

Half Yearly Examination – 2016-17

No. of Printed Page : 6
 Subject : Physics
 Time : 3 hrs.

Roll No.
 Class : XI
 Maximum Marks :

General Instructions :

- (i) All questions are compulsory. There are 26 questions in all.
- (ii) Question paper has five sections A, B, C, D and E.
- (iii) Section A has five questions of one mark each, Section B has five questions of two marks each, Section C has twelve questions of three marks each, Section D has one question of four marks. Section E has three questions of five marks each.
- (iv) There is no overall choice. However, an internal choice is there is one question of 2 marks, one of 3 marks and in all 3 of 5 marks. You may use the following values of physical constants wherever necessary :

$c = 3 \times 10^8 \text{ m/s}$

$g = 9.8 \text{ m/s}^2$

Mass of electron = $9.1 \times 10^{-31} \text{ kg}$

Mass of neutron = $1.675 \times 10^{-27} \text{ kg}$

Mass of proton = $1.675 \times 10^{-27} \text{ kg}$

Avogadro's number = 6.023×10^{23} per gram mole

Section – A

1. Give magnitude and direction of net force acting on a car moving with a constant velocity 30 km/h on a rough road.
2. How does friction decrease on lubrication ?
3. Write the dimensional equation of molar gas constant R.
4. What is the ratio of kinetic energy of a particle at the bottom to the kinetic energy at the top, when it just loops a vertical loop of radius r ?
5. Under what condition is the work done by a force maximum ?

$PV = nRT$
 P: vol, n: Temp

$\frac{ML^2 T^{-2}}{L^2} = ML^{-1} T^{-2} = L^3$
 K

P.T.O.

Section - B

6. The density of a cylindrical rod was measured by using the formula :

$$\rho = \frac{4m}{\pi D^2 \ell}$$

The percentage error in m , d and ℓ are 1%, 1.5% and 0.5%. Calculate the percentage error in the calculated value of density.

OR

Time period T of a simple pendulum may depend upon its mass m , length ℓ and acceleration due to gravity g . Find an expression for time period T by method of dimensions.

7. Derive a relation for the optimum velocity of negotiating a curve by a vehicle in a banked curve.
8. Rain is falling vertically with a speed of 30ms^{-1} . A woman rides a bicycle with a speed of 10ms^{-1} in the north to south direction. What is the direction in which she should hold her umbrella ?
9. Define coefficient of restitution. What is its value for different types of collision ?
10. A food packet is released from a helicopter. Which is rising steadily at 2ms^{-1} . The food packet falls on the ground after 6s. Find the height of the helicopter when (i) the food is dropped
11. Find the value of $60W$ on a system having 100g, 20 cm and 1 min. as the fundamental units. *sec-c*
2. Draw velocity time graph for uniformly accelerated motion in the following cases :
- (a) $u = +ve$, $a = +ve$ (b) $u = -ve$, $a = +ve$
- (c) $u = +ve$, $a = -ve$

OR

- (a) Obtain the expression for distance covered in a particular instant of time (nth second) for uniformly accelerated motion.
- (b) Can a body have a constant velocity but variable speed.
- State the law of conservation of linear momentum. Prove it by using the second law of motion. Give two situation where the linear momentum remain conserved.
4. (a) What is the workdone by the centripetal force ? Explain.
- (b) Find the workdone in pulling and pushing a roller through 100m horizontally when a force of 1500N is acting along a chain making an angle of 60° with ground.
15. State the laws of limiting friction. Hence define coefficient of static friction.
16. A particle is forced at an angle θ with horizontal :
- (a) Show that its trajectory is a parabola.
- (b) Obtain expression for horizontal range and at what value of θ is the horizontal range maximum ?
17. (a) What would be the potential energy of the body when a conservative force does positive work on a body ?
- (b) Tick the correct answer :
Work done by a body against friction always results in a loss of its kinetic / potential energy.
- (c) The rate of change of total momentum of a many particle system is proportional to the external force/sum of the internal forces on the system.
18. (a) How would you measure the diameter of the moon ?
- (b) What do you mean by absolute error and relative error of measurement ?

