

# SESSION ENDING EXAM 2013

## CLASS XI SUB-PHYSICS

TIME 3 HOURS

MAXIMUM MARKS 70

### General Instructions

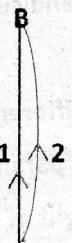
- 1 All Questions are compulsory.
2. There are 29 Questions in the total. Marks for each question are indicated against it.
3. Questions 1 to 8 are very short answer type carry 1 mark each.
4. Questions 9 to 16 are short answer type and carry 2 marks each.
5. Questions 17 to 25 are also short answer type and carry 3 marks each.
- 6 Question 26 is a value based question carries 4 marks.
7. Questions 27 to 29 are long answer type and carry 5 marks each.
8. There is no overall choice but internal choice has been given in 1 question of 2 marks, 1 question of 3 marks and all three questions of 5 marks.

1. The errors in the measurement of mass and volume of an object are 3% and 4% respectively. What is maximum possible error in the measurement of density of material of the object? (1)

2. Carpet is beaten to remove dust from it. Which phenomenon of physics is involved in the act? (1)

3. An object is raised from position A to position B through different paths against gravity.

In which case work done against gravity is maximum? (1)



4. The earth and moon are brought close to each other such that their surfaces

Touch each other. State whether center of mass of earth moon system is

(i) at the contact of two surfaces (ii) inside the earth or (iii) inside the moon. (1)

A

B

5. State Newton's law of cooling. (1)

6. Write SI unit of thermal conductivity. (1)

7. A gas has only three degrees of freedom at all temperature ranges. Identify whether it is monoatomic, diatomic or polyatomic? (1)

8. What is the ratio of rms speeds of hydrogen and oxygen gases at 300 K temperature? (1)

9. Using dimensional method check the correctness of equation

$$v = \frac{1}{2l} \sqrt{\frac{F}{\mu}}$$

Where  $v$  frequency of oscillation of a string of length  $l$  is mass per unit length  $\mu$  and kept under tension  $F$ . (2)

10. A ball is dropped from some height on a rigid surface. After falling on the surface it bounces back with the same speed and reaches to same height.

(a) Draw velocity-time graph for the above situation

(b) Draw acceleration time graph for complete motion. (2)

11. Define impulse. A bullet of mass 0.05 kg is fired from a gun to gain a muzzle speed of 400 m/s. What is impulse imparted by the gun? (2)

12. Calculate the power of a water pump which lifts 120 kg of water to a tank at height of 15 m in 5 minutes. ( $g=10 \text{ m/s}^2$ ) (2)

13. Moment of inertia of a uniform circular ring about an axis passing through its Centre and perpendicular to its plain is  $MR^2$ . Find moment of inertia about a diameter. (2)

14. Differentiate in between communication satellites and meteorological satellites on the basis of given parameters

a) height of orbit from the surface of earth

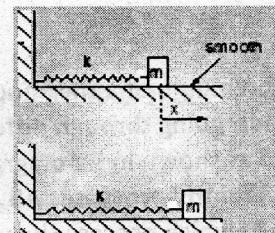
b) period of revolution (2)

15. State zeroth law of thermodynamics.

OR

State second law of thermodynamics as Kelvin -Planck statement (2)

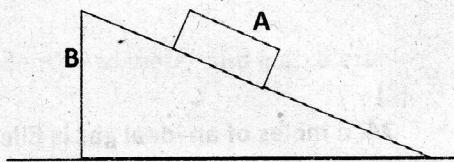
16. Force is applied on the mass  $m$  to pull it so that spring is stretched by  $x$ . Now force is withdrawn and system oscillates simple harmonically. Find frequency of oscillation of oscillating mass. (2)



17. Blocks A and B form a system in equilibrium. Considering all the contact surfaces rough find direction of friction

a) On block A at contact surface with B

b) On block B at contact with ground (3)



18. The position of a particle is given by

$$\vec{r} = (3.0t\hat{i} - 2.0t^2\hat{j} + 4.0\hat{k}) \text{ m}$$

where  $t$  is in seconds and the coefficients have the proper units for  $\vec{r}$  to be in meters

a) Find velocity and acceleration of the particles

b) What is magnitude and direction of velocity at  $t=2.0$  s (3)

19. Two balls of masses  $m_1$  and  $m_2$  are moving with velocities  $u_1$  and  $u_2$  in the same direction along the same line. Balls collide elastically. Show that velocity of separation between the balls after collision is equal to velocity of approach before collision. (3)

20. A solid cylinder of mass 20 kg rotates about its axis with angular speed 100 rad/sec. The radius of cylinder is 0.25 m.

a) What is kinetic energy associated with rotation of cylinder?

b) What is the magnitude of angular momentum about its axis? (3)

21. Explain the variation in acceleration due to gravity with increase in height. (3)

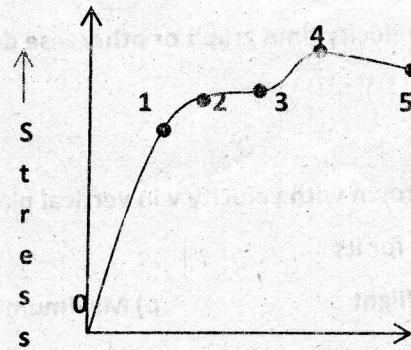
22.

State Hook's law.

Stress Strain curve for a metal wire is shown in figure

a) What names can be given to points 1 and 5 on the curve

b) which part of the curve obeys hook's law (3)

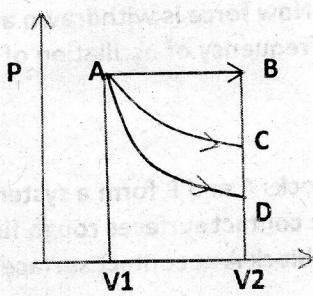


23. Volume of a thermodynamic system increases from  $V_1$  to  $V_2$  undergoing through different thermodynamic processes AB, AC and AD as shown in PV diagram

a) Identify processes AB, AC and AD

b) In which process the work done is maximum

(3)



24.  $n$  moles of an ideal gas is filled in a cubical container of rigid walls of side  $L$ . Show that pressure exerted by the molecules of gas on walls is  $\frac{1}{2} \rho v_{rms}^2$ .

where  $\rho$  is density of gas molecules and  $v_{rms}$  is root mean square speed of gas molecules. (3)

OR

State law of equipartition of energy. Using this show that  $\gamma = \frac{C_p}{C_v}$  for molecules of diatomic gas at low temperature is 1.4 (3)

25. A pendulum bob is connected by an inextensible string of length  $l$  and suspended from a rigid support. Show that time period of small oscillations is  $T = 2\pi \sqrt{\frac{l}{g}}$ . (3)

26. A plague epidemic in 1665 forced Cambridge University to close and Newton had to return to his mother's farm. There in period of two years he did fundamental discoveries in mathematics and physics. Binomial theorem for negative and fractional exponents, the beginning of calculus, inverse square law of gravitation, the spectrum of white light and so on. Returning to Cambridge he persuades his investigations in optics and devised reflecting telescope.

a) What according to you are the values displayed by Sir Isaac Newton in the text.

b) State universal law of gravitation

(2+2)

27. Using velocity time graph or otherwise derive kinematic equations of uniformly accelerated motion. (5)

OR

A ball is thrown with velocity  $v$  in vertical plane in direction making angle  $\theta$  with horizontal. Derive expression for its

a) Time of flight

b) Maximum Height

c) Horizontal Range

(5)