dv}{dt} = \frac{d}{dt}(mv)$$

where F is the sum of the external forces acting on the particle. This equation says the external force acting on a particle is equal to the rate of change of its momentum. Integrating over time from $t = t_1$ to $t = t_2$, we arrive at the following relation between the integrated force and the particle's change in momentum.

$$\int_{t_1}^{t_2} F dt = \int_{t_1}^{t_2} \frac{d}{dt}(mv) dt = mv_2 - mv_1$$

The quantities v_1 and v_2 are the particle's velocity vectors at times t_1 and t_2, respectively. We define the integral of the force over the time interval t_1 to t_2 as the linear impulse, whichwe denote by Imp_{1-2}, viz.,

$$Imp_{1-2} = \int_{t_1}^{t_2} F dt$$

Thus, the Principle of Impulse and Momentum is

$$Imp_{1-2} = mv_2 - mv_1 \qquad (1)$$

The fact that Equation (1) is a vector equation constitutes one of the most significant differences between the Principle of Impulse and Momentum and the Principle of Work and Energy.

b) difference between impulse and impact

Impact force is specifically for forces over a short period of time. It is still a force and has the same unit as force: example $\frac{kg \cdot m}{s^2}$

Impulse is understood in terms of change in momentum of a body and is a function of force applied and the time period for which it is applied. Impulse force is force multiplied by time duration and is similar to momentum.
Impulse is change of momentum and has the same unit as momentum: example $\frac{kg \cdot m}{s}$

Thus the different is impact is related to acceleration $\left(\frac{m}{s^2}\right)$, impulse is related to velocity $\left(\frac{m}{s}\right)$. Impulse is an integral of force over time which is why it has units different from that of force.