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N – 4003

Reg. No. : .....

Name : .....

First Semester B.Sc. Degree Examination, June 2022

First Degree Programme under CBCSS

Physics

Complementary Course for Chemistry and Polymer Chemistry

PY 1131.2 — ROTATIONAL DYNAMICS AND PROPERTIES OF MATTER

(2013–2017 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions in **one** or **two** sentences. **Each** question carries **1** mark.

1. State the parallel axis theorem.
2. What is flywheel?
3. Define a rigid body.
4. What is a compound pendulum?
5. What are the characteristics of SHM?
6. Define progressive wave.
7. When do you say that a body is plastic?
8. Steel is more elastic than rubber. Why?
9. Define surface energy.
10. What are the factors affecting surface tension?

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Answer any **eight** questions, not exceeding a paragraph. **Each** question carries **2** marks.

11. Explain the law of conservation of angular momentum.

12. Find the moment of inertia of a thin ring about an axis passing through its diameter.

13. Write the expression for velocity of a particle executing SHM.

14. Does mass affect oscillation spring? Explain.

15. Write down the differential equation for a simple harmonic oscillator. Explain the different terms.

16. Every SHM is periodic motion but every periodic motion need not be SHM. Why?

17. Distinguish between transverse wave motion and longitudinal wave motion.

18. Write the practical applications of viscosity.

19. Define the terms elastic limit and yield point.

20. Explain the term Poisson's ratio and discuss the limiting values.

21. Why hot water is preferred to cold water for washing clothes?

22. Explain Stokes law.

(8 x 2 = 16 Marks)

SECTION – C

Answer any **six** questions. **Each** question carries **4** marks.

23. Starting from rest, the flywheel of a motor attains an angular velocity 100 rad/s from rest in 10 s. Calculate

    (a) angular acceleration and

    (b) angular displacement in 10 seconds.

24 A thin metal ring of diameter 0.6m and mass 1 kg starts from rest and rolls down on an inclined plane. Its linear velocity on reaching the foot of the plane is 5 ms^{-1} calculate

(a) the moment of inertia of the ring and

(b) the kinetic energy of rotation at that instant.

25. A body is thrown vertically up from the ground with a velocity of 39.2 ms^{-1}. At what height will its kinetic energy be reduced to one – fourth of its original kinetic energy.

26. The equation of a particle executing SHM is $y = 5(\sin \pi t + \pi/3)$ Calculate

(a) amplitude

(b) period

(c) maximum velocity and

(d) velocity after 1 second (is in metre).

27. A block of mass 15 kg executes SHM under the restoring force of a spring. The amplitude and the time period of the motion are 0.1 m and 3.14 s respectively. Find the maximum force exerted by the spring on the block.

28. The acceleration due to gravity on the surface of moon is 1.7 ms^{-2}. What is the time period of a simple pendulum on the surface of the moon, if its period on the Earth is 3.5s?

29. A sphere contracts in volume by 0.01% when taken to the bottom of seal 1 km deep. If the density of sea water is 10^3 kg m^{-3}, find the bulk modulus of the material of the sphere.

30. A 50 kg mass is suspended from one end of a wire of length 4 m and diameter 3 mm whose other end is fixed. What will be the elongation of the wire? Take Young's modulus (q) = 7×10^{10} N m^{-2} for the material of the wire.

31. A square plate of 0.1 m side moves parallel to another plate with a velocity of 0.1 ms^{-1}, both plates being immersed in water. if the viscous force is 2×10^{-3} N and viscosity of water is 10^{-3} Nsm^{-2}, find their distance of separation.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. **Each** question carries **15** marks.

32. Define moment of inertia of a rotating body. What is its physical significance? Calculate the moment of inertia of a solid sphere about

    (a) its diameter

    (b) a tangent.

33. Derive expressions for velocity, acceleration and total energy of a particle executing SHM.

34. Derive the relations between elastic moduli (Y, K, η) and Poisson's ratio (σ).

35. Describe Jaeger's method for measuring the surface tension of liquid.

(2 × 15 = 30 Marks)
