MODEL QUESTION PAPER-I

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 / circuit 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 the following. **10 × 1 = 10**

1. Mention the method of determining the mass of planets, stars etc.,
2. What is the minimum number of vectors required to give zero resultant?
3. What is the value of One kilowatt hour (kWh) in joules?
4. Define linear momentum of a system of particles.
5. State Hooke's law.
6. Write the equation of continuity for the flow of incompressible fluids.
7. Give an importance of Reynolds number.
8. Name the principle used in calorimetry.
9. State Zeroth law of thermodynamics.
10. Define degrees of freedom of a molecule.

PART – B

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

11. Name two Physicists who achieved the unification of electricity and magnetism.
12. Mention two uses of dimensional analysis.
13. A player throws a ball vertically upwards. What is the direction of acceleration during upward motion? What is the velocity at the highest point of its motion.
14. Define the terms: unit vector and equal vectors.
15. Mention two methods of reducing friction.
16. State the principle of moments for a liver. Give an example of liver.
17. Define surface tension. Why there is no surface tension in gases?
18. What is a periodic motion? Give an example.

PART – C

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

19. What is centripetal acceleration? Write the expression for the centripetal acceleration and explain the terms.
20. Derive F = ma with usual notations.
21. Prove that change in kinetic energy of a particle is equal to the work done on it by a variable force.
22. State and explain the perpendicular axis theorem.
23. Arrive at the expression for escape speed of the body from the surface of earth.
24. Draw a typical stress-strain curve for a metal. Mention yield point and fracture point.
25. Mention three factors on which heat flow by conduction in a bar depends.
26. Derive an ideal gas equation by using gas laws.

PART – D

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

27. What is v-t graph? Derive $x = V_o t + \frac{1}{2}at^2$ using v-t graph.
28. Derive an expression for potential energy of a spring and show that spring force is a conservative force.
29. What is centre of mass of a body? Obtain an expression for the position vector of a centre of mass of two particle system.

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

30. Define latent heat of fusion and latent heat of vapourisation. Explain the variation of temperature with heat (energy) for water at one atmosphere with a graph.
31. What are beats? Give the theory of beats.
32. What is a heat engine? Explain its working with schematic diagram.

PART– E

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

33. A cricket ball is thrown at a speed of 56 ms^{-1} in a direction, making an angle 30^o with the horizontal. Calculate

a) Maximum height,

b) Total time taken by the ball to return to the earth and

c) The distance from thrower to the point where the ball returns to the earth.

34. A well 20m deep and 7m in diameter is full of water. Calculate the work done in pumping the whole of water up to ground level.

35. If the mass of the earth is 100 times that of the moon and its diameter 5 times that of moon, compare the weight of a body on the surface of the moon with its weight on the surface of the earth.

36. A thermocole ice box is a cheap and efficient method for storing small quantities of cooked food in summer in particular. A cubical ice box of side 30 cm has a thickness of 5 cm. If 4.0 kg of ice is put in the box, estimate the amount of ice remaining after 6 hrs. The outside temperature is 45^{o}C and co-efficient of thermal conductivity of thermocole is 0.01 Js^{-1} m^{-1} k^{-1}.
[Heat of fusion of water = $335 \times 10^3\ \mathrm{J\,kg^{-1}}$]

37. A train standing at the outer signal of a railway station blows a whistle of frequency 400Hz in still air.
   (i) What is the frequency of whistle for a platform observer when the train
      (a) approaches the platform with speed of 10 $\mathrm{ms^{-1}}$
      (b) Recedes from the platform with the speed of 10 $\mathrm{ms^{-1}}$
   (ii) What is the speed of sound in each case?
      [The speed of sound in still air = 340 $\mathrm{ms^{-1}}$]

