

# BLUE PRINT FOR MODEL QUESTION PAPER – 1

**SUBJECT : PHYSICS (33)**

**CLASS : I PUC**

| Unit         | Chapter | Topic                              | Teaching Hours | Marks allotted | 10           | 8            | 8            | 3+3         | 5           |
|--------------|---------|------------------------------------|----------------|----------------|--------------|--------------|--------------|-------------|-------------|
|              |         |                                    |                |                | 1 mark (VSA) | 2 mark (SA1) | 3 mark (SA2) | 5 mark (LA) | 5 mark (NP) |
| I            | 1       | Physical world                     | 2              | 2              |              | √            |              |             |             |
|              | 2       | Units and measurement              | 4              | 3              | √            |              |              |             |             |
| II           | 3       | Motion in a straight line          | 8              | 7              |              | √            |              | √           |             |
|              | 4       | Motion in a plane                  | 12             | 11             | √            | √            | √            |             | √           |
| III          | 5       | Laws of motion                     | 11             | 10             |              | √            | √            | √           |             |
| IV           | 6       | Work energy and power              | 11             | 9              | √            |              | √            |             | √           |
| V            | 7       | System of particles and rigid body | 12             | 11             | √            |              |              | √           | √           |
| VI           | 8       | Gravitation                        | 9              | 8              | √            | √            |              | √           |             |
| VII          | 9       | Mechanical properties of solids    | 5              | 4              | √            |              | √            |             |             |
|              | 10      | Mechanical properties of fluids    | 5              | 4              | √            |              | √            |             |             |
|              | 11      | Thermal properties of matter       | 10             | 9              | √            |              | √            |             | √           |
| VIII         | 12      | Thermodynamics                     | 8              | 6              | √            |              |              | √           |             |
| IX           | 13      | Kinetic theory                     | 5              | 4              | √            |              | √            |             |             |
| X            | 14      | Oscillations                       | 8              | 7              |              | √            |              | √           |             |
|              | 15      | Waves                              | 10             | 10             |              | √            | √            |             | √           |
| <b>TOTAL</b> |         |                                    | <b>120</b>     | <b>105</b>     | <b>10</b>    | <b>16</b>    | <b>24</b>    | <b>30</b>   | <b>25</b>   |

# MODEL QUESTION PAPER – 2

## I P.U.C. PHYSICS (33)

Time: 3 hours 15 min

Max marks:70

General Instructions:

- All parts are compulsory
- Answers without relevant diagram/figure wherever necessary will not carry any marks.
- Direct answers to the Numerical problems without detailed solutions will not carry any marks .

### PART A

**I. Answer ALL the following** **10×1=10**

- Mention the SI unit of luminous intensity.
- Define null vector.
- What is potential energy?
- Write the expression for moment of inertia of a solid sphere of radius R about its diameter.
- Write the distance of the geostationary satellite from the center of the earth.
- State Hooke's law.
- What is the principle behind the uplift of an aeroplane?
- Give an example for Greenhouse gas.
- What is the physical significance of Zeroth law of thermodynamics?
- Which quantity remains unchanged in isochoric process?

### PART B

**II. Answer any FIVE of the following questions.** **5×2=10**

- Name any two fundamental forces in nature.
- Write two applications of dimensional analysis.
- Distinguish between 'path length' and 'displacement'.
- Write the equation for the trajectory of a projectile motion. What is the nature of its trajectory?
- State the two laws of friction.
- Write the equation for escape velocity and explain the terms used in the equation.
- Where is the velocity of the body maximum and minimum in case of simple harmonic motion?
- What harmonics are present in a) an open pipe b) a closed pipe?

### PART C

**III. Answer any FIVE of the following questions.** **5×3=15**

- Define centripetal acceleration? Write the expression for it and explain the terms.
  - Deduce  $f = ma$ , using Newton's second law of motion.
  - What is meant by collision? Distinguish between elastic and inelastic collision.
  - Draw stress-strain curve. Show yield point and fracture point.
  - Mention three applications of capillarity.
  - Derive  $\alpha_V = \frac{1}{T}$  for ideal gas.
  - Draw schematic diagram of the refrigerator. Define its coefficient of performance.
  - Give the Newton's formula for the speed of sound in air and hence explain Laplace's correction.
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## PART D

**IV. Answer any TWO of the following questions.**

2×5=10

27. What is  $v - t$  graph? Derive the equation  $x = v_0 t + \frac{1}{2} a t^2$  using  $v - t$  graph.
28. State and prove the law of conservation of linear momentum from Newton's third law of motion.
29. Define torque and hence derive  $\frac{d\vec{l}}{dt} = \vec{\tau}$ .

