

**SAMPLE PAPER - 2014**  
**PHYSICS**  
**Class – XI**

Time Allowed: 3 Hrs

Maximum Marks: 70

**General Instructions:**

- All questions are compulsory. Symbols have their usual meaning.
- Use of calculator is not permitted. However you may use log table, if required.
- Draw neat labeled diagram wherever necessary to explain your answer.
- Q. No. 1 to 5 are of very short answer type questions, carrying 1 mark each.
- Q.No.6 to 10 are of short answer type questions, carrying 2 marks each.
- Q. No. 11 to 22 carry 3 marks each.
- Q.No. 23 carry 4 marks.
- Q. No. 24 to 28 carry 5 marks each.

1. What is the S.I. unit of impulse?
2. One of the rectangular components of velocity of 80km/h is 40km/h, find the other component.
3. Why does person lower his hands while catching a ball?
4. A light body and heavy body have equal kinetic energy, which one have greater Momentum?
5. Write down the dimensions of viscosity coefficient.
6. A physical quantity P is related to four observables a, b, c and d as follows;  $P = a^2b^3/c^4\sqrt{d}$  the percentage errors in a, b, c and d are 2%, 4%, 3% and 2% respectively. What is the percentage error in the quantity P?
7. Check the dimensional consistency of the following equation  $\frac{1}{2}mv^2 = mgh$  where m is the mass of the body, v is its velocity, g is acceleration due to gravity and h is the height.
8. Draw the Position – Time graph for following cases when :  
(i) Object is moving with positive acceleration      (ii) An object is under free fall
9. A bullet of mass **0.04kg** moving with a speed of **90m/sec** enters a heavy wooden block and is stopped after a distance of 60cm. what is the average resistive force exerted by the block on the bullet?
10. Determine the maximum acceleration of the train in which a box lying on its floor will remain stationary, given that the co-efficient of static friction between the box and the train's floor is 0.15.

**OR**

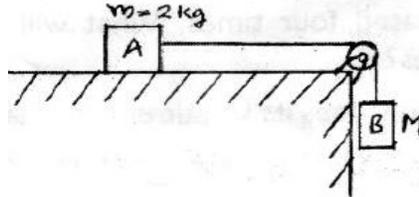
What are concurrent forces? Under what conditions will a body remain in equilibrium?

11. What is that which provides the necessary centripetal force in the following cases? Also find work done by centripetal force.  
(i) The earth going round the sun      (ii) Electrons revolving round the nucleus of an atom?
12. State and prove conservation of linear momentum.
13. If a nucleus at rest disintegrates into two smaller nuclei, the products must be emitted in opposite directions. Explain?
14. A ball is dropped vertically from rest at a height of 12 m. After striking the ground, it bounces to a height of 9 m. What fraction of kinetic energy does it loose on striking the ground?

15. Derive the expression for viscous force acting on spherical body of radius  $r$  moving with velocity  $v$  through viscous liquid of co-efficient of viscosity  $\eta$ . using dimensional analysis.
16. Derive any two equation motion by calculus method.
17. The motion of a car along y-axis is given by  $v(t) = -12t + 12$  where velocity  $v$  is in m/s and time  $t$  in seconds. Find the instantaneous position of the car as a function of time if at  $t = 0$  it was at 5m. Also find its acceleration at  $t = 2$  second.
18. A projectile is fired in air making an angle  $\theta$  with horizontal. Show that its path is parabolic in nature. Find an expression for time of flight.
19. Find the **sine** of the angle between the vectors  $\vec{A} = 3\hat{i} - 4\hat{j} + 5\hat{k}$  and  $\vec{D} = \hat{i} - \hat{j} + \hat{k}$ .
20. If vectors  $\vec{P}$ ,  $\vec{Q}$  and  $\vec{R}$  have magnitude 5, 12 and 13 units and  $\vec{P} + \vec{Q} = \vec{R}$ . Find the angle between  $\vec{Q}$  and  $\vec{R}$ .
21. Prove that second law is real law.
22. (a) Explain why it is easier to pull a roller than to push it.  
(b) Suggest some ways to minimize friction.

**OR**

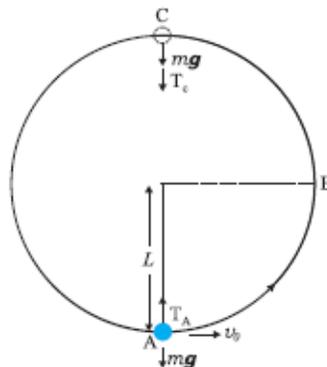
State the laws of limiting friction. The coefficient of static friction between block A and the table is 0.2. what would be the maximum mass of block B so that the two blocks do not move. (The string and the pulley are assumed to be smooth and massless,  $g = 10 \text{ m/s}^2$ )



23. Raju saw her grandmother trying to clean a carpet. She was feeling difficulty in lifting the carpet. Raju helped his grandmother in cleaning the carpet by beating it with a stick.
  - (a) What are the values displayed by Raju?
  - (b) Name the scientific principle involved in Raju's action?
  - (c) Give one such more example.
24. (a) Does the expression  $K.E. = 1/2mv^2$  holds good for a variable force? Prove.  
(b) State and prove Work-energy theorem.  
(c) Plot graphs between K.E & P.E and total energy of an elastic spring and displacement ( $x$ ).

**OR**

A bob of mass  $m$  is suspended by a light string of length  $L$ . It is imparted a horizontal velocity  $v_0$  at the lowest point A such that it completes a semi-circular trajectory in the vertical plane with the string becoming slack only on reaching the topmost point, C. This is shown in Fig. 6.6. Obtain an expression for (i)  $v_0$ ; (ii) the speeds at points B and C; (iii) the ratio of the kinetic energies ( $K_B/K_C$ ) at B and C. Comment on the nature of the trajectory of the bob after it reaches the point C.



25. Derive expression for maximum safe velocity with which a vehicle can travel on banked road. Derive minimum angle of banking to travel without wear and tear?

**OR**

- a) A body of mass  $m_1$  moving with velocity  $u_1$  along a straight line collide with another body of mass  $m_2$ , perfect elastically, which is initially at rest. Find their velocities after collision.
- b) A stone of mass 0.25 kg tied to the end of a string is whirled round in a circle of radius 1.5 m with a speed of 40 rev./min in a horizontal plane. What is the tension in the string? What is the maximum speed with which the stone can be whirled around if the string can withstand a maximum tension of 200 N?
26. a) From the top of a building a ball is dropped while another is projected horizontally at the same time.
- (i) Which ball will strike the ground first?
- (ii) Which will strike the ground with more speed? Justify your answer in each case.
- (b) A body is projected with speed  $u$  at an angle  $\theta$  to the horizontal to have maximum range. What is the velocity at the highest point?
- (c) What is the angle of projection of a projectile motion whose range  $R$  is  $n$  times the maximum height.

**OR**

- a) What is a projectile? Derive the expressions for the time of flight, and maximum height for the projectile thrown upwards at an angle  $\theta$  with the horizontal direction.
- b) The ceiling of a long hall is 25 m high. What is the maximum horizontal distance that a ball thrown with a speed of 40 m/s can go without hitting the ceiling of the hall?

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