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FOR KARNATAKA CLASS 11 PREPARATION

Karnataka 1st PUC Model Question Paper 2027 for Physics (Paper 2)

EXAM	YEAR	TYPE	SUBJECT
Karnataka Class 11	2027	Sample Paper	Physics

GOVERNMENT OF KARNATAKA
DEPARTMENT OF SCHOOL EDUCATION (PRE-UNIVERSITY)
First PUC Model Question Paper – 2 (2026-27)

Subject: **PHYSICS (33)** Maximum Marks: **70**

Total number of Questions: **45** Time: **3 Hours**

General Instructions:

1. *All PARTS* (A *to* D) *are compulsory.*
2. *For Part – A questions, first written-answer will be considered for awarding marks.*
3. *Answers without relevant diagram/figure, wherever necessary, will not carry any marks.*
4. *Direct answers to numerical problems without relevant formulae and detailed solutions will not carry any marks.*

PART – A

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

1. **The number of significant figures in 230.00 is:**

   (A) 2 (B) 3 (C) 4 (D) 5

2. **Choose the INCORRECT statement among the given options:**

   (A) A body can have a constant speed and varying velocity.

   (B) If the acceleration of a particle is negative, the particle must be slowing down.

   (C) An accelerating particle can have zero speed at an instant.

   (D) A particle moving with a decreasing acceleration can still be speeding up.

3. **Which one of the following algebraic operations with scalar and vector physical quantities is meaningful?**

   (A) Adding a scalar to a vector of the same dimensions.

   (B) Dividing a vector by another vector.

   (C) Multiplying any vector by any scalar.

   (D) Adding a component of a vector to the same vector.

4. **The SI unit of impulse is:**

   (A) N s^{-1} (B) kg m s^{-2} (C) N s (D) kg m^{-1} s^{-1}

5. **The area under force (*F*) versus position (*x*) graph gives:**

   (A) the potential energy. (B) the work done by the force.

   (C) change in momentum of the object. (D) the power delivered by the force.

6. **The relationship between linear velocity and angular velocity for a rotating rigid body is:**

   (A) $\vec{v} = \vec{\omega} \times \vec{r}$ (B) $\vec{v} = r\vec{\omega}$ (C) $\vec{v} = \omega\vec{r}$ (D) $v = \vec{\omega} \cdot \vec{r}$

7. **The value of escape speed for an object projected from the Earth's surface is nearly:**

   (A) 7.9 km s^{-1} (B) 11.2 km s^{-1} (C) 2.3 km s^{-1} (D) 5 km s^{-1}

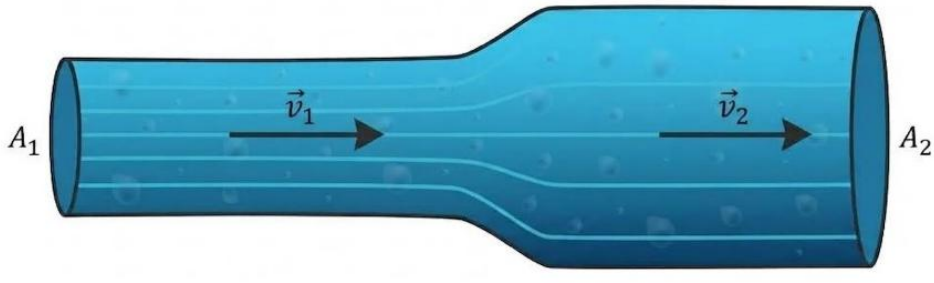
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8. The quantities with the same dimensional formula are:

(A) Modulus of elasticity and strain (B) Elastic energy and stress

(C) Stress and elastic energy density (D) Young's modulus and Poisson's ratio

9. Consider an incompressible non-viscous fluid under streamline flow in a horizontal tube of varying cross-sectional area as shown in the figure. Then:



(A) v_1 is greater than v_2 but the flow rate through A_1 and A_2 is the same.

(B) v_2 is greater than v_1 but the flow rate through A_1 and A_2 is the same.

(C) v_1 is equal to v_2 but the flow rate through A_2 is greater than that through A_1.

(D) v_2 is greater than v_1 and flow rate through A_2 is greater than that through A_1.

10. Water is used as a coolant in automobile radiators because it has:

(A) high specific heat capacity. (B) high density.

(C) high conductivity. (D) low boiling point.

11. Identify the extensive thermodynamic variable among the given quantities:

(A) Pressure (B) Temperature (C) Density (D) Internal energy

12. For an isochoric process (symbols have usual meanings):

(A) $\Delta Q = \Delta U - \Delta W$ (B) $\Delta Q = \Delta W$

(C) $\Delta Q = \Delta U$ (D) $\Delta U + \Delta W = 0$

13. In the table given below, match COLUMN – I with appropriate option in COLUMN – II.

COLUMN – I		COLUMN – II	
(a)	**For *He* gas molecule**	**(p)**	$C_V = \frac{5}{2}R$
(b)	**For N_2 gas molecule**	**(q)**	$C_P = \frac{5}{2}R$
(c)	**For H_2O molecule**	**(r)**	$\gamma \approx 1.3$

(A) (a) → (p); (b) → (q); (c) → (r) (B) (a) → (q); (b) → (p); (c) → (r)

