SRS PU COLLEGE, CHITRADURGA
I PUC PREPARATORY EXAMINATION: JAN- 2025
PHYSICS (33)

Time: 3 Hours　　　　　　　　　　**DATE:18-01-2025**　　　　　　　　　　**Max. Marks: 70**

General Instructions:

(i) *All parts are compulsory.*

(ii) *Part – A questions have to be answered in the first two pages of the answer – booklet. For Part – A questions, first written – answer will be considered for awarding marks.*

(iii) *Answers without relevant diagram/figure/circuit wherever necessary will not carry any marks.*

(iv) *Direct answers to Numerical problems without detailed solutions will not carry any marks.*

PART – A

I. Pick the correct option among the four given options for ALL of the following questions : 15 x 1 = 15

1. The number of significant figures in 1.03×10^2

   a) 2　　　　　　　b) 3　　　　　　　c) 4　　　　　　　d) 1

2. The ratio of speed to velocity of an object is

   a) equal to 1　　　　　　　　　　b) less than 1

   c) less than or equal to 1　　　　　　d) greater than or equal to 1

3. A vector $\vec{A}$ makes an angle of θ with x-axis, its component along y-axis is.

   a) A cos θ　　　　b) A sin 2θ　　　　c) A sin θ　　　　d) A tan θ

4. The time rate of change of momentum is called

   a) Force　　　　　b) impulse　　　　c) Acceleration　　　d) Torque

5. If μ_s, μ_k and μ_r represent the co-efficient of static, kinetic and rolling friction respectively, then

   c) $\mu_s = \mu_k = \mu_r$　　　　b) $\mu_s > \mu_k > \mu_r$　　　　c) $\mu_s < \mu_k < \mu_r$　　　　d) $\mu_s > \mu_k = \mu_r$

6. 1KWh=…………..J

   a) 3.6×10^{-6}　　　　b) 3.6×10^6　　　　c) 3×10^6　　　　d) 3×10^{-6}

7. The physical quantities related to rotational motion are listed in column I and the SI units are listed in column II. Identify the correct match.

COLUMN-I	COLUMN-II
1. Angular velocity	Nm
2. Angular acceleration	Rad S^{-1}
3. Torque	Rad S^{-2}

   a) i–b　(b) ii-a　(c) iii- c　　　　　　b) i–c　ii-b　iii-c

   c) i–b　(b) ii-c　(c) iii-a　　　　　　d) i–c　ii-b　iii-a

8. The gravitational potential energy associated with two particles of masses m_1 and m_2 separated by distance r is given by

   a) $U = \frac{-Gm_1m_2}{r^2}$　　　　　　　　b) $U = \frac{-Gm_1m_2}{r}$

   c) $U = \frac{Gm_1m_2}{r^2}$　　　　　　　　d) $U = \frac{Gm_1m_2}{r}$

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9. The following is the most elastic material

   a) rubber   b) steel   c) wood   d) copper

10. The principle used in hydraulic lift is.

   a) Pascal's law   b) Hooke's law   c) Bernoulli's law   d) Boyle's law

11. On the Fahrenheit scale of temperature, the normal boiling point of water is.

   a) 100^0 F   b) 212^0 F   c) 32^0F   d) 180^0F

12. First law of thermodynamics signifies.

   a) the law of conservation of mass.

   b) the law of conservation of energy.

   c) the law of conservation of charge.

   d) the law of conservation of momentum.

13. The value of Avogadro number is.

   a) $N_A = 6.023 \times 10^{-23}$ b) $N_A = 6.023 \times 10^{23}$ c) $N_A = 6.023 \times 10^{-26}$ d) $N_A = 6.023 \times 10^{26}$

14. In simple harmonic motion, acceleration of the particle is maximum at.

   a) Extrem position   b) all position   c) Mean position   d) half displacement

15. Identify the mechanical wave in the following.

   a) x-ray   b) visible light   c) sound waves   d) Radio waves

II. Fill in the blanks by choosing appropriate answer given in the brackets for ALL the following questions: 5 x 1 = 5

(Velocity, impulsive force, couple, calorimeter, pressure, mean free path)

16. Large force acting on a body for short interval of time is called _____

17. A pair of forces of equal magnitude but acting in opposite direction with different lines of action is

   Known as _____

18. _____ is device used to measure the quantity of heat.

19. A Thermodynamic process in_____ is constant is called isobaric process.

20. The average distance travelled by molecule between two successive collisions is called_____

PART – B

III. Answer any FIVE of the following questions:-   **5 x 2 = 10**

21. Mention two uses of dimensional analysis.

22. The displacement (in metre) of a particle moving along x-axis is given by $x = 18t + 5t^2$. Calculate instantaneous

   velocity at t=2s.

23. Distinguish between scalars and vectors of a physical quantity.

24. Write any two advantages of friction.

25. What is elastic collision? Give example.

26. State any two postulates of kinetic theory of ideal gases.

27. Define simple harmonic motion. Give example.

28. What are longitudinal and transverse waves?

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PART – C

IV. Answer any FIVE of the following questions   **5 x 3 = 15**

29. Derive an expression for centripetal acceleration for a particle executing uniform circular motion.

30. State Newton's second law of motion and hence derive F=ma.

31. A force $\vec{F} = 5\hat{\imath} + 6\hat{\jmath} - 4\hat{k}$ acting on a body produces a displacement $\vec{S} = 6\hat{\imath} + 5\hat{k}$. Calculate the work done by the force.

32. Derive the relation between torque and angular momentum of a particle.

33. State and explain Newton's law of gravitation.

34. Draw stress-strain curve. Show yield point and fracture point.

35. State Bernoulli's principle. Write the Bernoulli's equation for the flow of an ideal fluid in streamline motion and explain the terms.

36. Write any three properties of thermal radiation.

PART – D

V. Answer any THREE of the following questions   **3 x 5 = 15**

37. What is v-t graph? Show that $V^2 = U^2 + 2ax$ using v-t graph.

38. Show that the total mechanical energy of a freely falling body under gravity is conserved.

39. (i) State Kepler's law of orbit of planetary motion.   (1)

   (ii) State and explain Kepler's law of area of planetary motion.   (2)

   (iii) State and explain Kepler's law of periods of planetary motion.   (2)

40. (a) State and explain first law of thermodynamics.   (2)

   (b) Derive the expression for work done in an isothermal process   (3)

41. With a schematic diagram showing the components of restoring force, derive an expression for the time period of an oscillating simple pendulum.

VI. Answer any TWO of the following questions   **2 x 5 = 10**

42. A cricket ball is thrown at a speed of 80ms-1 in a direction 60° above the horizontal. Calculate
     a) the maximum height reached by the ball.
     b) the distance from the thrower to the point where the ball returns to the same level
     c) the time taken by the ball to return to the same level.

43. A rope of negligible mass is wound round a hollow cylinder of mass 3kg and radius 40cm. What is the angular acceleration of the cylinder if the rope is pulled with a force of 30N? What is the linear acceleration of the rope? Assume that there is no slipping.

44. Calculate the rate at which heat through a glass window of area $0.1\,m^2$ thickness 4mm when the temperature of inside is at 40^0c and outer side is $-5°C$.
Co-efficient of thermal conductivity of glass is 1.1 Wm-1K-1

45. A wire stretched between two rigid supports vibrates in its fundamental mode with frequency of 45 Hz. The mass of the wire is 3.5x10-2 kg and its linear density is 4x10-2kgm-1. Calculate
     a) the speed of transverse wave in the string and
     b) the tension in the string

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