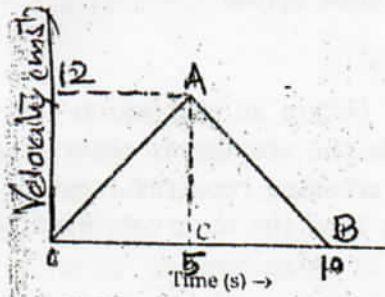


Sub. PHYSICS	Class: XI	Date: 09-03-2015	Time: 3hrs	M.M. 70
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- Q.1 Calculate the work done by the force of tension in the string of simple pendulum. 1
- Q.2 State Stefan' s law. 1
- Q.3 Two sound sources produce 36 beats in 4 sec. By how much do their frequencies differ? Can we hear these beats? 1
- Q.4 A wire stretches by a certain amount under a load. If the load and radius both increased to four times, find the extension in the wire. 1
- Q.5 Draw a graph between the velocity and time of a small sphere dropped from rest in to a viscous liquid. Also show the terminal velocity in the graph. 1
- Q.6 Two masses  $M$  and  $m$  are connected at the two ends of an inextensible string. The string passes over a smooth frictionless pulley. Calculate acceleration of the masses and tension in the string. Given  $M > m$ . 2
- Q.7 A body of mass 1 Kg initially at rest explodes and breaks into three fragments of masses in the ratio 1:1:3. The two pieces of equal mass fly off perpendicular to each other with a speed of 30 m/s each. What is the velocity of heavier fragment? 2
- Q.8 Define degree of freedom. Calculate the degree of freedom of monoatomic and diatomic gas molecules. 2
- Q.9 Write Newton' s formula for the speed of sound wave in air. What was wrong with this formula? What correction suggested by the Laplace in this formula. 2
- Q.10 Derive an expression for excess pressure inside a soap bubble. 2
- Q.11 The speed - time of a particle moving along a fixed direction is shown in following diagram. 3



Obtain the distance travelled by the particle between

- (i)  $t = 0$  to  $t = 10$  sec
- (ii)  $t = 2$  to  $t = 6$  sec
- (iii) average speed of the particle in time intervals in (i) and(ii)

- Q.12
- (i) A body tied to one end of a string is made to revolve in vertical circle. Derive an expression for the velocity of the body and tension in the string at any point. Hence find tension at the bottom and the top of the circle
  - (ii) A ball of mass 0.1Kg is suspended by a string 30 cm long. Keeping the string taut, the ball describes a horizontal circle of radius 15 Cm. Calculate the angular speed.

