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		√	√		√
TOTAL			**120**	**105**	**10**	**16**	**24**	**30**	**25**

MODEL QUESTION PAPER – 2

I P.U.C. PHYSICS (33)

Time: 3 hours 15 min Max marks:70

General Instructions:

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

PART A

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

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

PART B

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

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

PART C

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

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

PART D

IV. Answer any <u>TWO</u> of the following questions. 2×5=10

27. What is $v-t$ graph? Derive the equation $x = v_0 t + \frac{1}{2}at^2$ 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 <u>TWO</u> 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 <u>THREE</u> 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 30^0 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.

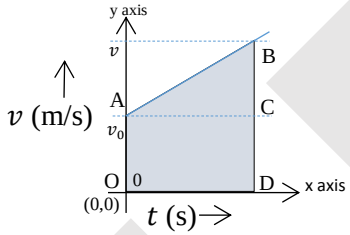
35. Three pieces of iron of uniform thickness and mass m , m and 2m respectively are placed at the three corners of the triangle having co-ordinate (2.5, 1.5),(3.5,1.5) and (3,3) respectively. Find the center of mass of the system.

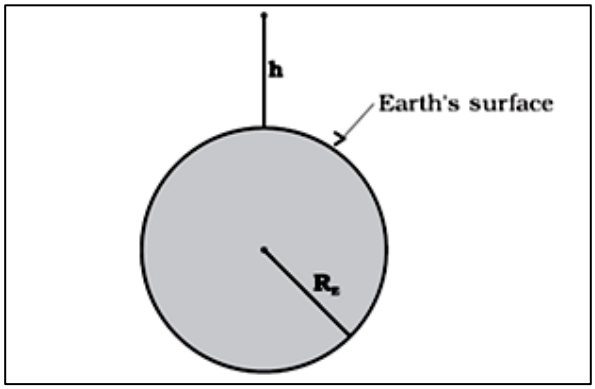
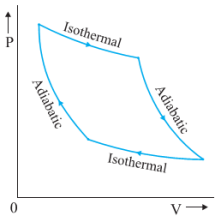
36. How much it is required to convert 10 gram of ice at -5 ^{0}C into steam at 100 ^{0}C. Given specific heat of ice 2.1 J g^{-1} $^0C^{-1}$. Latent heat of steam =2268 J g^{-1} and latent hear of fusion of ice is 336 J/g. Specific heat of water = 4.2 J g^{-1} $^0C^{-1}$

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.

SCHEME OF EVALUATION : MODEL PAPER – 2

<table>
<tr><th>Q. No.</th><th>ANSWERS</th><th>Marks</th></tr>
<tr><td>I</td><td>PART A</td><td></td></tr>
<tr><td>1</td><td>Candela</td><td>1</td></tr>
<tr><td>2</td><td>A vector having zero magnitude.</td><td>1</td></tr>
<tr><td>3</td><td>Energy possessed by a body by virtue of its position or configuration.</td><td>1</td></tr>
<tr><td>4</td><td>$I = \frac{2}{5}MR^2$</td><td>1</td></tr>
<tr><td>5</td><td>42200 km</td><td>1</td></tr>
<tr><td>6</td><td>Within the elastic limit, the stress in a body is directly proportional to strain.</td><td>1</td></tr>
<tr><td>7</td><td>Bernoulli’s principle.</td><td>1</td></tr>
<tr><td>8</td><td>Carbon dioxide, nitrous oxide methane, chloro floro carbon etc.</td><td>1</td></tr>
<tr><td>9</td><td>Temperature</td><td>1</td></tr>
<tr><td>10</td><td>Volume</td><td>1</td></tr>
<tr><td></td><td>PART B</td><td></td></tr>
<tr><td>11</td><td>Strong nuclear force, electromagnetic force, weak nuclear force, gravitational force (any two)</td><td>1 each</td></tr>
<tr><td>12</td><td>i) Checking the dimensional consistency of equations
ii) Deducing relation among the physical quantities</td><td>1
1</td></tr>
<tr><td>13</td><td><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></td><td>1 each</td></tr>
<tr><td>14</td><td>$y = x\tan\theta - \frac{gx^2}{v_0{}^2\cos^2\theta_0}$ and trajectory is parabola</td><td>1+ 1</td></tr>
<tr><td>15</td><td>i. Limiting friction is independent of area of surface of contact of two bodies
ii. Magnitude of limiting friction is directly proportional to normal reaction.</td><td>1
1</td></tr>
<tr><td>16</td><td>Escape velocity: $v_e = \sqrt{2Rg}$ or $v_e = \sqrt{\frac{2GM}{R}}$
R is radius of the earth, G is gravitational constant and M is mass of the earth</td><td></td></tr>
<tr><td>17</td><td>i. Mean position or equilibrium position
ii. Extreme position</td><td>1
1</td></tr>
<tr><td>18</td><td>i. All harmonics
ii. Odd harmonics</td><td>1
1</td></tr>
<tr><td></td><td>PART C</td><td></td></tr>
<tr><td>19</td><td>Definition:
$a_c = v^2/r$
Where v is velocity and r is radius of the circle</td><td>1
1
1</td></tr>
<tr><td>20</td><td>To get $f \propto \frac{dp}{dt}$
Arriving to the final result</td><td>1
2</td></tr>
<tr><td>21</td><td>Definition<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></td><td>1
1 each</td></tr>
<tr><td>22</td><td>Curve
Explanation</td><td>1
2</td></tr>
</table>