**V. Answer any TWO of the following questions.**

2×5=10

30. Derive the expression for the variation of the acceleration due to gravity with altitude.
31. Explain Carnot cycle with  $P - V$  diagram.
32. Derive the expression for the time period of the simple pendulum.

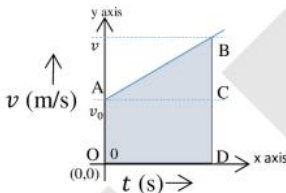
**VI. Answer any THREE of the following questions.**

3×5=15

33. A ball is thrown with the velocity of a 39.2 m/s at an angle of  $30^\circ$  with the horizontal. Calculate the maximum height, time of flight and horizontal range of the projectile.
34. A bullet of mass 50 gram moving with a velocity of 400 m/s strikes a wall and goes out from the other side with a velocity of 100 m/s. Calculate the work done in passing through the wall.
35. Three pieces of iron of uniform thickness and mass  $m$ ,  $m$  and  $2m$  respectively are placed at the three corners of the triangle having co-ordinate (2.5, 1.5), (3.5, 1.5) and (3, 3) respectively. Find the center of mass of the system.
36. How much it is required to convert 10 gram of ice at  $-5^\circ\text{C}$  into steam at  $100^\circ\text{C}$ . Given specific heat of ice  $2.1 \text{ J g}^{-1}^\circ\text{C}^{-1}$ . Latent heat of steam  $= 2268 \text{ J g}^{-1}$  and latent heat of fusion of ice is  $336 \text{ J/g}$ . Specific heat of water  $= 4.2 \text{ J g}^{-1}^\circ\text{C}^{-1}$ .
37. The apparent frequency of a note when listener moves towards a stationary source with velocity 40 m/s is 200 Hz. When he moves away from the same source with same speed the apparent frequency of note is 160 Hz. Calculate velocity of sound in air.
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## SCHEME OF EVALUATION : MODEL PAPER – 2