(C) (a) → (r); (b) → (q); (c) → (p) (D) (a) → (q); (b) → (r); (c) → (p)

14. The frequency (*f*) of small oscillations of a spring-mass system depends on the mass (*m*) as:

(A) $f \propto m$ (B) $f \propto \sqrt{m}$ (C) $f \propto \frac{1}{m}$ (D) $f \propto \frac{1}{\sqrt{m}}$

15. Select the non-mechanical wave from the list:

(A) X - rays (B) Water waves

(C) Ultrasonic waves (D) Seismic waves

II. Fill in the blanks by choosing the appropriate answer given inside the brackets for ALL of the following questions. **5 × 1 = 5**

(coefficient of viscosity, shear modulus, pressure, interference, acceleration, angular momentum)

16. If the external torque about an axis acting on a system is zero, the _____ about the axis remains constant.

17. The ratio of shearing stress to the strain rate is called _____.

18. Absolute zero is the temperature at which _____ of an ideal gas becomes zero.

19. At the extreme position of the oscillations of a simple pendulum, _____ of the bob is maximum.

20. The phenomenon of beats arises due to _____ of sound waves.

PART – B

III. Answer ANY FIVE of the following questions: **5 × 2 = 10**

21. What are derived physical quantities? Give an example.

22. A particle in a uniform circular motion has a linear speed of 5 m s^{-1} and angular speed of 2 rad/s. What is the magnitude of its acceleration?

23. State and explain Newton's third law of motion.

24. Define power. Express power (P) in terms of force $\vec{F}$ and velocity $\vec{v}$.

25. Draw the stress - strain curve for a metal wire. Indicate the important points on the curve.

26. Why do drops and bubbles have a spherical shape? Explain.

27. Mention two characteristics of simple harmonic motion.

28. List the factors on which the speed of a transverse wave on a stretched string depends.

PART – C

IV. Answer ANY FIVE of the following questions: **5 × 3 = 15**

29. Derive the expression for the magnitude of resultant of two concurrent vectors.

30. What is static friction? Explain why static friction is called a self-adjusting force.

31. Prove the work-energy theorem for a constant force.

32. 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 (*take* $g = 10$ m s^{-2}).

33. Derive the relationship between the acceleration due to gravity (g) and the universal gravitational constant (G).

34. Mention any three properties of thermal radiation.

35. Using the expression for pressure of an ideal gas, $P = \frac{1}{3}mn\bar{v}^2$, show that the average kinetic energy of a molecule is proportional to the absolute temperature of the gas.

36. A particle undergoes Simple Harmonic Motion (SHM) starting from an extreme position. Write the expressions for its kinetic energy, potential energy, and total energy as a function of time.

PART – D

V. Answer ANY THREE of the following questions: **3 × 5 = 15**

37. Show that the path of a projectile is a parabola.

38. Illustrate the conservation of total mechanical energy of a body falling freely under gravity.

39. (i) Define centre of mass of a system of particles. **[1]**

(ii) Starting with the expression for the velocity of the centre of mass of a system, derive the equation of motion of the centre of mass, $M\vec{A} = \vec{F}_{\text{ext}}$. **[4]**

40. (i) Consider a solid cube that expands uniformly in all directions when its temperature is increased by a small amount. Derive the relationship between the coefficient of linear expansion and the coefficient of volume expansion for the solid. **[3]**

(ii) State and explain the principle of calorimetry. **[2]**

41. Obtain the expression for the natural frequencies of an open organ pipe. Show that all the harmonics are present in this case.

VI. Answer ANY TWO of the following questions: **2 × 5 = 10**

42. A hot air balloon is ascending vertically at a constant speed of 10 m s^{-1}. As it reaches a height of 175 m above the ground, a packet is dropped from it. (*Take acceleration due to gravity, g* = 10 m s^{-2}*, and ignore air resistance*). Find:

(i) the total time taken by the packet to hit the ground.

(ii) the velocity with which the packet strikes the ground.

43. Block A of mass 2 kg is sliding to the right with a velocity of 10 m s^{-1} on a rough, horizontal surface where the coefficient of kinetic friction (μ_k) is 0.2. It collides head-on with a stationary block B of mass 3 kg. Immediately after the collision, the two blocks stick together and slide as a single unit before coming to a stop. (*Take g* = 10 m s^{-2})

(i) Calculate the velocity of the combined system immediately after the collision.

(ii) What is the acceleration of the blocks during their motion over the surface?

44. A remote-sensing satellite of mass 200 kg is revolving around the Earth in a circular orbit at a height of 3.6×10^6 m above the surface of the Earth. Calculate:

(i) the orbital speed of the satellite.

(ii) the total energy of the satellite in its orbit.

(Given: *Mass of the Earth* = 6×10^{24} kg; *Radius of the Earth* = 6.4×10^3 km; *universal gravitational constant*, $G = 6.67 \times 10^{-11}$ N m^2 kg^{-2}).

45. A Carnot engine absorbs 5×10^4 calories of heat energy from a source at a temperature of 227 °C during each operating cycle. It performs useful mechanical work and rejects the remaining energy to a sink kept at 127 °C. Determine:

(i) the efficiency of the engine.

(ii) the heat rejected to the sink by the engine per cycle in joules.