23	1) Rise of oil through wick of the lamp 2) Rise of water in the plant through xylem in plants 3) Absorption of ink by blotting paper/chalk piece	1 each
24	1) Ideal gas equation 2) Arriving result 2 marks	1 2
25	1) Diagram with label 2) Definition of coefficient of performance	2 1
26	1) Newton's formula 2) Laplace's correction	1 2
	PART D	
27	v-t graph definition  <u>Derivation</u> Displacement = area under v-t graph $x = area\ of\ rectangle\ OACD + area\ of\ triangle\ ABC$ =OA×OD+ ½ (AC×BC) $=v_0 t + \frac{1}{2} t \times (v - v_0)$ $x = v_0 t + \frac{1}{2} a t^2$	1 1 1 1 1
28	**Statement:** The total momentum of an isolated system of interacting particles is conserved. Consider two bodies A and B, with initial momenta $\mathbf{p}_A$ and $\mathbf{p}_B$. The bodies collide; get apart, with final momenta $\mathbf{p}'_A$ and $\mathbf{p}'_B$ respectively. By the Second Law: Force exerted on A by B : $\mathbf{F}_{AB}\,\Delta t = \mathbf{p}'_A - \mathbf{p}_A$ Force exerted on B by A : $\mathbf{F}_{BA}\,\Delta t = \mathbf{p}'_B - \mathbf{p}_B$ Since $\mathbf{F}_{AB} = -\mathbf{F}_{BA}$ by the third law: Thus $\mathbf{p}'_A - \mathbf{p}_A = -(\mathbf{p}'_B - \mathbf{p}_B)$ i.e., $\mathbf{p}'_A + \mathbf{p}'_B = \mathbf{p}_A + \mathbf{p}_B$	1 1 1 1 1 1
29	Definition: Derivation $\vec{L} = \vec{r} \times \vec{p}$ Differentiation of $\vec{L}$ $\vec{v} \times \vec{p} = 0$ and $\vec{r} \times \vec{F} = \vec{\tau}$ Arriving at $\frac{d\vec{L}}{dt} = \vec{\tau}$	1 1 1 1 1

30	 Diagram **Derivation:** Consider a point mass m at a height h above the surface of the earth as shown in Figure. The radius of the earth is denoted by R_E. The distance from the centre of the earth is $(R_E + h)$. The magnitude of the force on the point mass m, $F = \frac{GM_E m}{(R_E + h)^2}$ The acceleration experienced by the point mass $g' = \frac{F}{m} = \frac{GM_E}{(R_E + h)^2}$ ..... (2) On earth surface acceleration experienced by the point mass: $g = \frac{GM_E}{R_E^2}$. Thus $g' = \frac{GM_E}{R_E^2(1 + h/R_E)^2} = g\,(1+h/R_E)^{-2}$	1 1 1 1 1
31	p-v diagram  Explanation of isothermal expansion Explanation of isothermal compression Explanation of adiabatic expansion Explanation of adiabatic compression	1 1 1 1 1
32	Simple pendulum Diagram Resolving acceleration due to gravity Arriving at expression for time period.	1 1 3
VI		
33	1) $H_m = \frac{v_0^2 \sin^2\theta}{2g}$=19.6 m 2) $T_f = \frac{2v_0 \sin\theta}{g}$=4 s 3) $R = \frac{v_0^2 \sin 2\theta}{g}$=135.79 m	2 1 2
34	$W = KE_2 - KE_1$ $KE_1 = \frac{1}{2}mv_1^2 = 4000\,J$ $KE_2 = \frac{1}{2}mv_2^2 = 250\,J$	1 1 1

	Arriving at final answer, $W = 3750\ J$	 2
35	$$x = \frac{m_1x_1 + m_2x_2 + m_3x_3}{m_1 + m_2 + m_3} = 3\ m$$ $$y = \frac{m_1y_1 + m_2y_2 + m_3y_3}{m_1 + m_2 + m_3} = 2.25\ m$$ Writing the co-ordinates of the center of mass,	2 2 1
36	$Q_1 = m\ S_i\ \Delta T$=10x2.1x5=105 J $Q_2 = m\ L_f$=10x336=3360 J $Q_3 = m\ S_w\ \Delta T$=10x4.2x100=4200 J $Q_4 = m\ L_v$=10x2268=22680 J $Q = Q_1 + Q_2 + Q_3 + Q_4 = 30345$ J	1 1 1 1 1
37	$$v' = \left(\frac{v + v_0}{v}\right)v$$ $$v'' = \left(\frac{v - v_0}{v}\right)v$$ $$\frac{v'}{v''} = \frac{v + v_0}{v - v_0}$$ Finding $v = 360\ m/s$	1 1 1 2