| Q. No.                                         | ANSWERS                                                                                                                                                                                                                                                                            |             | Marks        |                |                          |                              |                                                |                                                    |        |             |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------|----------------|--------------------------|------------------------------|------------------------------------------------|----------------------------------------------------|--------|-------------|
| I                                              | PART A                                                                                                                                                                                                                                                                             |             |              |                |                          |                              |                                                |                                                    |        |             |
| 1                                              | Candela                                                                                                                                                                                                                                                                            |             | 1            |                |                          |                              |                                                |                                                    |        |             |
| 2                                              | A vector having zero magnitude.                                                                                                                                                                                                                                                    |             | 1            |                |                          |                              |                                                |                                                    |        |             |
| 3                                              | Energy possessed by a body by virtue of its position or configuration.                                                                                                                                                                                                             |             | 1            |                |                          |                              |                                                |                                                    |        |             |
| 4                                              | $I = \frac{2}{5}MR^2$                                                                                                                                                                                                                                                              |             | 1            |                |                          |                              |                                                |                                                    |        |             |
| 5                                              | 42200 km                                                                                                                                                                                                                                                                           |             | 1            |                |                          |                              |                                                |                                                    |        |             |
| 6                                              | Within the elastic limit, the stress in a body is directly proportional to strain.                                                                                                                                                                                                 |             | 1            |                |                          |                              |                                                |                                                    |        |             |
| 7                                              | Bernoulli's principle.                                                                                                                                                                                                                                                             |             | 1            |                |                          |                              |                                                |                                                    |        |             |
| 8                                              | Carbon dioxide, nitrous oxide methane, chloro fluoro carbon etc.                                                                                                                                                                                                                   |             | 1            |                |                          |                              |                                                |                                                    |        |             |
| 9                                              | Temperature                                                                                                                                                                                                                                                                        |             | 1            |                |                          |                              |                                                |                                                    |        |             |
| 10                                             | Volume                                                                                                                                                                                                                                                                             |             | 1            |                |                          |                              |                                                |                                                    |        |             |
|                                                | PART B                                                                                                                                                                                                                                                                             |             |              |                |                          |                              |                                                |                                                    |        |             |
| 11                                             | Strong nuclear force, electromagnetic force, weak nuclear force, gravitational force (any two)                                                                                                                                                                                     |             | 1 each       |                |                          |                              |                                                |                                                    |        |             |
| 12                                             | i) Checking the dimensional consistency of equations<br>ii) Deducing relation among the physical quantities                                                                                                                                                                        |             | 1<br>1       |                |                          |                              |                                                |                                                    |        |             |
| 13                                             | <table><tr><th>Path length</th><th>Displacement</th></tr><tr><td>It is a scalar</td><td>It is a Vector</td></tr><tr><td>Is always positive</td><td>Positive or negative or zero</td></tr></table>                                                                                  | Path length | Displacement | It is a scalar | It is a Vector           | Is always positive           | Positive or negative or zero                   |                                                    | 1 each |             |
| Path length                                    | Displacement                                                                                                                                                                                                                                                                       |             |              |                |                          |                              |                                                |                                                    |        |             |
| It is a scalar                                 | It is a Vector                                                                                                                                                                                                                                                                     |             |              |                |                          |                              |                                                |                                                    |        |             |
| Is always positive                             | Positive or negative or zero                                                                                                                                                                                                                                                       |             |              |                |                          |                              |                                                |                                                    |        |             |
| 14                                             | $y = x \tan \theta - \frac{gx^2}{v_0^2 \cos^2 \theta_0}$ and trajectory is parabola                                                                                                                                                                                                |             | 1+ 1         |                |                          |                              |                                                |                                                    |        |             |
| 15                                             | i. Limiting friction is independent of area of surface of contact of two bodies<br>ii. Magnitude of limiting friction is directly proportional to normal reaction.                                                                                                                 |             | 1<br>1       |                |                          |                              |                                                |                                                    |        |             |
| 16                                             | Escape velocity: $v_e = \sqrt{2Rg}$ or $v_e = \sqrt{\frac{2GM}{R}}$<br>$R$ is radius of the earth, $G$ is gravitational constant and $M$ is mass of the earth                                                                                                                      |             |              |                |                          |                              |                                                |                                                    |        |             |
| 17                                             | i. Mean position or equilibrium position<br>ii. Extreme position                                                                                                                                                                                                                   |             | 1<br>1       |                |                          |                              |                                                |                                                    |        |             |
| 18                                             | i. All harmonics<br>ii. Odd harmonics                                                                                                                                                                                                                                              |             | 1<br>1       |                |                          |                              |                                                |                                                    |        |             |
|                                                | PART C                                                                                                                                                                                                                                                                             |             |              |                |                          |                              |                                                |                                                    |        |             |
| 19                                             | Definition:<br>$a_c = v^2/r$<br>Where $v$ is velocity and $r$ is radius of the circle                                                                                                                                                                                              |             | 1<br>1<br>1  |                |                          |                              |                                                |                                                    |        |             |
| 20                                             | To get $f \propto \frac{dp}{dt}$<br>Arriving to the final result                                                                                                                                                                                                                   |             | 1<br>2       |                |                          |                              |                                                |                                                    |        |             |
| 21                                             | Definition<br><table><tr><th>ELASTIC</th><th>INELASTIC</th></tr><tr><td>Kinetic energy conserved</td><td>Kinetic energy not conserved</td></tr><tr><td>The forces involved are conservative in nature</td><td>The forces involved are non-conservative in nature</td></tr></table> |             | ELASTIC      | INELASTIC      | Kinetic energy conserved | Kinetic energy not conserved | The forces involved are conservative in nature | The forces involved are non-conservative in nature |        | 1<br>1 each |
| ELASTIC                                        | INELASTIC                                                                                                                                                                                                                                                                          |             |              |                |                          |                              |                                                |                                                    |        |             |
| Kinetic energy conserved                       | Kinetic energy not conserved                                                                                                                                                                                                                                                       |             |              |                |                          |                              |                                                |                                                    |        |             |
| The forces involved are conservative in nature | The forces involved are non-conservative in nature                                                                                                                                                                                                                                 |             |              |                |                          |                              |                                                |                                                    |        |             |
| 22                                             | Curve<br>Explanation                                                                                                                                                                                                                                                               |             | 1<br>2       |                |                          |                              |                                                |                                                    |        |             |

