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Roll. No. 1102 Name Mayank Bharti

NEW GREEN FIELDS SCHOOL
HALF YEARLY EXAMINATION, 2015-16
PHYSICS

Time : 3 hrs. **Class – XI** **M.M. : 70**

General Instructions—

(1) All questions are compulsory. There are 26 questions.

(2) There are 5 sections in question paper which are A, B, C, D and E.

(3) Section A has 5 questions of 1 mark each. Section B has 5 questions of 2 marks each. Section C has 12 questions of 3 marks each. Section D has 1 question of 4 marks. Section E has 3 questions of 5 marks each.

(4) There is no overall choice. However internal choice in one question of 2 marks, one of three of 5 marks.

Use following physical constants whenever necessary :

Speed of light $C = 3 \times 10^8$ *m/s* *Gravitational constant* $G = 6.6 \times 10^{-11} \frac{Nm^2}{kg^2}$

Gas constant $R = 8.314$ *J/mol. K* $m_e = 9.11 \times 10^{-31}$ *kg*

Mechanical equivalent of heat = 4.185 J/cal

Standard atmospheric pressure $= 1.013 \times 10^5$ *pa*

Absolute zero K = –273.15°C

Acceleration due to gravity $= 9.8 m/s^2$

SECTION—A

1 Write the dimensions and SI unit of linear momentum.

2 What is nature of position time graph for uniform motion ?

[P.T.O.]

3 Under what condition average velocity of a body is equal to instantaneous velocity ?

4 What is dot product of two perpendicular vectors ?

5 Name the unit of coefficient of limiting friction.

SECTION—B

6 Select the correct alternative from following and explain it—

(a) When a conservative force does positive work on a body the potential energy of the body increases / decreases / remains unaltered.

(b) Work done by a body against friction always results in a loss of its kinetic / potential energy.

7 What is a unit vector ? How would you obtain unit vector of a given vector ?

8 A ship of mass 4×10^7 kg is pulled by a force of 6×10^5 N. Find the acceleration of the ship. Also find velocity of ship after it has covered a distance of 300 m. Neglect resistance of sea water.

OR

A body of mass 10 kg is placed on an inclined plane of angle 30°. If coefficient of static friction is $\frac{1}{\sqrt{3}}$. Find the force just required to push the body up the inclined plane. The forced is being applied parallel to the inclined surface.

9 What do you mean by coinitial vector and coplanas vectors ?

10 Find the expression for gravitational potential energy of mass 'm' above 'h' height above earth's surface.

SECTION—C

11 A small bucket containing water is rotated in a vertical circle. Obtain expression for minimum speed of bucket so that water does not spill even at highest point during its motion in a vertical circle. If radius of circle is 1 met, what will be minimum velocity at highest point ?

12 Read each statement below carefully and state with reasons and examples if it is true or false—

(a) Conserved in a process.

(b) Does not vary from one point to another in space

(c) Has the same value for observers with different orientations of axes.

13 Establish the kinematic equation $v^2 - u^2 = 2as$ from velocity time graph for a uniformly accelerated motion.

14 (a) Mass of an average person is 40-100 kg. An athelete in olympic games covers 100 metres in 10 sec. What is range of kinetic energy for him ?

(b) A body moves a distance of 10 met along a straight line under the action of 4 newton. If work done is 25 J, the angle which force makes with direction of motion of body is how much ?

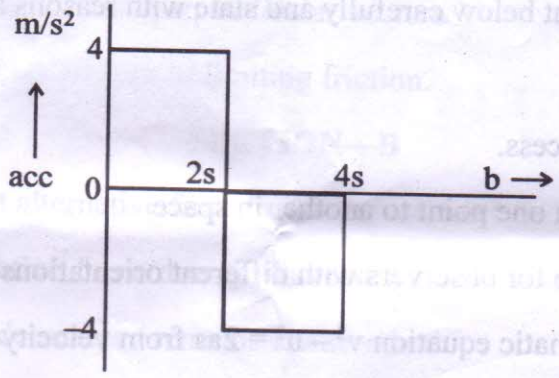
(c) If a long spring a stretched by 0.02 m its potential energy is 'U' if spring is stretched by 0.1 m. What will be its potential energy ?

