Indian School Al Wadi Al Kabir
Assessment 1
Physics (Code: 042)

Class : XI SET II Time: 3 Hours
Date : 25/09/2022 Max. Marks : 70

General Instructions:
(1) All questions are compulsory. There are 29 questions in all.
(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
(3) Section A contains ten objective multiple-choice questions of 1 mark each, Section B contains seven very short answer type questions of 2 marks each, Section C contains 7 short answer questions of 3 marks each, Section D contains three long answer type questions of 5 marks each, Section E contains two case-based study questions of 5 marks each.
(4) There is no overall choice. However internal choice is provided. You have to attempt only one of the choices in such questions.
(5) All questions are compulsory. In case of internal choices, attempt any one of them.

SECTION A [10X1= 10]

[1] Which of the following is a derived quantity

[a] Time [b] momentum[c] second[d] All of these

[2] The equation, $F = at+bt^2$ represents the force acting on a body

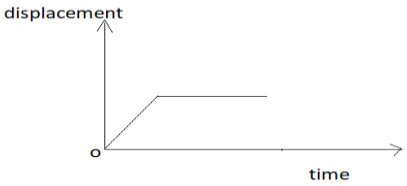
where F is the force, t is the time , Then dimension of 'b' is

[a] MLT^{-2} [b] ML^2T [c] ML^2T^{-3} [d] MLT^{-4}

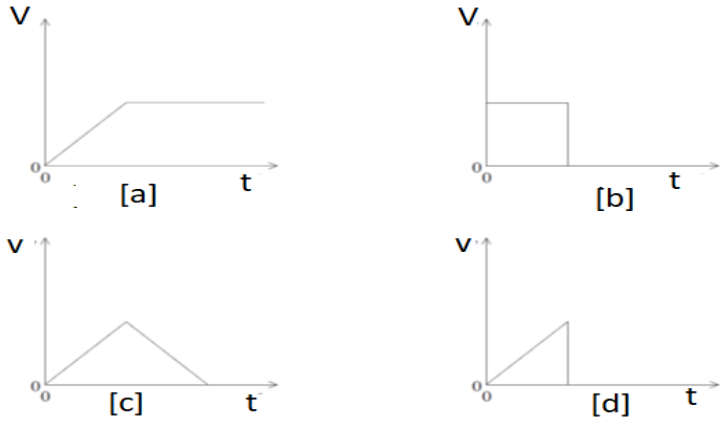
[3]A dimensionless quantity

[a] may have a unit [b] does not exist [c]never has a unit [d]always has a unit

[4] The graph below shows the variation with time 't' of the displacement 'd' of a body moving along a straight line.



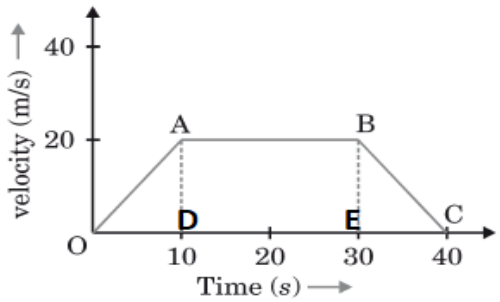
Which graph best represents the variation with time ‘t’of the velocity ‘v’of this body



[5]A car travelling at 5m/s takes a ‘U’ turn without changing its speed in 5 seconds. what is the acceleration of the car ?

[a] -2$\frac{m}{s^2}$ [b] zero [c] -1$\frac{m}{s^2}$ [d] 0.5$\frac{m}{s^2}$

[6] The velocity -time graph of a body is shown . Find the value of retardation.



[a] 1$\frac{m}{s^2}$ [b] zero [c] -2$\frac{m}{s^2}$ [d] -1$\frac{m}{s^2}$

[7] A stone is thrown horizontally from the top of a tower. Assuming air resistance is negligible, what is the effect of gravitational force on the horizontal and on the vertical components of the velocity of the stone.

Vertical component of velocity	Horizontal component of velocity
[a]increases to a constant value	Stays constant
[b]increases continuously	Stays constant
[c]decreases to a constant value	Decreases to zero
[d]remains same	Increases and then decreases

[8] What is the angle between the velocity vector and the acceleration vector in uniform circular motion

[a] 45^0[b] 60^0 [c] 90^0 [d] 180^0

[9] The unit of angular acceleration is

[a]$\frac{radians}{sec}$ [b]$\frac{radians}{sec^2}$ [c] radians sec [d] none of these

[10] A bullet is dropped from the same height when another bullet is fired horizontally .They will hit the ground in such a way that,

[a] the bullet which is dropped reached first

[b] the bullet which is fired horizontally reached first

[c]both will reach simultaneously

[d] can't be predicted

SECTION B [7X2 = 14]

[11] Check the correctness of the equation

T = $\frac{2m1m2g}{m1+m2}$

Where T is the tension[force], m1= m2 = mass , g = acceleration due to gravity

[12] An object is thrown vertically upwards to a certain height and received by the thrower at the same point of projection. Draw the [i]velocity – time graph and [ii] speed -time graph for the entire journey of the stone.