- Q.13 A bullet of mass 0.01 Kg and moving with a speed of 500m/s strikes a block of mass 2 Kg which is suspended by a string of length 5 m. The centre of gravity of the block rises a vertical distance of 0.1 m. What is the speed of the bullet after it emerges from the block? Take  $g = 9.8 \text{ m/s}^2$  3
- Q.14 State Kepler's laws of planetary motion. Deduce Newton's law of gravitation from Kepler's law of periods. 3
- Q.15 Find the expression for the total energy of a satellite revolving around the surface of the earth. What is the significance of negative sign in the expression? Calculate the energy required to move an earth satellite of mass 103 Kg from a circular orbit of radius  $2R$  to that of radius  $3R$ . Given mass of earth,  $M = 6 \times 10^{24} \text{ Kg}$  and radius of earth  $R = 6 \times 10^6 \text{ m}$  3
- Q.16 Write any four assumptions of kinetic theory of gasses . 3  
 Prove that the pressure exerted by a gas is  $P = \frac{1}{3} \rho v_{rms}^2$ , Where  $\rho$  is the density and  $v_{rms}$  is the root mean square velocity.
- Q.17 State first law of thermodynamics. On its basis derive the relation between two molar specific heats for a gas. 3  
 OR  
 What is an isothermal process? Derive an expression for the work done during an isothermal process
- Q.18 What is capillarity? Drive an expression for the height to which the liquid rises in a capillary tube of radius  $r$  3  
 Explain what happen when the length of capillary tube is less than the height up to which liquid can rises in it.
- Q.19 A cylindrical piece of cork of base area  $A$  and height  $h$  floats in a liquid of density  $d_2$ . The cork is depressed slightly and then released. Show that the cork oscillates up and down simple harmonically. If density of cork is  $d_1$ , find time period of oscillation. 3  
 OR  
 One end of a U Tube containing mercury is connected to suction pump and the other end is connected to atmosphere. A small pressure differences is maintained between the two columns. Show that when the suction pump is removed, the liquid in the U tube execute SHM. Also find time period of liquid column.
- Q.20 Explain Doppler effect in sound. Obtain an expression for the apparent frequency of sound when the source is moving towards the stationary observer with a uniform velocity. 3  
 An observer standing on railway crossing receives frequencies of 2.2kHz and 1.8kHz when the train approaches and recedes from the observer. Find the velocity of the train. The speed of sound in air is 300m/s
- Q.21 Prove that the different frequencies produced in a closed organ pipe are in the ratio 1:3:5:7:..... 3  
 An open pipe is suddenly closed at one end with the result that the frequency of the third harmonic of closed pipe is found to be higher by 100Hz than the fundamental frequency of the open pipe. What is the fundamental frequency of the open pipe?



Q.22 A man stands on a rotating platform, with his arms stretched horizontally holding a 5 Kg weight in each hand. The angular speed of the platform is 30 revolution per minute. The man then brings his arms close to his body with the distance of each weight from 90 cm to 20 cm. The moment of inertia of the man together with the platform may be taken to be constant and equal to  $7.6 \text{ kgm}^2$ .

(a) What is new angular speed? (Neglect friction)

(b) Is kinetic energy conserved in the process? If not, from where does the change come about?

Q.23 (i) Ratan noticed that his grandfather to be suffering from fever. He took him to the doctor the doctor gave him some pills. When the pills were used he sweated much, after some time became normal. Ratan enquired the Doctor about how his grandfather became normal.

According to you what values are possessed by Ratan?

(ii) A child running a temperature of  $101^\circ \text{ F}$  is given an Antipyria which causes an increase in the rate of evaporation of the body. If the fever is brought down to  $98^\circ \text{ F}$  in 20 mts, what is the amount of heat lost by the body?. The mass of the child is 30 kg.

Given  $1^\circ \text{ F} = \frac{5}{9} ^\circ \text{ C}$

Q.24 State and prove Bernoulli's theorem.

If a ball thrown and given a spin, then the path of the ball is curved more than a usual. Why?

Water is flowing with a speed of  $2 \text{ m/s}$  in a horizontal pipe with cross-sectional area decreasing from  $2 \times 10^{-2} \text{ m}^2$  to  $0.01 \text{ m}^2$  at pressure  $4 \times 10^4 \text{ pa}$ . What will be the pressure at small cross-section?

Q.25 (1) Derive an expression for kinetic and potential energies of a harmonic oscillator.

Hence show that the total energy remain conserved in SHM.

Draw graphs for (a) energy vs. time and (b) energy vs. displacement

(2) For a particle in SHM, the displacement  $x$  of the particle as a function of time  $t$  is given by

$$x = A \sin(2\pi t)$$

Let the time taken by the particle to travel from  $x = 0$  to  $x = A/2$  be  $t_1$  and the time taken to travel from  $x = A/2$  to  $x = A$  be  $t_2$ . Find  $t_1/t_2$

Q.26 (i) Define cross product of two vectors.

(ii) Show that the magnitude of the vector product of two vectors

Is equal to twice the area of the triangle formed by the two Vectors as its adjacent sides.

(iii) Determine a unit vector perpendicular to both  $A = 2i + j + k$

And  $B = i - j + 2k$ . Also find the angle between these two vectors.