11 MODAL QUESTIONS PAPER

PHYSICS

Time:3.00hrs Marks:75

INSTRUCTIONS :

(1)CHECK THE QUESTION PAPER FOR FAIRNESS OF PRINTING. IF THERE IS ANY LACK OF FAIRNESS, INFORM THE HALL SUPERVISOR IMMEDIATELY.

(2)USE BLUE OR BLACK INK TO WRITE AND UNDERLINE AND PENCIL TO DRAW DIAGRAMS.

PART - I

NOTE :

(I)ANSWER ALL THE QUESTIONS.

(II)CHOOSE THE MOST APPROPRIATE ANSWER FROM THE GIVEN FOUR ALTERNATIVES AND WRITE THE OPTION CODE AND THE CORRESPONDING ANSWER.

1.An air column in a pipe which is closed at one end, is in resonance with the vibrating body of frequency 83 Hz. Then the length of the air column is : (velocity of sound in air = 332 ms−1)

(a)1.5 m
(b)0.5M
(c)2.0 m
(d)1.0M

2.Which one of the following is a scalar quantity ?

(a)Speed
(b)Velocity
(c)Displacement
(d)Linear momentum

3.Human audible wavelength range (velocity of sound in air = 340 ms−1) is :

(a)17 m to 170 m
(b)0.17 m to 17 m
(c)0.017 m to 17 m
(d)1.7 m to 17 m

4.If the distance between the Earth and Sun is twice its present value, the number of days in a year will be :

(a)730
(b)1032
(c)64.5
(d)182.5

5.rms speed of hydrogen molecule at 278 C :

(a)193 kms−1
(b)1.93 kms−1
(c)19.3 kms−1
(d)0.193 kms−1

6.The efficiency of a heat engine working between the freezing point and boiling point of water is :

(a)12.5%
(b)6.25%
(c)20%
(d)26.8%

7.A BODY OF MASS 20 KG MOVING WITH A SPEED OF 10 MS^{-1} ON A HORIZONTAL SMOOTH SURFACE COLLIDES WITH A MASSLESS SPRING OF SPRING CONSTANT 5 N/M. IF THE MASS STOPS AFTER COLLISION, DISTANCE OF COMPRESSION OF THE SPRING WILL BE :

(A)10 M
(B)50 M
(C)5 M
(D)20 M

8.THE FIRST THREE FREQUENCIES OF HARMONICS OF A CLOSED ORGAN PIPE WILL BE IN THE RATIO :

(A)1 : 2 : 3
(B)1 : 3 : 5
(C)1 : 4 : 9
(D)2 : 4 : 6

9.WHICH OF THE FOLLOWING IS AN EXAMPLE OF NON-LINEAR TRIATOMIC MOLECULE ?

(A)WATER
(B)HYDROGEN
(C)HELIUM
(D)NITROGEN

10.AN OBJECT OF MASS 10 KG IS HANGING FROM A SPRING SCALE WHICH IS ATTACHED TO THE ROOF OF A LIFT. IF THE LIFT IS IN FREE FALL, THE READING IN THE SPRING SCALE IS :

(A)98 N
(B)ZERO
(C)49 N
(D)9.8 N

11.THE ENERGY CONSUMED IN ELECTRICAL UNITS WHEN A 60 W FAN IS USED FOR 8 HOURS DAILY FOR ONE MONTH (30 DAYS) IS NEARLY :

(A)14 UNITS
(B)18 UNITS
(C)16 UNITS
(D)20 UNITS

12.IF THE ERROR IN THE MEASUREMENT OF RADIUS OF A SPHERE IS 2%, THEN THE ERROR IN THE DETERMINATION OF ITS VOLUME WILL BE :

(A)8%
(B)2%
(C)4%
(D)6%

13. If a particle executes uniform circular motion in the xy plane in clockwise direction, then the angular velocity is in :

(A) +y direction
(B) +z direction
(C) −z direction
(D) −x direction

14. If S_P and S_V denote the specific heats of nitrogen gas per unit mass at constant pressure and constant volume respectively, then :

(A) $S_P - S_V = 28R$
(B) $S_P - S_V = R/28$
(C) $S_P - S_V = R/14$
(D) $S_P - S_V = R$

PART - II

6×2=14

Answer any six questions. Q. No. 24 is compulsory

15. Define precision and accuracy. Explain with one example

16. State Newton's Universal Law of Gravitation.

17. Define distance and displacement.

18. During a cyclic process, a heat engine absorbs 500 J of heat from a hot reservoir, does work and ejects an amount of heat 300 J into the surroundings (cold reservoir). Calculate the efficiency of the heat engine.

19. List the factors affecting the mean free path.

20. When walking on ice one should take short steps. Why ?

21. What is coefficient of restitution ?

22. What is radius of gyration ?

23. What are inertial frames?

24. If the length of the simple pendulum is increased by 44% from its original length, calculate the percentage increase in time period of the pendulum.

PART - III

6×3=18

Note : Answer any six questions. Q. No. 33 is compulsory

25. What are the limitations of dimensional analysis? (any-3)

26. Write any three applications of Surface Tension.

27. Using free body diagram, show that it is easy to pull an object than to push it.

28. Write any six postulates of kinetic theory of gases.

29. How do you distinguish between stable and unstable equilibrium?

30. State Kepler's three laws.

31. An object is thrown with initial speed 5 ms^{-1} with an angle of projection 308 . Calculate the maximum height reached and the horizontal range.

32. When a cricket player catches the ball, he pulls his hands in the direction of the ball's motion. Why ?

33. Calculate the amplitude, angular frequency, frequency, time period and initial phase of the simple harmonic oscillation for the given equation $y=0.3 \sin(40\pi t+1.1)$

PART - IV. 5×5=25

Note : Answer all questions.

34. (a) Explain the principle of homogeniety of dimensions. What are its uses? Give example.

OR

(b) Derive the expression for Carnot engine efficiency.

35. (a) Arrive at an expression for elastic collision in one dimension and discuss various cases.

OR

(b)What is a sonometer?. Give its construction and working. Explain how to determine the frequency of tuning fork using sonometer

36.(a) Derive the kinematic equations of motion for constant acceleration.

OR

(b)Discuss in detail the energy in simple harmonic motion.

37. (a) State and prove perpendicular axis theorem.

OR

(b)Describe the total degrees of freedom for monoatomic molecule, diatomic molecule and

triatomic molecule

38. (a) Explain the motion of blocks connected by a string in
i) Vertical motion

OR

(b) Explain in detail the Eratosthenes method of finding the radius of Earth.

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