**SESSION ENDING EXAMINATION – (2013-2014)**

**Physics (Set 1)**

**CBSE CLASS – XI**

**Time: 3 Hrs. M.M: 70**

**General Instructions:**

**(i)** Question 1 to 5 one mark.

**(ii)** Question 6 to 10 each two mark.

**(iii)** Question 11 to 22 each three mark.

**(iv)** Question 23 is value based question and carry four marks.

**(v)** Questions 24 to 26 each five mark.

**1.** Write the dimension and SI unit of linear momentum.

**2.** What does the slope of velocity-time graph represent.

**3.** Give the magnitude and direction of net force acting on

**(a)** A drop of rain falling down with constant speed

**(b)** A cork of mass 10g floating on water.

**4.** Name the physical quantity which is expressed as 'the dot product of force and velocity'. Is it scalar or a vector quantity?

**5.** Is it necessary that the centre of mass of a body should always lie inside the body? Justify your answer.

**6.** In which of the following examples of motion can the body be considered approximately a point object:

**(a)** A railway carriage moving without jerks between two stations.

**(b)** A monkey sitting on the top of a man cycling smoothly on a circular track.

**(c)** A spinning cricket ball that turns sharply on hitting the ground, and

**(d)** Tumbling beaker that has slipped off the edge of a table?

**7. (a)** Define relative error.

**(b)** The error in the measurement of radius of sphere is 2%. What would be the error in the volume of the sphere?

**8.** State the law of conservation of linear momentum. Derive it from the Newton's second law of motion.

OR

Define coefficient of limiting friction. A body slides down an incline plane having friction. Indicate the directions of frictional force and the reaction of the plane on the body.

**9.** A body of mass m is raised to a height h from the surface of the earth where the acceleration due to gravity on the surface of the earth where the acceleration due to gravity on the surface of the earth. Prove that the loss in weight due to variation of g is approximately 2mgh/R. Where R is the radius of earth and H<<R.

**10.** The escape velocity on earth is 11.2 km/s. What will be its value on a planet having double the radius and eight times the mass of earth?

**11**. Explain why:
**(a)** It is easier to pull a lawn mower than to push it.
**(b)** A cricketer moves his hands backwards while holding a catch.
**(c)** The outer rail of a curved railway track is generally raised over the inner.

**12.** The displacement (in metre) of a particle moving along x-axis is given by x= 18t + $5t^2$. Calculate:
**(a)** The instantaneous velocity at t = 2s.
**(b)** Average velocity between t = 2s and t = 3s.
**(c)** Instantaneous acceleration

**13.** Rain is falling vertically with a speed of 30 $ms^{-1}$. A woman rides a bicycle with a speed of 10 $ms^{-1}$ in north to south direction. What is the relative velocity of rain with respect to the woman? What is the direction in which she should hold her umberalla to protect herself?

**14.** The velocity 'v' of water waves depends on the wavelength '$\lambda$', density of water 'p' and the acceleration due to gravity 'g'. Deduce by method of dimensions the relationship between these quantities.

**15.** A man weighs 70 kg. He stands on a weighing machine in a lift, which is moving

**(a)** Upwards with a uniform speed of 10m/s.

**(b)** Downwards with a uniform acceleration of 5 $m/s^2$.

**(c)** Upwards with a uniform acceleration of 5 $m/s^2$.

What would be readings on the scale in each case?

**16.** Define angle of repose. Deduce its relation with coefficient of friction.

**17.** State and prove work-energy theorem.

**18.** Springs A and B are identical except that A is stiffer than B, i.e. constant $k_A > k_B$. In which spring is more work expended if they are stretched by the same amount.

**19. (i)** A child stands at the centre of a turn table with his two arms out stretched. The turn table is set rotating with an angular speed of 40 rpm. How much is the angular speed of the child change if he folds his hands back and thereby reduces his moment of inertia to $\frac{2}{3}$ times the initial value? Assume that the turntable rotates without friction.

**(ii)** Show that the child's new kinetic energy of rotation is more than the initial kinectic energy of rotation.

OR

State the law of conservation of angular momentum. Find the torque of a force $7\hat{i}-3\hat{j}-5\hat{k}$ about the origin which acts on a particle whose position vector is $\hat{i}+\hat{j}-\hat{k}$.

**20.** What is torque? Give its unit, show that it is equal to the product of force and the perpendicular distance of its line of action from the axis of rotation.

**21.** Discuss the variation of acceleration due to gravity with depth.

**22.** Define the term 'gravitational potential'. Derive an expression for the gravitation potential at a point in the gravitational field of the earth.

**23.** Raju saw his 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 value displayed by Raju?

**(b)** Name the scientific principle involved in Raju's action.

**(c)** Give one such more example.

**24.** What is a projectile? Derive the expression for the trajectory, time of flight and horizontal range for the projectile range for the projectile thrown upwards, making an angle $\theta$ with the horizontal direction.

OR

State he parallelogram law of vector addition and find the magnitude and direction of the resultant of two vectors $\vec{p}$ and $\vec{Q}$ inclined at an angle $\theta$ with each other. What happens, when $\theta = 0^0$ and $\theta = 90^0$.

**25.** State the law of conservation of energy. Show that the total mechanical energy of a freeling falling body under gravity is conserved. Show it graphically also.

OR

Define elastic collision. Show that in the case of one dimensional elastic collision of two bodies, the relative velocity of separation after the collision is equal to the relative velocity of approach before the collision.

**26. (a)** Define centre of mass.

**(b)** From a uniform disc. Of radius R, a circular hole of radius R/2 is cut out. The centre of the original disc. Locate the centre of mass of the resulting flat body.

OR

**(a)** State the theorem of parallel axes.

**(b)** Determine the moment of inertia of circular disc.

**(c)** About its diameter.

**(d)** About a tangent in its plane. Given the moment of inertia of circular disc about an axis passing its centre and perpendicular to its plane is $\frac{1}{2}MR^2$.