[13] [i] What do you mean by instantaneous velocity ?

[ii]How can you find the instantaneous velocity using displacement-time graph ?

[14] One body is dropped and another is thrown downward with an initial velocity of 2m/s simultaneously. After what time interval these two bodies get separated through a distance of 20m? [Take g =10m/s^2]

OR

A stone is dropped from a balloon moving upwards with a velocity of 4.5m/s. The stone reaches the ground in 5s. Calculate the height of the balloon when the stone was dropped[g = 9.8m/s^2]

[15] If the magnitude of two vectors are 2 and 3 and the magnitude of their scalar product is 3 $\sqrt{2}$, then find the angle between the vectors ?

[16] What is a unit vector? What is the difference between scalar and vector product of 2 vectors ?

[17] Derive the expression to find the maximum height reached by a projectile

SECTION C [7X3 = 21]

[18] Find the dimensions of 'a' and 'b' in the equation ,

$$[P + \frac{a}{V^2}][V - b] = RT$$

where P =pressure, V = volume, T = temperature.

[19]A ball is thrown vertically upwards with a velocity of 20m/s from the top of a building. The height of the point from where the ball is thrown is 25m from the ground. [a] How high will the ball rise? [b] How long will it be before the ball hits the ground? [g = 9.8 $\frac{m}{s^2}$]

[20] A bus starts from rest with an acceleration of 1m/s^2. A man who is 48m behind the bus starts with uniform velocity of 10m/s What is the minimum time after which the man will catch the bus?

[21] Draw the nature of a position –time graph for a motion of a particle moving with [i] negative acceleration [ii] zero acceleration [iii] negative uniform velocity

[22] What is angular acceleration? Derive the relation between linear acceleration 'a' and angular acceleration $'\alpha'$

[23] State triangle law of vector addition. And derive an expression to find the resultant vector 'R' of 2 vectors 'P' & 'Q' makes angle $'\theta'$ between them.

[24] A ball is kicked off with a speed of 40m/s at an angle of 45°. A receiver in the goal line 340 m away in the direction of kick stars running to catch the ball at that instant. What must his uniform speed be if he is to catch the ball before it hits the ground ?[g =10m/s^2]

OR

A fighter plane flying horizontally at an altitude of 2 km with a speed of 200m/s passes directly overhead an anticraft gun . At what angle from the vertical should the gun be fixed for the shell with muzzle speed 400m/s to hit the plane ?[g=l0m/s^2]

SECTION D [3X5 = 15]

[25][a] Write any 2 uses of dimensions.

[b] The planet Mars moves around the sun in a circular orbit. Assuming that , the period of rotation 'T' depends upon the radius 'r' of the orbit, the mass of the sun 'M' and the gravitational constant 'G' .Obtain by the method of dimension an expression for time period [Take the dimensional formula for G = M^{-1} T^{-2} L^3]

OR

[a] What are the limitations of dimensions [any 2]

[b] The velocity of sound 'V' depends upon elasticity of the medium 'Y', density of the medium 'd'. Obtain the formula to find the velocity.

[Take the dimensional formula for 'Y' as ML^{-1} T^{-2}]

[26][a] With the help of velocity- time graph,

Derive the equations, [i] V = U + at [ii] S = ut + $\frac{1}{2}$ at^2

[b] If the displacement of a body is zero,is the distance covered by it necessary zero? Comment with an illustration.

OR

[a] With the help of velocity- time graph, Derive the equation $V^2 = U^2$ + 2as

[b] A car starts from rest and accelerates uniformly for 10s to a velocity of 8m/s. It then returns at a constant velocity and is finally brought to rest in 64m with

constant retardation. The total distance travelled by the car is 584m.Find the acceleration, retardation, and the total time taken?

[27][a]What is a projectile? Show that the path traced by a projectile is a parabola.

[b] A projectile is thrown upwards with an initial horizontal component of velocity 4m/s. What is its final horizontal component of velocity, when it reaches the maximum height ?

