**CONTINUATION OF FIRST TERM LESSON AND SUMMARY**

 **CAUSES OF MOTION**

FORCE. A stationary object does not move unless a force acts on it to start it going .Once it is moving .it moves with a the same speed and in the same direction unless a force makes it speed up ,change direction or slow down.

Newton’s second law state that the sum of forces applied to a system is proportional to the acceleration of that system.

 **EFFECT OF MOTION**

1. Hold two ends of a strip of rubber band or spring and try to stretch it .allow it to return to its original length.

2. Hold the ends of a metal rod and try to bend the rod through those ends

3. Place some iron nails on a table .Now bring a magnet near these nails.

In all these examples above .we have either felt or seen the presence or the effect of force .the cause of every motion is force.

 **FORCE**

A force is an agent that changes or tends to change the state of rest or of uniform motion in a straight line of a body

 **TYPE OF FORCES**

1. Contact forces: They are force which are in contact with the body or object to which they are applied. e.g. forces of push, pull, tension, reaction and frictional force.
2. Force fields (Non- contact force): these are forces whose sources do not require contact with the body to which they are applied eg gravitational force, magnetic force.

Gravitational force: It is the force with which the earth attracts objects towards its centre

Electrostatics forces: it is the force that exists round charged bodies.

Magnetic force: it exist around a bar magnet

 **FRICTION**

Friction is a force which acts at the surface of separation between two objects in contact and tends to oppose the motion of one over the other, friction is a force of opposition

Static or limiting friction: is the minimum force that must be overcome before a body can just start to move over another.

Kinetic or dynamic: is the force that must be overcome so that a body can move with uniform speed over another body.

 **METHOD OF REDUCING FRICTION**

1. The use of lubricant like oil, grease air and graphite

2. The use of ball or roller bearing

3. The streamline of body shapes of moving objects

 **SIMPLE IDEA OF CIRCULAR MOTON**

An object moving in a uniform circular motion moves with a constant speed along a circular path .example of such move are

1. When a stone tied to a string which is whirled in a horizontal or vertical circle

2. The earth moving around the sun

3. The satellite circling around the earth etc.

The speed of the object is constant in magnitude but its direction is changing in a uniform manner .the velocity of the object is therefore changing since acceleration is defined as rate of change of velocity

 a = $\frac{v2}{r}$ where v = uniform speed

 r = radius of the circular path

 a = centripetal acceleration

 **SPEED AND VELOCITY**

**Speed:** It is the rate at which a body covers a distance v$\frac{s}{t}$ . Speed =$\frac{distance}{time}$, it is measured in meter/seconds (ms-1) or cm/s and km/hr.

**Example:** If a bus covers a distance of 200km in 2hr.it average speed is?

**Solution:** v$\frac{s}{t}$ . Speed =$\frac{distance}{time}$ = $\frac{200km}{2hr}$ = 100kmh-1

**Uniform speed**: This is when a body covers equal distance in equal time interval. it is also called constant speed.

**Velocity**: Velocity is the rate of change of displacement

Velocity = $\frac{displacemnet}{time}$ , v = $\frac{s}{t}$

 In motion, it is necessary to distinguish between the two, in speed, no direction is specified, but in velocity it is necessary to specify direction. Since displacement refers to the distance covered in a specific direction. We defined velocity in terms of displacement

**Uniform velocity**: This is when a body moves with equal displacement in equal time intervals. it is also called constant velocity. it unit is meter per second (ms-1)

**Non uniform velocity**: this is when a body moves round a circular path at constant speed .it direction of motion is constantly changing.

**Example**: A car travels at an average speed of 100kmhr-1.what distance does it cover in 5min.

**Solution:**

100kmhr = $\frac{100}{60}$ km/min

Speed = $\frac{distance}{time}$

Distance = speed x time

$\frac{100}{60}$ x 5 = $\frac{25}{3}$ = 8.3km

Velocity = gradient of displacement – time graph, but the speed between C and T is no more uniform but variable

Instantaneous velocity is velocity at any instant of time, the speedometer of a moving vehicle indicate instantaneous velocity

**Acceleration** is the rate of change of velocity with tine .its unit is meter per seconds (ms-2)

Acceleration (a) = $\frac{velocity change }{time taken for change }$

Acceleration (a) = $\frac{final velocity-initial velocity }{time}$ = $\frac{v-u}{t}$ or v = u + at

Retardation: it occur when velocity decreases with time .it is a negative acceleration

Example: Suppose a bus moves from a velocity of 20ms-1 to a velocity of 30ms-1 in 5 sec. it average acceleration is given by a $\frac{v-u}{t}$ = $\frac{30-20}{5}$ = 2ms-1 . It means that the velocity of the car increase by 2ms-1

 **SCALAR AND VECTOR QUANTITIES**

**Scalar quantities**: These are the quantities that has magnitude (numerical value or size) but do not have direction. Examples are mass, speed, distance, time, area, length etc .imagine a vehicle moving at a speed of 100kmhr-1

**Vector quantities**: These are a quantity that has magnitude and direction. examples are displacement, force, acceleration, velocity, momentum, imagine a bird that flies a distance of 100km in a North-Easterly direction.

 **DIFFERRNCES BETWEEN SCALAR AND VECTOR QUANTITES**

|  |  |
| --- | --- |
| Scalar quantity | Vector quantity |
| A quantity with magnitude only | A quantity with magnitude and direction |
| It is specified by a number(magnitude) and a unit | It is specified by a number, direction and unit |
| Scalar are added by arithmetic method | Vector are added by geometrical method |
|  |  |

**The parallelogram law of vector state**: that if two vectors acting simultaneously at a point can be represented both in magnitude and direction by the adjacent side of a parallelogram drawn from a point, then the resultant vector is represented both in magnitude and direction by the diagonal of the parallelogram passing through that point

 **WORK, ENERGY AND POWER**

Work done is defined as the product of the force and the displacement in the direction of the force . W = F X S. The unit of work is the joule when the force is measured in Newton and displacement in meters,

The work done when a force of 10newtons displaces an object through 5 meters is given by

W = 10 x 5 = 50joules.

**Energy** is the capacity to do work

**Kinetic energy (K.E.)** is the energy possessed by a body by virtue of its motion .examples of kinetic energy are the following and K.E of a body in motion is given by K.E. = $\frac{1}{2}$ MV2

1. A student running a race

2. An object falling freely under gravity

3. Wind or air in motion

4, Electrical charges in motion

5. A moving bullet or a moving hammer head

**Example:** An object of mass 5kg is moving at a constant velocity of 15ms-1.calculate its kinetic energy

K.E. = $\frac{1}{2}$ MV2 = $\frac{1}{2}$ X 5 x 152joules = 562.5joules