(Pages : 3) **7098**

Reg. No. : .....

Name : .....

First Semester B.Sc. Degree Examination, December 2014
First Degree Programme under CBCSS
PHYSICS
Core Course
PY 1141 : Basic Mechanics and Properties of Matter
(For 2013 Admission)

ime : 3 Hours Max. Marks : 80

SECTION – A

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

. Write the expression for rotational kinetic energy and explain the terms.

. Identify the quantity analogous to mass in rotational motion.

. Write the total energy of a simple harmonic oscillator and explain the terms.

What is Poisson's ratio ?

What is the difference between cohesion and adhesion ?

Write the principle of a venturimeter.

Write the differential equation of a simple harmonic oscillator.

What is meant by damping ?

Can we say that photosynthesis is a process where the conservation of energy is violated ? Explain.

Write an expression for angular momentum. **(10×1= 10 Marks)**

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SECTION – B

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

11. Can a compound pendulum have infinite period ?
12. Why the camphor particles move, when they are placed in the surface of water ?
13. How dust particles in air affect the formation of rain drops ?
14. Write one example each for a transverse and longitudinal wave and note down the basic difference between them.
15. State and explain work energy theorem.
16. Show that for a conservative force the work done around a closed path is always zero.
17. What is meant by the term critical velocity ? How it varies with radius of the tube ?
18. When a liquid rises against gravity in a capillary tube, its potential energy increases. Where does the energy come from ?
19. Explain surface tension.
20. What is meant by rigidity modulus ? Explain.
21. Write parallel axes theorem and perpendicular axes theorem.
22. Does simple harmonic motion obey the principle of superposition ? Explain.

(8×2= 16 Ma

SECTION – C

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

23. A circular disc of mass 50 grams and radius 5 cm is making 120 rpm about an axis passing through its centre and perpendicular to its plane. Calculate its kinetic energy.
24. Show that the curl of a conservative force vanishes.

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25. A body having a mass of 4 gm, executes S.H.M. The force acting on the body when displacement is 8 cm, is 24 gm. Wt $[24 \times 10^{-3} \times 9.8]$. Find the period. If the maximum velocity is 500 cm/sec. , find the amplitude and maximum acceleration.

26. A sphere of mass 0.8 kg and radius 10 cm is suspended from a wire of length 50 cm and radius 4×10^{-4} m. If the period of torsional oscillations of this system is 2s, calculate the modulus of rigidity of the wire.

27. Calculate the work done in spraying a spherical drop of mercury of radius 10^{-3}m into 100 drops of equal size. [surface tension of mercury $= 550 \times 10^{-3}\ Nm^{-1}$.]

28. Calculate the speed at which the velocity head of a stream of water is equal to 0.50 m of Hg.

29. Find the limiting velocity of a rain drop, assume diameter = 10^{-3} m. Density of air relative to water 1.3×10^{-3} kg/m^3 coefficient of viscosity of air = 1.81×10^{-5} S.I units. Density of water 10^3 kg/m^3.

30. The Young's Modulus of a metal is 2×10^{11} N/m^2 and its breaking stress is 1.078×10^9 N/m^2. Calculate the maximum amount of energy per unit volume which can be stored in the metal when stretched.

31. The potential energy possessed by a particle moving under the influence of a conservative force is given by $U(x) = x^3 - 9x^2 + 24x$. Find the force on the particle.

(6×4= 24 Marks)

SECTION – D

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

32. Derive Poiseuille's equation for the flow of a liquid through a horizontal capillary tube.

33. Explain the Jaeger's method for the determination of the surface tension of a liquid. Point its drawbacks.

34. Derive an expression for couple required to twist a rod through 1 radian, and then find the work done in twisting the rod.

35. Find the moment of inertia of, a) solid sphere about a diameter b) thin uniform rod about an axis perpendicular to length.

(2×15= 30 Marks)

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