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                               |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 23            | 1) Rise of oil through wick of the lamp<br>2) Rise of water in the plant through xylem in plants<br>3) Absorption of ink by blotting paper/chalk piece                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1 each                        |
| 24            | 1) Ideal gas equation<br>2) Arriving result 2 marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1<br>2                        |
| 25            | 1) Diagram with label<br>2) Definition of coefficient of performance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2<br>1                        |
| 26            | 1) Newton's formula<br>2) Laplace's correction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1<br>2                        |
| <b>PART D</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                               |
| 27            | <p>v-t graph definition</p>  <p><u>Derivation</u><br/> Displacement = area under v-t graph<br/> <math>x = \text{area of rectangle OACD} + \text{area of triangle ABC}</math><br/> <math>= OA \times OD + \frac{1}{2} (AC \times BC)</math><br/> <math>= v_0 t + \frac{1}{2} t \times (v - v_0)</math><br/> <math>x = v_0 t + \frac{1}{2} a t^2</math></p>                                                                                                                                                                                                                                                                                                                                                                                                | 1<br><br>1<br><br>1<br>1<br>1 |
| 28            | <p><b>Statement:</b> The total momentum of an isolated system of interacting particles is conserved.<br/> Consider two bodies A and B, with initial momenta <math>\mathbf{p}_A</math> and <math>\mathbf{p}_B</math>.<br/> The bodies collide; get apart, with final momenta <math>\mathbf{p}'_A</math> and <math>\mathbf{p}'_B</math> respectively.<br/> By the Second Law: Force exerted on A by B : <math>\mathbf{F}_{AB} \Delta t = \mathbf{p}'_A - \mathbf{p}_A</math><br/> Force exerted on B by A : <math>\mathbf{F}_{BA} \Delta t = \mathbf{p}'_B - \mathbf{p}_B</math><br/> Since <math>\mathbf{F}_{AB} = -\mathbf{F}_{BA}</math> by the third law:<br/> Thus <math>\mathbf{p}'_A - \mathbf{p}_A = -(\mathbf{p}'_B - \mathbf{p}_B)</math><br/> i.e., <math>\mathbf{p}'_A + \mathbf{p}'_B = \mathbf{p}_A + \mathbf{p}_B</math></p> | 1<br><br>1<br>1<br>1<br>1     |
| 29            | <p>Definition:<br/> Derivation <math>\vec{L} = \vec{r} \times \vec{p}</math><br/> Differentiation of <math>\vec{L}</math><br/> <math>\vec{v} \times \vec{p} = 0</math> and <math>\vec{r} \times \vec{F} = \vec{\tau}</math><br/> Arriving at <math>\frac{d\vec{L}}{dt} = \vec{\tau}</math></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1<br>1<br>1<br>1<br>1         |



|           |                                                                            |   |
|-----------|----------------------------------------------------------------------------|---|
|           | Arriving at final answer,<br>$W = 3750 \text{ J}$                          | 2 |
| <b>35</b> | $x = \frac{m_1 x_1 + m_2 x_2 + m_3 x_3}{m_1 + m_2 + m_3} = 3 \text{ m}$    | 2 |
|           | $y = \frac{m_1 y_1 + m_2 y_2 + m_3 y_3}{m_1 + m_2 + m_3} = 2.25 \text{ m}$ | 2 |
|           | Writing the co-ordinates of the center of mass,                            | 1 |
|           |                                                                            |   |
| <b>36</b> | $Q_1 = m S_i \Delta T = 10 \times 2.1 \times 5 = 105 \text{ J}$            | 1 |
|           | $Q_2 = m L_f = 10 \times 336 = 3360 \text{ J}$                             | 1 |
|           | $Q_3 = m S_w \Delta T = 10 \times 4.2 \times 100 = 4200 \text{ J}$         | 1 |
|           | $Q_4 = m L_v = 10 \times 2268 = 22680 \text{ J}$                           | 1 |
|           | $Q = Q_1 + Q_2 + Q_3 + Q_4 = 30345 \text{ J}$                              | 1 |
| <b>37</b> | $v' = \left( \frac{v + v_0}{v} \right) v$                                  | 1 |
|           | $v'' = \left( \frac{v - v_0}{v} \right) v$                                 | 1 |
|           | $\frac{v'}{v''} = \frac{v + v_0}{v - v_0}$                                 | 1 |
|           | Finding $v = 360 \text{ m/s}$                                              | 2 |