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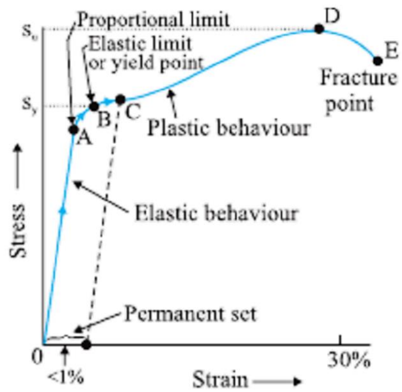
SCHEME OF VALUATION

Model Question Paper – 1

I P.U.C PHYSICS (33)

Qn.No.		Marks Allotted
I	**PART – A**	
1	Gravitational method	**1**
2	Two	**1**
3	3.6×10^{6} J	**1**
4	It is defined as the product of the total mass of the system and the velocity of its centre of mass.	**1**
5	For small deformation, the stress and strain are directly proportional to each other	**1**
6	AV=constant, i.e volume flux or rate flow of incompressible fluids is a constant.	**1**
7	Reynolds number is used to determine the flow of liquid streamline or turbulent.	**1**
8	Heat gained = heat lost	**1**
9	Two systems in thermal equilibrium with a third system separately are in thermal equilibrium with each other.	**1**
10	Number of co-ordinates required to specify the configuration of system of molecules.	**1**
II	**PART – B**	
11	Hans Christian Oersted, Michael Faraday	**1+1**
12	To check the correctness of the equation To convert one system of units to other (Any two)	**1** **1**
13	Vertically downwards and zero	**1+1**
14	A vector of unit magnitude is called unit vector. Two vectors of same magnitude and same direction are called equal vectors.	**1** **1**
15	Using lubricants Using ball bearings (any two methods)	**1** **1**
16	Load arm × load = effort arm × effort See-saw (any one example)	**1** **1**
17	It is the force/unit length (or surface energy per unit area) acting in the plane of the interface between the plane of the liquid and any other substance. Gases do not have free surfaces,hence no surface tension.	**1** **1**

18	A motion that repeats itself at regular intervals of time is called periodic motion. Oscillations of a simple pendulum (any one example)	**1** **1**
III	**PART – C**	
19	In a circular motion , the acceleration of a particle is always directed towards the centre. This acceleration is called centripetal acceleration.	**1**
	$a=v^2/r$	**1**
	v= speed,r= radius of circular motion	**1**
20.	$F \propto \frac{dP}{dt}$ $\Rightarrow \quad F = K.\frac{dp}{dt}$	**1**
	For a body of fixed mass m $\frac{dp}{dt} = \frac{d}{dt}(mv) = m.\frac{dv}{dt} = ma$	**1**
	F = Kma K = 1 Arriving F = ma	**1**
21	$dk = Fdx$	**1**
	$\int_{k_i}^{k_f} dk = \int_{x_i}^{x_f} Fdx$	**1**
	$k_f - k_i = W$	**1**
22	The moment of inertia of a planar body about an axis perpendiculr to its plane is equal to the sum ot its moments of inertia about two perpendicular axes concurrent with perpendicular axis and lying in the plane of the body. Explanation Iz = Ix + Iy	**2** **1**
23	By the principle of energy conservation $\frac{m{v_i}^2}{2} - \frac{GmM_E}{(h+R_E)} = \frac{m{v_f}^2}{2}$	**1**
	$\frac{m{v_i}^2}{2} - \frac{GmM_E}{(h+R_E)} \geq 0$	**1**
	Arriving $(v_i)_{min} = \sqrt{2gR_E}$	**1**

