JAIN COLLEGE V V Puram **1st PUC MOCK Paper – Jan. 2024**	**Course:** 1st year PUC **Subject:** Physics **Max. Marks:** 70 **Duration:** 3:15 hour

General Instructions:

(i) All parts are compulsory.
(ii) 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 15x1=15

1. The number of significant figures in 0.00450 is
   a) 5 b) 3 c) 2 d) 6
2. The area under the curve of v-t graph represents
   a) velocity b) force c) displacement d) acceleration
3. For resultant of two vectors to be maximum, the angle between them will be
   a) 0^0 b) 90^0 c) 180^0 d) 45^0
4. Position of a particle in rectangular co-ordinate system is (3,2,5). Then its position vector is
   a) $3\hat{i}+2\hat{j}+5\hat{k}$ b) $2\hat{i}+3\hat{j}+5\hat{k}$ c) $-2\hat{i}+3\hat{j}-5\hat{k}$ d) $+3\hat{i}-2\hat{j}-5\hat{k}$
5. An object will continue moving uniformly until
   a) the resultant force acting on it begins to decrease
   b) the resultant force acting on it is zero
   c) the resultant force is at right angles to its motion
   d) the resultant force on it increases continuously
6. When a body falls freely under gravity, which of the quantities will remain constant
   a) Potential energy b) Kinetic energy c) Total energy d) Linear momentum
7. For which of the following objects does the centre of mass lie outside the body
   a) Pencil b) Shot put c) Dice d) Bangle
8. The weight of a body at the centre of the earth is
   a) zero b) infinity
   c) double that on the surface d) same as that on the surface
9. If A is area of cross section of a pipe and v , the velocity of a fluid through it, the equation of continuity is written as
   a) $A\sqrt{v}$ = constant b) Av = constant c) $\frac{A}{v}$ = constant d) $\frac{A}{\sqrt{v}}$ = constant
10. Elastic potential energy per unit volume of a stretched wire is
    a) $E=\frac{1}{2}Y(strain)^2$ b) $E=Y(strain)^2$ c) $E=Y(strain)$ d) $E=\frac{1}{2}Y(strain)$
11. Sea breeze is
    a) the movement of air from sea to land during day time
    b) the movement of air from sea to land during night time
    c) the movement of air from land to sea during day time
    d) the movement of air from land to sea during night time

12. The isochoric process is a thermodynamic process in which
    a) pressure remains constant b) temperature remains constant
    c) heat energy remains constant d) volume remains constant
13. The degrees of freedom for a diatomic molecule is
    a) 5 b) 6 c) 3 d) 2
14. The time period of oscillation of a simple pendulum varies directly as
    a) g b) $\frac{1}{\sqrt{g}}$ c) g^2 d) $\sqrt{g}$
15. A longitudinal wave is composed of
    a) alternate compressions and rarefactions b) alternate compressions and troughs
    c) alternate crests and troughs d) alternate crests and rarefactions

II. Fill in the blanks by choosing appropriate answer given in the brackets for ALL the the following questions 5x1=5

(linear, inelastic, couple, amplitude, temperature, elastic)

16. In_____ collision, the kinetic energy is not conserved
17. A pair of forces of equal magnitude but acting in opposite directions with different lines of action is known as_____.
18. The expansion in length due to heating is called _____expansion.
19. The zeroth law of temperature defines the physical quantity _____.
20. The maximum displacement of a particle from its mean position is _____.

PART – B

III. Answer any FIVE of the following questions 5x2=10

21. Check the correctness of equation v = u + at by dimensional analysis.
22. A ball is thrown with a velocity of 39.2 ms^{-1} at an angle of 30^0 with the horizontal. Calculate the maximum height reached by the ball.
23. Give two methods of reducing friction.
24. When work done is negative? Give one example.
25. Compare equations of linear and rotational motions.
26. Write the expression for orbital velocity and explain the terms.
27. Define specific heat of substance. Mention its SI unit.
28. What are reversible and irreversible processes?
29. At what positions the velocity of a particle executing SHM is maximum and minimum?

PART – C

IV. Answer any FIVE of the following questions 5x3=15

30. State triangle law of vector addition. Explain using diagram.
31. Show that F= ma using Newton's second law.
32. State and prove work energy theorem for constant force.
33. In HCl molecule the separation between the nuclei of the two atoms is about 1.27 Å^0 Find the approximate location of the centre of mass of the molecule. Given that chlorine atom is about 35.5 times as massive as a hydrogen atom nearly all the mass of an atom is concentrated in its nucleus.

34. Draw a stress strain curve and show the fracture point and yield point.
35. What is viscosity? How does it vary for liquids and gases with temperature?
36. Write three postulates of kinetic theory of gases.
37. Mention the three modes of heat transfer.
38. Define the terms frequency, time period and wavelength of a wave.

PART – D

V. Answer any THREE of the following questions **3x5=15**

39. What is velocity – time graph? Derive $S = ut+\frac{1}{2}at^2$ using v – t graph.
40. Show that trajectory of projectile is a parabola.
41. State and prove the law of conservation of linear momentum.
42. a) State the law of conservation of angular momentum. Give two examples to illustrate the law **2**
    b) What is moment of inertia? Write one factor on which it depends. **3**
43. State and prove Newton's law of cooling.
44. Derive the expression for time period of a simple pendulum.

VI. Answer any TWO of the following questions **2x5=10**

45. An elevator which can carry a maximum load of 1800kg (elevator +passengers) is moving up with a constant speed of $2ms^{-1}$. The frictional force opposing the motion is 4000N. Determine the minimum power delivered by the motor to the elevator in watt and in horse power
46. The size of a planet is same as that of the earth. Its mass is 4 times that of the earth. Find the potential energy of mass 2kg at a height of 2m on the planet. Take g on the surface of the earth to be $10ms^{-2}$.
47. The efficiency of Carnot heat engine is 25%, when the temperature of the source alone is raised by 100K the efficiency becomes 50%. Find the temperature of the source and sink.
48. A transverse harmonic wave on a string is described by $y(x,t)=3.0\sin(36t+0.018x+\frac{\pi}{4})$ where x and y are in cm and t in s. Find
    i) amplitude ii) frequency iii) time period and iv)initial phase of wave.

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