GF-11-250/Physics/XI

◇ 3 (XI) ◇

sin

cos

0/2

0

0

1

-1/2

30

1/2

5/3

4/5

45

1/5

1/5

3/4

60

5/3

1/2

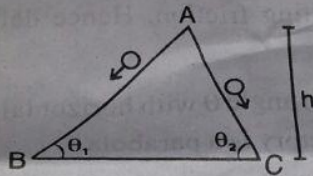
1/2

90

1

0

19. (a) An athlete runs a certain distance before a long jump. Name the law that. Explain it.
 (b) A ball thrown upward by a child sitting in a running train continues to move with the train. How ?
 (c) Railway bogies provided with buffers. Why ?
20. Two inclined frictionless tracks, one gradual and the other steep meet at A from where two stones are allowed to slide down from rest, one on each track. Will the stones reach the bottom at the same time ? Will they reach there with the same speed ? Explain given $\theta_1 = 30^\circ$, $\theta_2 = 60^\circ$ and $h = 10\text{m}$, what are the speeds and times taken by the two stones ?



21. (a) How is impulse related to the linear momentum ?
 (b) Why should the hammer used be heavier for inserting a nail deeper in to the wall ?
 (c) For uniform circular motion, does the direction of the centripetal force depend on the sense of rotation i.e. clockwise or anticlockwise rotation.
22. (a) Why is it not necessary for a body following another, to stop, to avoid collision ?
 (b) Give two examples of scalar product of two vectors.
 (c) What conclusion do you draw about \vec{B} , if $\vec{A} - \vec{B} = \vec{A} + \vec{B}$.

Section - D

23. One day Ashok was travelling with his uncle in his car and his uncle was driving the car. Ashok observed that his uncle did not tie the seat belt. He

requested his uncle to tie seat belt but very short distance. Ashok's uncle experienced a forward jerk and his head collided with the steering. Fortunately he did not receive serious injuries. Ashok immediately took his uncle to a nearby doctor for first-aid and immediate care. Later on he explained the use of seat belt to his uncle in details. His uncle promised to put on seat in future while driving.

- What values were shown by Ashok?
- When a car suddenly stops, in which direction a passenger would experience a jerk and why?
- What is the function of seat belt?

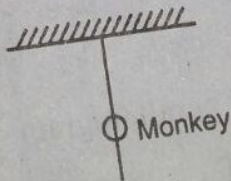
Section - D

24. Define the term static friction, limiting friction and kinetic friction. Draw the graph between friction and applied force on any object and show static friction and kinetic friction in graph.

Using graph show that static friction is a self adjusting force.

OR

- Discuss the equilibrium of concurrent forces acting on a rigid body.
- A monkey of mass 40 kg climbs on a rope. Which can stand a maximum tension of 600N. In which of the following cases will the rope break.
The monkey



- Climb up with an acceleration of 6ms^{-2} .
- Climb up with a uniform speed of 5ms^{-1} .
- Falls down the rope nearly freely under gravity?
(neglect mass of rope)

◇ 5 (XI) ◇

25. (a) Spring A and B have the same dimensions and mass but force constant $K_A < K_B$. In which spring we require more work if :
- (a) they are stretched by equal amount.
 - (b) they are stretched by the same force ?
- (b) State work-energy theorem for a variable force.

OR

- (a) Prove the law of conservation of mechanical energy for a body falling freely and discuss it graphically too.
 - (b) What is two dimensional elastic collision ? Discuss collision of two bodies in two dimensions.
26. (a) Displacement-time equation of a particle moving along x-axis is :

$$x = 20 + t^3 - 12t$$

- (i) Find position and velocity of particle at time $t = 0$.
 - (ii) State whether the motion is uniformly accelerated or not.
 - (iii) Find position of particle when velocity of particle is zero.
- (b) Water is flowing in a river at a uniform rate of 3 kmh^{-1} due to south. A swimmer is swimming relative to river water with a constant velocity of 7.5 kmh^{-1} due to north. Determine the velocity of swimmer with respect to ground.

OR

- (a) Can you associate vectors with :
- (i) the length of a wire bent in to a loop
 - (ii) a plane area
 - (iii) a sphere ?
- (b) Calculate the area of parallelogram whose sides are :

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

$$\vec{B} = 2\hat{i} - 3\hat{j} + \hat{k}$$