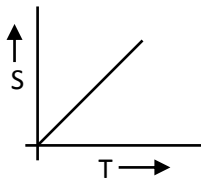


## CBSE TEST – 3

1. What is the effect of temperature on the surface tension of a liquid?
2. Why is not necessary for a body to be in motion to be accelerated?
3. Displacement-time (S-T) graph of any object is shown in figure. Draw velocity-time graph for this motion.



4. A screw gauge has a pitch of 1.0 mm and 200 division on the circular scale. Is it possible to increase the accuracy of the screw gauge by increasing the number of divisions on the circular scale?
5. State the factors on which the speed of a wave travelling along a stretched ideal string depends.
6. Using component of force, show that it is easier to pull than to push it.
7. A car is moving on road with speed  $54\text{ kmh}^{-1}$ . What should be the value of torque if the car is brought to rest in 15 seconds? Radius and moment of inertia of wheel about the axis of rotation are 0.35 m and  $3\text{ kgm}^2$  respectively.
8. Two masses  $M$  and  $m$  are connected at the two ends of an inextensible, light string. The string passes over a smooth frictionless pulley. Calculate the acceleration of the masses and the tension in the string.  $M$  is heavier than  $m$ .
9. Derive an expression for the excess pressure inside a liquid drop.
10. Two sitars A and B, playing the note 'Dha' are slightly out of tune and produce beats of frequency 5 Hz. Then tension of the string B is slightly increased and the beat frequency is found to decrease to 3 Hz. What is the original frequency of B if the frequency of A is 427 Hz.

OR

11. A steel rod 100m long clamped at its middle. The fundamental frequency of longitudinal vibration of the rod are given to be 2.53 KHz. What is the speed of sound in steel?
12. An elastic spring of force constant  $K$  is compressed by an amount  $x$ . Show that its potential energy is  $\frac{1}{2} Kx^2$ .
13. Show that terminal velocity  $V$  of a spherical object of radius  $r$ , density  $\rho$  falling vertically through a viscous fluid of density  $\sigma$  and coefficient of viscosity  $\eta$  is given by
 
$$V = \frac{2}{9} \frac{(\rho - \sigma)r^2g}{\eta}$$
14. Show that the average K.E of a gas molecule is directly proportional to the temperature of the gas. Hence give the Kinetic interpretation of temperature.
15. A body of mass  $m$  is placed on the floor of a lift. Find its apparent weight when the lift is :
  - a) Moving upward with uniform acceleration.
  - b) Moving downward with uniform acceleration.
  - c) Moving upward with constant speed.
16. Derive an expression for the height to which the liquid rises in a capillary tube of radius  $r$ .
17. Derive the expression for kinetic and potential energies for a particle on SHM. Draw the graph of variation of PE and KE with distance from mean position.
18. Show analytically that work done by one mole of an idea gas during isothermal expansion from volume  $V_1$  to volume  $V_2$  is given by

$$W = RT \log_e \left( \frac{V_2}{V_1} \right)$$

19. State and prove the theorem for parallel axis for a rigid body.
20. Calculate the energy required to move an earth's satellite of mass  $10^3\text{kg}$  from a circular orbit of radius  $2R$  to that of radius  $3R$ . Given mass of earth  $M = 5.98 \times 10^{24}\text{kg}$ , radius of earth  $R = 6.37 \times 10^6$
21. Find the component of  $\vec{a} = 2\hat{i} + 3\hat{j}$  along the directions of vectors  $\hat{i} + \hat{j}$  and  $\hat{i} - \hat{j}$ .
22. a) What can be the maximum and minimum values of  $(\vec{A} + \vec{B})$  and  $(\vec{A} - \vec{B})$ ?  
b) If two vectors of equal magnitude added to each other gives magnitude of one of them. What is the angle between them?

OR

Derive an expression for the centripetal acceleration of a particle moving with uniform speed  $V$  along a circular path of radius  $r$ .

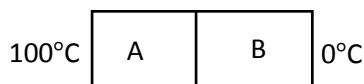
23. Explain the method of finding the time period of simple pendulum using dimensional analysis.
24. Ravi came to stay in a multistoried building. He noticed that motor supplying water to the second floor is power rating  $X\text{kW}$  while of that supplying water to 8<sup>th</sup> floor is  $Y\text{kW}$ . He asked his father the reason behind the difference of the power ratings. His father explained him the reason.  
a) What values does Ravi possess?  
b) Which power rating is more  $X$  and  $Y$ ?  
c) A motor pumps up  $1000\text{kg}$  of water through a height of  $10\text{m}$  in  $5\text{s}$ . If the efficiency of the motor is  $60\%$ , calculate the power of the motor in kilowatt.
25. Define Doppler effect in sound. Obtain an expression for apparent frequency of sound when source and listeners are (a) approaching each other, (b) moving away from each other.
26. A body is projected at an angle  $\theta$  upward with the horizontal:  
(a) Obtain the condition for maximum horizontal range.  
(b) Prove that horizontal range of projectile is same when fired at an angle  $\theta$  and  $(90-\theta)$  with the horizontal.  
(c) Obtain an expression for velocity of projectile at an instant  $t$ .

OR

Derive the following equations of motion for uniformly accelerated motion from velocity-time graph (symbol have their usual meaning):

- (a)  $v = u + at$   
(b)  $s = ut + \frac{1}{2} at^2$   
(c)  $v^2 - u^2 = 2as$

27. (a) Derive expression for rate of flow of fluid as measured by venturimeter.  
(b) Two metal cubes A and B of same size are arranged as shown in figure. The extreme ends of the combination are maintained at the indicated temperatures. The arrangement is thermally insulated. The coefficient of thermal conductive of A and B are  $300\text{W/m C}$  respectively. After steady state is reached, what will be the temperature  $T$  of the interface?



28. State the law of equipartition of energy of a dynamic system and use it to find the values of internal energy of a dynamic system and use it to find the values of internal energy and the ratio of the specific heats of (a) monoatomic, (b) diatomic, (c) triatomic gas molecules.