OR

[a] A body which is in uniform circular motion always accelerated. Why?
[b] Derive an expression to find the centripetal acceleration acting on a body of mass 'm' when it is executing circular motion of radius 'r'

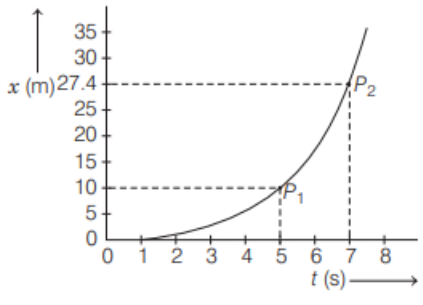
SECTION E [2X5 = 10]

CASE STUDY

[28] If the position of an object is continuously changing w.r.t. its surrounding, then it is said to be in the state of motion. Thus, motion can be defined as a change in position of an object with time. It is common to everything in the universe

When an object is in motion, its position changes with time. So, the quantity that describes how fast is the position changing w.r.t. time and in what direction is given by average velocity. The velocity of an object, in general, changes during its course of motion. Initially, at the time of Galileo, it was thought that, this change could be described by the rate of change of velocity with distance. But, through his studies of motion of freely falling objects and motion of objects on an inclined plane, Galileo concluded that, the rate of change of velocity with time is a constant of motion for all objects in free fall. This led to the concept of acceleration as the rate of change of velocity with time.

[i] In the following graph, average velocity is geometrically represented by



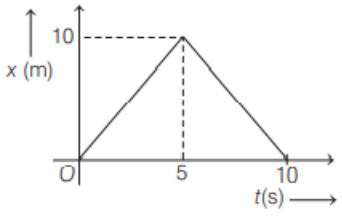
[fig.1]

(a) length of the line P1 P2 (b) slope of the straight line P1P 2 (c) slope of the tangent to the curve at P1 (d) slope of the tangent to the curve at P2

[ii] Displacement of an object can be

(a) positive (b) negative (c) zero (d) All of the above

[iii] The x-t graph for motion of a car is given below



[fig.2]

With reference to the graph, which of the given statement(s) is/are incorrect?

(a) The instantaneous speed during the interval t =5 s to t =10 s is negative at all time instants during the interval.

(b) The velocity and the average velocity for the interval t =0 s to t =5 s are equal and positive.

(c) The car changes its direction of motion at t =5 s.

(d) The instantaneous speed and the instantaneous velocity are positive at all time instants during the interval t =0 s to t =5 s.

[iv] What is the velocity of the car during the interval t =0 s to t =5 s.

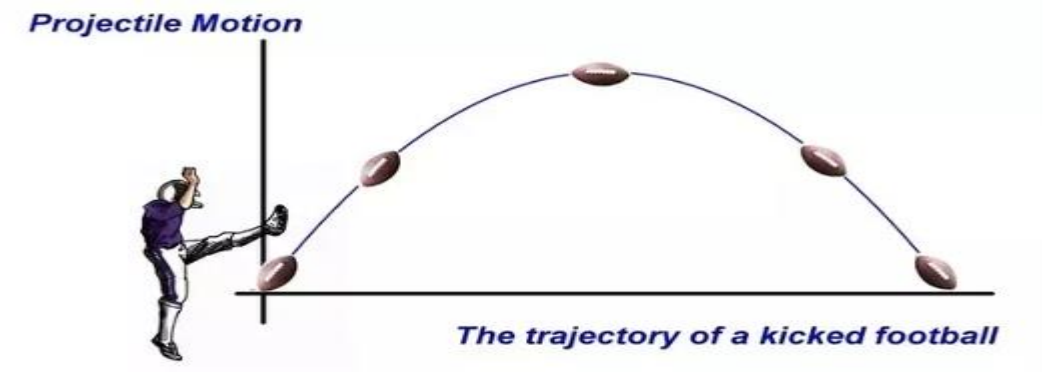
[a]2m/s[b] 1m/s] [c] 5m/s [d] 2.5m/s

[v] With reference to the graph,[fig.2] which of the given statement is correct?

The car has negative velocity during the interval

[a] t =0 s to t =5 s [b] t =0 s to t =10 s. [c] t =5 s to t =10 s[d] non of these

[29] Projectile motion is an example of 2D. The path followed by a projectile is a parabola. When a projectile is projected obliquely, then its trajectory is as shown in the figure below.



[i]The example of such type of motion is
(a) motion of car on a banked road
(b) motion of boat in sea
(c) a javelin thrown by an athlete
(d) motion of ball thrown vertically upward

[ii]The acceleration of the object in horizontal direction is
(a) constant
(b) decreasing
(c) increasing
(d) zero
[iii] The vertical component of velocity at maximum height is
(a) maximum
(b) zero
(c) double the initial vertical component of velocity
(d) equal to initial horizontal component of velocity

[iv] A cricket ball is thrown at a speed of 28 m/s in a direction 30° with the horizontal. The time taken by the ball to return to the same level will be
(a) 2.0 s
(b) 3.0 s
(c) 4.0 s
(d) 2.9 s

[v] In above case, the distance from the thrower to the point where the ball returns to the same level will be
(a) 39 m
(b) 69 m
(c) 68 m
(d) 72m