Design of Question Paper

I PUC PHYSICS (33)

Time: 3 Hours 15 Minutes (of which 15 minutes for reading the question paper)

Max. Marks: 70

The weightage of the distribution of marks over different dimensions of the question paper is as follows:

A. Weightage Objectives:

Objective	Weightage	Marks
Knowledge	40%	46/115
Understanding	30%	34/115
Application	20%	23/115
Skill	10%	12/115

B. Weightage to content/ subject units:

Unit No.	Chapter No.	Topic	No. of Hours	Marks
I	1	Physical World	2	2
	2	Units and Measurement	4	4
II	3	Motion in a Straight Line	8	8
	4	Motion in a Plane	12	11
III	5	Laws of Motion	11	10
IV	6	Work, Energy and Power	11	11
V	7	System of Particles and Rotational Motion	12	11
VI	8	Gravitation	9	9
VII	9	Mechanical Properties of Solids	5	4
	10	Mechanical Properties of Fluids	5	5
	11	Thermal Properties of Matter	10	10
VIII	12	Thermodynamics	8	8
IX	13	Kinetic Theory	5	4
X	14	Oscillations	8	8
	15	Waves	10	10
TOTAL			120	115

C. Weightage to form of questions:

Part	Question Main	Type of Questions	Marks	Number of questions to be set	Number of questions to be answered
A	I	Multiple Choice Questions (MCQ)	1	15	15
	II	Fill in the blank type (FIB)	1	5	5
B	III	Short Answer (SA1)	2	9	5
C	IV	Short Answer (SA2)	3	9	5
D	V	Long Answer (LA)	5	6	3
	VI	Numerical Problems (NP)	5	4	2
TOTAL				**48**	**35**

Note:

1. Questions in I Main (MCQ) should be knowledge based only and should not involve numerical calculations.
2. Questions in IIMain (FIB) should be simple, direct and should not involve numerical calculations.

D. Weightage to level of difficulty:

Level	Weightage	Marks
Easy	40%	46/115
Average	40%	46/115
Difficult	20%	23/115

General instructions

1. This blueprint must be used for setting question papers for all future examinations.
2. Questions should be clear, unambiguous, understandable and free from grammatical errors.
3. Questions which are based on same concept, law, fact etc. and which generate the same answer should not be repeated under different forms (MCQ, FIB, SA1, SA2, LA and NP).

Blue Print for the Physics Question Paper
I PUC PHYSICS (33)

Unit	Chapter	Topic	Teaching Hours	Marks allotted	1 Mark (MCQ)	1 Mark (FIB)	2 Marks (SA1)	3 Marks (SA2)	5 Marks (LA)	5 Marks (NP)
I	1	Physical World	2	2			✓			
	2	Units and Measurement	4	4	✓			✓		
II	3	Motion in a Straight Line	8	8	✓		✓		✓	
	4	Motion in a Plane	12	11	✓		✓	✓		✓
III	5	Laws of Motion	11	10	✓	✓		✓	✓	
IV	6	Work, Energy and Power	11	11	✓		✓	✓	✓	
V	7	System of Particles and Rotational Motion	12	11	✓		✓	✓		✓
VI	8	Gravitation	9	9	✓	✓	✓		✓	
VII	9	Mechanical Properties of Solids	5	4	✓			✓		
	10	Mechanical Properties of Fluids	5	5	✓	✓		✓		
	11	Thermal Properties of Matter	10	10	✓ ✓			✓		✓
VIII	12	Thermodynamics	8	8	✓		✓		✓	
IX	13	Kinetic Theory	5	4	✓	✓	✓			
X	14	Oscillations	8	8	✓		✓		✓	
	15	Waves	10	10	✓	✓		✓		✓
TOTAL = 115 Marks			**120**	**115**	**15**	**05**	**18**	**27**	**30**	**20**

Instructions:

1. This blueprint must be used for setting question papers for all future examinations.
2. 5 Mark questions from chapters ***Gravitation*** and ***Oscillations*** must be split questions of the form (1 + 2 + 2) or (1 + 1 + 1 + 2) or (2 + 3) or (1 + 1 + 3).
3. 3 Mark Question from the chapter ***Work, Energy and Power***must be a numerical problem.

MODEL QUESTION PAPER FOR 2022-23

I PUC - PHYSICS (33)

Time: 3 hours 15 min. **Max Marks:** 70

General Instructions:

1. *All parts are compulsory.*
2. *Part – A questions have to be answered in the first two pages of the answer-booklet. For Part – A questions, first written-answer will be considered for awarding marks.*
3. *Answers without relevant diagram / figure / circuit wherever necessary will not carry any marks.*
4. *Direct answers to the 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: 15 × 1 = 15

1. The number of significant figures in 0.00230 is:

(A) 2 (B) 3

(C) 5 (D) 6

2. The slope of velocity – time graph gives:

(A) velocity (B) position

(C) displacement (D) acceleration

3. The direction of centripetal acceleration of a particle in circular motion is:

(A) towards the centre of the circle

(B) along the tangent to the circle

(C) away from centre of the circle

(D) along the perpendicular to the plane of motion.