15 A bullet fired from a rifle is more dangerous than air molecule hitting a person though both of them have almost same speed. Why ? Why a person sitting inside a car at rest, can not move it by pushing it from within. If action and reaction are equal and opposite why don't they cancel each other ?

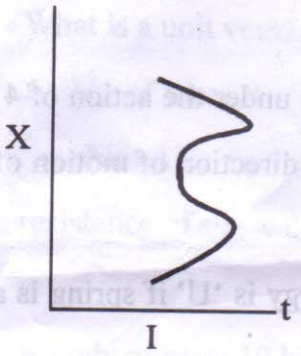
16 A cyclist is riding with a speed of 27 km/h. As he approaches a circular turn on the road of radius 80 m he applies brakes and reduces his speed at constant rate of 0.50 m/s every second. What is the magnitude and direction of net acceleration of the acceleration of the cyclist on the circular turn ?

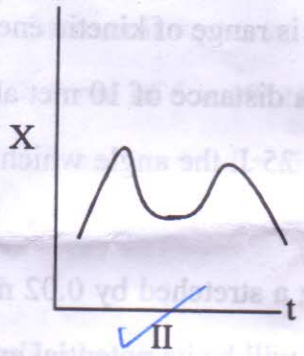
17 Define inertial frame of reference. Write two important features of it.

18 A particle starts from rest and moves along a straight line in positive 'x' direction. Acceleration time graph of particle is shown in figure 3.34. Draw velocity time graph for it.



Which of following graph is possible in practice and why ?





19 What is meant by unit of a physical quantity ? Write two essential characteristics which should be possessed by a unit.

20 Differentiate between following—

(a) Absolute and relative error (b) Mass and weight of a body

(c) Standard and derived unit

21 Derive expression for centripetal acceleration of an object in uniform circular motion in a plane. What will be direction of velocity and acceleration at any instant ?

OR

Find area of parallelogram formed by vectors—

$\vec{A} = 3\hat{i} + 2\hat{j}$

$\vec{B} = 2\hat{i} - 4\hat{k}$

22 Write number of significant figure in—

(a) 9.11×10^{-31} kg (b) 0.00427 g

Calculate length of arc of circle of radius 31.0 cm which makes angle $\pi/6$ at centre.

SECTION—D

23 One day Arvind went to super market to purchase groceries. He saw an old lady struggling with shopping. He immediately showed her lift and explained to see her how she can carry her goods from one floor to others. Old lady was hesitant to use lift. Arvind took lady to lift and showed her how to operate the lift. The old lady was very happy and finished her shopping.

(a) What are values shown by Arvind ?

(b) An elevator which can carry a maximum load of 1800 kg is moving up with a constant speed of 2 m/s. The frictional force opposing the motion is 4000 N. Determine the maximum power delivered by motor to elevator in horse power.

SECTION—E

24 Write two uses of dimensions. The wavelength 'λ' associated with a moving particle depends upon its mass 'm' its velocity 'v' and plank's constant 'h'. Find inter-relation between them $h = [ML^2T^{-1}]$.

OR

State two limitations of methods of dimensional analysis. By method of dimensions find value of 8 m/s^2 in into km/hr^2.

25 What is a projectile ? Derive an expression for trajectory time of flight maximum height and horizontal range of a projectile thrown at angle 'θ' with horizontal.

OR

Write the expression for magnitude and direction of result of two vectors $\vec{P}$ & $\vec{Q}$ inclined at 'θ' with each other. Discuss special case when θ is—

(a) 0° (b) 180°

(c) 90°

m/s
L T
LT^{-1}

26 Briefly explain static friction, limiting friction and kinetic friction. How do they vary with applied force explain with help of graph.

OR

State three basic laws of motion. Show that first law of motion gives definition of force and second law of motion gives the measure of force.