APEEJAY SCHOOL, SAKET
FIRST TERM EXAMINATION (2018-19)
CLASS-XI
PHYSICS

Time: 3 Hours **Max. Marks: 70**

GENERAL INSTRUCTIONS

1. All questions are compulsory.
2. The question paper consists of 27 questions.
3. The question paper has ***four*** sections: Section ***A*** comprises ***5*** Questions (1 marks each), Section ***B*** comprises *7* Questions (2 marks each), Section ***C*** comprises ***12*** Questions (3 marks each) and Section ***D*** comprises ***3*** Questions (5 marks each).
4. Questions from Section A are to be answered in one word or one sentence as per requirement.
5. Calculator is not permitted. You may ask for logarithm table if required.

SECTION – A

1. Find the dimensional formula of coefficient of viscosity (η). **(1)**

2. Give an example of uniformly accelerated linear motion. **(1)**

3. What is the value of m in $\boldsymbol{i} + m\boldsymbol{j} + \boldsymbol{k}$ to be unit vector? **(1)**

4. What is the loss in kinetic energy after collision if the target of a body is initially at rest? **(1)**

5. Does the moment of inertia of a rigid body change with the speed of rotation? **(1)**

SECTION – B

6. Write the dimensions of (a) Moment of Inertia (b) Stress and Strain. **(2)**

OR

Using the relation , obtain the dimensions of Planck's constant .

7. Find the angle of projection at which horizontal range and maximum height are equal in case of a projectile. **(2)**

8. A woman throws an object of mass 500 g with a speed of 25 m/s.

i. What is the impulse imparted to the object?
ii. If the object hits a wall and rebounds with half the original speed, what is the change in momentum of the object? **(2)**

9. A spring balance reads forces in Newtons. The scale is 20 cm long and read from 0 to 60 N. Find the potential energy of spring when the scale reads 20 N. **(2)**

10. If the earth contracts to half of its radius. What would be the length of the day? **(2)**

11. In HCl molecule separation of nuclei of the two atoms is about 1.27 Å. Find the centre of mass of molecule given that chlorine atom is about 35.5 times massive than a hydrogen atom. **(2)**

12. Determine the speed with which the earth would have to rotate on its axis so that a person on the equator would weigh $3/5^{th}$ as much as his weight at present. Take the equatorial radius as 6400 km. **(2)**

SECTION – C

13. State which of the situations are possible and give an example for each of these.

i. An object with constant acceleration but with zero velocity.

ii. An object moving in a certain direction with an acceleration in the perpendicular direction. **(3)**

OR

State which of the situations are possible and give an example for each of these?

i. An object with constant acceleration but zero velocity.

ii. An object moving in a certain direction with acceleration in the perpendicular direction.

14. Obtain equations of motion for constant acceleration using method of calculus. **(3)**

15. What do you understand by non-uniform motion? Explain the average velocity and instantaneous velocity of an object in one dimensional motion. **(3)**

16. The position of the particle is given by

where t in seconds and the coefficient have proper units for to be in meters

i. Find velocity and acceleration of the particle.

ii. What is the magnitude and direction of velocity of the particle at t = 2 s? **(3)**

17 A helicopter of mass 1000 kg. rises with a vertical acceleration of 15 m/s^2. The crew and passengers weigh 300 kg. Give the magnitude and direction of the

i. force on the floor by the crew and the passenger.

ii. action of the rotor of the helicopter on the surrounding air.

iii. force on the helicopter due to surrounding air.(Take g= 10 m/s^2) **(3)**

18. State the laws of Kinetic friction. Define coefficient of kinetic friction. Differentiate between the rolling and sliding friction. **(3)**

19.A pump on the ground floor of a building can pump up water to fill a tank of volume 30 m^3 in 15 min. If the tank is 40 m. above the ground, and the efficiency of the pump is 30 % , how much electric power is consumed by the pump? **(3)**

20. When a 300 g mass is hung from a vertical spring, it stretches from equilibrium by 10 cm. What work is required to stretch it by next 5 cm? **(3)**

21. A hoop of radius 2 m weighs 100 kg. It rolls along a horizontal floor so that its centre of mass has a speed of 20 cm/s. How much work has to be done to stop it? **(3)**

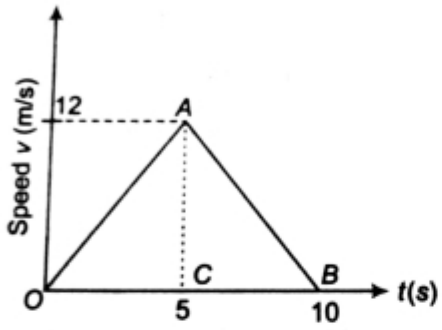
22. A car weighs 1800 kg. The distance between its front and back axles is 1.8 m. Its centre of gravity is 1.05 m behind the front axle. Determine the force exerted by the level ground on each front wheel and each back wheel. **(3)**

23. Derive the expression of work done against gravity. **(3)**

24. Assuming the earth to be a sphere of uniform mass and density how much a body would weigh half way down the centre of earth, if it is weighted 250 N on the surface of earth. **(3)**

SECTION – D

25. The speed-time graph of a particle moving along a fixed direction is shown in the figure below. Obtain the distance travelled by the particle between (i) t = 0 s to 10 s (ii) t =2 s to 6 s. What is the average speed of the particle over the intervals in (i) and (ii)? **(5)**



OR

Show that for motion of a car in a banked road the angle of banking θ for minimum wear and tear of tyres is given by where v is the velocity, r is the radius and g is acceleration due to gravity.

26. Show that the path of projectile is parabolic in nature using right expression. Derive an expression of horizontal range of projectile. **(5)**

OR

A particle of mass m moving with an initial velocity u collides inelastically with a particle of mass M initially at rest. If the collision is completely inelastic, find the expressions for

i. final velocity of the combined entity and
ii. loss in kinetic energy during collision.

27. Choose the correct alternatives :(Substantiate your answers with suitable explanation)

i. Acceleration due to gravity increase / decreases with increasing altitude. **(5)**
ii. Acceleration due to gravity increase / decreases with increasing depth(assuming earth to be uniform sphere)
iii. Acceleration due to gravity is independent of mass of the earth / mass of the body.
iv. The formula is more / less accurate than the formula)for the difference of potential energy between two points and distance away from centre of earth.

OR

Find the centre of mass for a solid cone of the base radius r and height h.