4. When a moving bus suddenly stops, a passenger on it falls in the forward direction. This is due to:

(A) inertia of rest (B) inertia of motion

(C) inertia of motion (D) the bus pushes him in the forward direction

5. 1 kWh is equal to:

(A) 3.6×10^5 J (B) 3.6×10^6 J

(C) 4.2 J (D) 8.314 J

6. Dimensional formula for torque is same as that of:

(A) work (B) moment of inertia

(C) angular momentum (D) radius of gyration

7. Geostationary stationary satellites are used for the purpose of:

(A) remote sensing (B) meteorology

(C) environmental studies (D) telecommunication

8. Compressibility is the reciprocal of:

(A) Young's modulus (B) shear modulus

(C) bulk modulus (D) Poisson's ratio

9. SI unit of surface tension is:

(A) $N\ m^{-2}$ (B) $J\ m^{-2}$

(C) $N\ m^{-1}$ (D) $kg\ m^{-3}$

10. Sea breeze is:

(A) the convective movement of air from sea towards land during daytime

(B) the convective movement of air from land towards sea during daytime

(C) the convective movement of air from sea towards land during night

(D) the convective movement of air from land towards sea during night

11. The lowest possible temperature is:

(A) 0 °C (B) 0 °F

(C) 273.15 K (D) – 273.15 °C

12. The mathematical statement of first law of thermodynamics is given by (symbols have usual meanings):

(A) $\Delta Q + \Delta U + \Delta W = 0$ (B) $\Delta Q = \Delta U + \Delta W$

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

13. The molar specific heat at constant pressure for a monoatomic molecule is:

(A) $\frac{3R}{2}$ (B) $\frac{7R}{2}$

(C) $\frac{5R}{2}$ (D) $3R$

14. Among the following, which is an example for a motion which is periodic but not oscillatory?

(A) Motion of a simple pendulum

(B) Motion of a mass attached to a spring placed on a horizontal frictionless surface which is slightly displaced from its equilibrium position

(C) Uniform motion of a car on a straight track

(D) Motion of earth around sun

15. In the case of third harmonic of normal modes of an air column which is open at one end and closed at the other end:

(A) there are one node and one antinode

(B) there are two nodes and two antinodes

(C) there are two nodes and one antinode

(D) there are two antinodes and one node

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

(*adiabatic, mean free path, decreases, linear momentum, increases*)

16. When the total external force acting on an isolated system is zero, the _____ of the system remains constant.

17. As height from the surface of increases, the value of acceleration due gravity _____.

18. Pressure inside a fluid _____ with depth.

19. The average distance a molecule can travel without colliding is called _____.

20. According to Laplace, the sound propagation is _____ process.

PART – B

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

21. Name the (i) strongest force and (ii) weakest force in nature.

22. What is relative velocity? When will the relative velocity of two moving objects be zero?

23. Differentiate between scalars and vectors.

24. What are conservative forces? Give an example.

25. State and explain perpendicular axes theorem of moment of inertia.

26. Write the relation connecting g and G and explain the terms.

27. Write the differences between isothermal and adiabatic processes.

28. Mention any two postulates of kinetic theory of gases.

29. What are transverse waves? Give an example.

PART –C

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

30. Check the consistency of the equation $\frac{1}{2}mv^2 = mgh$using dimensional analysis (symbols have usual meanings).

31. Derive the expression time of flight of a projectile.

32. List any three methods of reducing friction.

33. A cyclist comes to a skidding stop in 10 m. During the process, the force on the cycle due to the road is 200 N and is directly opposed to the motion. How much work does the road do on the cycle?

34. Derive the relationship between torque and angular momentum.

35. State Hooke's law. Draw stress –strain curve for a metal like copper.

36. Write any three applications of Bernoulli's principle.

37. Mention any three properties of thermal radiation.

38. Define the terms: amplitude, frequency and wavelength of a wave.

PART –D

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

39. What is velocity – time graph? Derive $\Delta x = v_o t + \frac{1}{2} a t^2$ using $v - t$ graph.

40. State and prove the law of conservation of momentum using Newton's laws.

41. Derive the expressions for final velocities of the two objects undergoing elastic head-on collision.

42. (i) Define escape speed. (1)

(ii) Derive an expression for escape speed. (3)

(iii) What is the value of escape speed on the surface of earth? (1)

43. Explain the working of a Carnot's cycle.

44. (i) What is simple harmonic motion? (1)

(ii) Write the force law for simple harmonic motion. (1)

(iii) Derive an expression for the total energy of a particle executing SHM. (3)

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

45. A projectile is projectile has a maximum horizontal range of 40 m. Calculate (g = 10 m s^{-1}):

(i) Speed of projection of the projectile.

(ii) The maximum height reached by the projectile.

46. The angular speed of a motor wheel is increased from 1200 rpm to 3120 rpm in 16 seconds.

(i) What is its angular acceleration, assuming the acceleration to be uniform.

(ii) How many revolutions does the engine make during this time?

47. A cubical thermacole icebox of side 30 cm has a thickness of 5 cm. If 4 kg of ice is put in the box, estimate the amount of ice remaining after 6 hours. The outside temperature is 45 °C. (Given: Coefficient of thermal conductivity of thermacole is 0.01 W m^{-1} K^{-1} and heat of fusion of water is 335×10^3 J kg^{-1})

48. A rocket is moving at a speed of 200 m s^{-1} towards a stationary target. While moving it emits a wave of frequency 1000 Hz. Some of the sound reaching the target gets reflected as an echo. Calculate:

(i) the frequency of the sound as detected by the target and

(ii) the frequency of the echo as detected by the target.

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