BAL BHARATI PUBLIC SCHOOL, PITAMPURA, DELHI – 110034

SUBJECT:-PHYSICS
CHAPTER:-MOTION
Class IX

TOPIC :   *EQUATIONS OF MOTION*

GUIDELINES :

Dear students,

- There are three assignments:
  - Assignment 11: Based on first equation of motion
  - Assignment 12: Based on second equation of motion
  - Assignment 13: Based on third equation of motion
- Solve the assignments in a separate Physics notebook.
- Suitable Video links have been provided for better understanding of the concept.

   https://youtu.be/qD3zHo6QEdM

- Do read NCERT too for better understanding of these concepts

  NCERT LINK FOR THE CHAPTER:
  http://ncert.nic.in/textbook/textbook.htm?iesc1=8-15
  (page no 107,108,109)

SUBTOPICS: Equations of motion
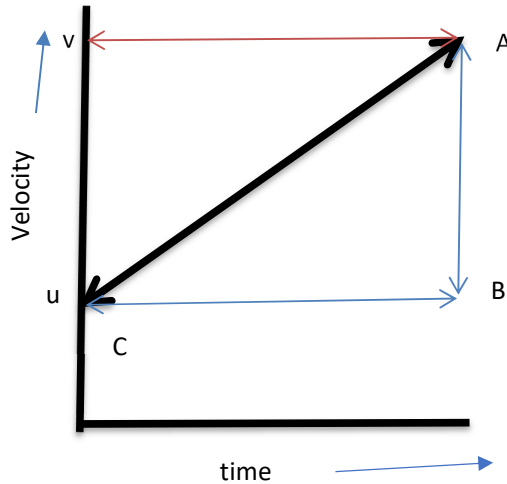
a) $v = u + at$
b) $S = ut + \frac{1}{2}at^2$
c) $v^2 - u^2 = 2as$

DERIVATIONS:

Let us consider an object moving in a straight line with an initial velocity u m/s , attaining finally a velocity of v m/s in time t sec, after being accelerated through a m/s²

During this time, it covers a distance of S m

Graphically this motion can be represented as follows:

Please note:

- ➢ All the three equations of motion can be derived with reference to this scenario.
- ➢ These equations of motion relate various physical quantities like u,v,a,t and S.
- ➢ These equations are valid for uniformly accelerated motion.

Now let us derive the equations:

    A) FIRST EQUATION OF MOTION

        $$v = u + at$$

The slope of v-t graph of a moving object determines its acceleration

In the above plotted graph

  a = Slope of v-t graph = AB/BC

AB= v-u

BC= t

  Hence   a = (v-u)/t

   Or, $v = u + at$

Hence, derived

     NOW SOLVE THIS ASSIGNMENT:

        <u>ASSIGNMENT 11</u>
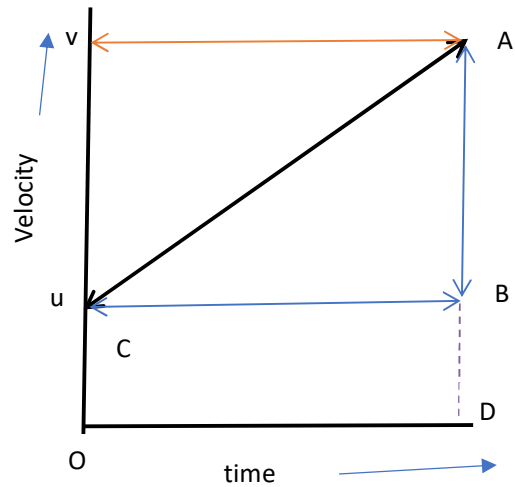
1. Derive the first equation of motion for a uniformly accelerated body.
2. A ball accelerated by 2 m/s² experiences the increase in its velocity from 5 m/s to 10m/s. In what time did it experience this change?

B) SECOND EQUATION OF MOTION:

$S = ut + \frac{1}{2}at^2$

Concept used:

Area under v-t graph gives the

displacement/ distance

covered by an object.

S = Area of rectangle OCBD + AREA OF TRIANGLE ABC

= BD x OD + ½ AB x BC

= ut + ½ (v-u) x t   Note: (v-u = at)

$S = ut + \frac{1}{2}at^2$, Hence, derived.

ASSIGNMENT 12

1. Derive the second equation of motion graphically for a body under uniformly accelerated motion.
2. A ball is thrown up with a velocity of 10m/s. In what time will it reach the highest point of its journey? Find the highest point of its journey. (take a=g= 10m/s²)

c) THIRD EQUATION OF MOTION:

$$v^2 - u^2 = 2as$$

Concept used:

Area under v-t graph gives the displacement/ distance covered by an object.

S= Area of trapezium OBAC

$= \frac{1}{2}$ x (sum of parallel sides) x height

$= \frac{1}{2}$ x (OC + AB) x OB
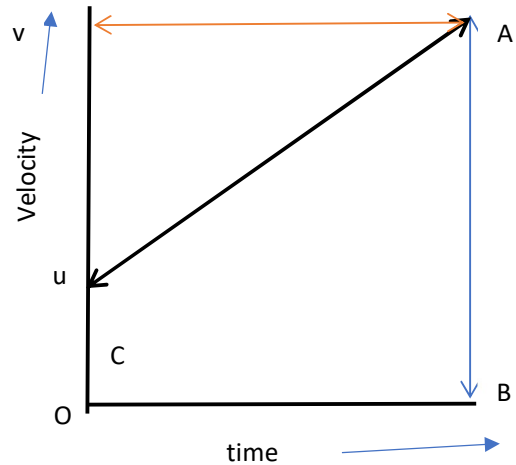
$= \frac{1}{2}$ x (u+v) X t

$= \frac{1}{2}$ x (u+v) x (v-u) / a

$= \frac{1}{2}$ x ($v^2 - u^{2)}$ /a

$v^2 - u^2 = 2as$,   **Hence Derived**

ASSIGNMENT 13

1. Derive the following expression, where symbols have their usual meaning.

   $$v^2 - u^2 = 2as$$

2. An object moves along a straight line with an acceleration of 2 m/s2. If its initial speed is 10 m/s, what will be its speed 2 s later?

3. A bullet hits a Sand box with a velocity of 20 m/s and penetrates it up to a distance of 6 cm. Find the deceleration of the bullet in the sand box.

STAY HOME STAY SAFE