24	 marking of yield point and fracture point	**Graph 1** **1 mark each**
25	1. Area of cross section of the bar (A). 2. Difference in temperature $(T_1 - T_2) = T$, between the two faces. 3. time 't' for which the heat flows 4. distance between the two faces 'd' of the bar. **Any three dependence**	**1 mark each**
26	*According to Boyle's law* $V \propto \frac{1}{P}$ when T is constant................(1) According to Charles law $V \propto T$ when P is constant ....(2) Arriving at $\boxed{PV = RT}$ is a perfect gas equation.	**1** **1** **1**
IV	**PART – D** **Answer any two**	
27	Explanation of V-t graph	**1**
	Correct graph	**1**
	$x = \frac{1}{2}(v - v_0)t + v_0 t$	**1**
	Arriving at $x = v_0 t + \frac{1}{2}at^2$	**2**
28	$F_s = -kx$	**1**
	Arriving at $W_s = -\frac{1}{2}kx_m^2$ when x_m is the extension	**1**
	$W_s = -\int_{x_i}^{x_f} kx\,dx = \frac{k x_i^2}{2} - \frac{k x_f^2}{2}$	**1**
	If the block is pulled from x_i and allowed to return x_i , $W_s = 0$ Here work done depends on end points only Hence spring force is conservative	**1+1**

29	Defintion	**1**
	$x = \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}$	**1**
	$y = \frac{m_1 y_1 + m_2 y_2}{m_1 + m_2}$	**1**
	$z = \frac{m_1 z_1 + m_2 z_2}{m_1 + m_2}$	**1**
	$\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$	**1**
V	**Answer any two**	
30	Graph	**1**
	Explanation	**2**
	Definition of latent heat of fusion	**1**
	Defintion of laent heat of vapourisation	**1**
31	Definition of beats	**1**
	$s_1 = a\cos\omega_1 t$ and $s_2 = a\cos\omega_2 t$	**1**
	$S = S_1 + S_2 = a(\cos\omega_1 t + \cos\omega_2 t)$	**1**
	Arriving at $S = [2a\cos\omega_b t] cas\omega_a t$	**1**
	Showing $\upsilon_{beat} = \upsilon_1 - \upsilon_2$	**1**
32	Definition	**1**
	Diagram	**1**
	Explanation of working	**3**
VI	**PART –E**	
33	The maximum height , $h_m = \frac{(v_0 \sin\theta_0)^2}{2g}$	**1**
	$h_m = 40m$	**1**
	The time taken to return to to same level $T_f = \frac{(v_0 \sin\theta)}{g} = 5.8s$	**1**
	$R = \frac{(v_0^2 \sin 2\theta_0)}{g}$	**1**
	$R = 276m$	**1**
34	Formula w.d = mgh =ρvgh$_{av}$ Substitution and calculation Arriving at 7.546×10^7J unit	**1** **2** **1** **1**

35	$g_m = \dfrac{GM_m}{R_m^{\,2}}$ - - - - - - - - - - - -(1) formula $g_E = \dfrac{GM_E}{R_E^{\,2}}$ - - - - - - - - - - - -(2) *dividing eqn* 1 *and* 2 $\dfrac{g_m}{g_E} = \dfrac{M_m}{M_E}\dfrac{R_E^{\,2}}{R_m^{\,2}}$ substitution and simplification arriving at $\dfrac{g_m}{g_E} = \dfrac{1}{4}$	**1** **1** **2** **1**
36	$Q = \dfrac{KA(T_1 - T_2)\,t}{x}$	**1**
	Substitution and arriving at $Q = 104976\text{J}$	**1**
	$Q = ml$	**1**
	$m = \dfrac{Q}{l} = 0.313\,\text{Kg}$	**1**
	Mass left after 6 hrs, 4 ï 0.313 = 3. 687 kg	**1**
37	i) a) $\upsilon' = \left(\dfrac{v - v_0}{v - v_s}\right)\upsilon$	**1**
	Substituion and arriving at $\upsilon' = 412.12$ Hz	**1**
	b) $\upsilon' = \left(\dfrac{v - v_0}{v + v_s}\right)\upsilon$	**1**
	Substitution and arriving at $\upsilon' = 384$	**1**
	ii) Speed of sound in each case = $340\,\text{ms}^{-1}$	**1**

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