JANATA MAHAVIDAYALAYA CHANDRAPUR

DEPARTMENT OF PHYSICS

CLASS-B.Sc (SEM-I)

TOPICS-LAWS OF MOTION

NAME OF TEACHER –PROF.S.V.KINNAKE

1.1 INTRODUCTION

Scientist Galileo Practically Found that ,external force is required to change the direction of a moving body but no force is required to maintain its velocity.This concept of external force studied together by Sir Isaacs Newton and formulated in the form of three laws.

2) Newton's Laws of Motion

There are three laws of motion

A)Newton's first law of motion

When there is no external force acting on the body then that body remains in own state of rest or of uniform motion in a straight line .I.e. there is no change in velocity unless the external force is acting.

If F=0 then dv=0 or dv/dt=0 or a=0

Newton's first law of motion is ,also called as the law of inertia. The inertia is define as The natural tendency of a body ,not to change its original state unless the external force is acting.

Limitations;

1) The first law of motion tells about the body either at rest or in uniform motion but not about the any other state of the body.
2) It does not hold well in a non-inertial frame of reference.

B)Newton's second law of motion;

"The rate of change of momentum is directly proportional to the impressed force and the direction is that of the impressed force".

Mathematically it is given by

F$\propto dp/dt$ Where P is momentum of a particle

If the propornality constant is unity then,

F=dp/dt=d(mv)/dt=m dv/dt

I.e F=m.a

Where m,v,a are mass, velocity and acceleration of a particle resp.

If m is constant then,F$\propto a$ I.e F$\propto dv/dt$.

Limitations;

1. It does not hold well in a non-inertial frame of reference.
2. The falling rain drops gather the mass due to the condensation and the mass increases. As mass do not remain constant ,the relation F=m.a do not hold good.

C) Newton's third law motion

"For every action there is a reaction ,which is equal in magnitude but opposite in direction"

If F_{12} is the force acting by first body on second body I.e. F_{21} acts by the second body on the first body I.e reaction, Mathematically $F_{12}=-F_{21}$

Limitations;-

1.It does not hold well in a non-inertial frame of reference.

2.If the external force or any other ghost forces are acting on the body then Newton's third law of motion violate.

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