

Roll No. of Candidate : _____

40J-42-21

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PHYSICS

(INTERMEDIATE PART - I) 321 - (I)

Paper-I Group-II

Time: 20 Minutes

OBJECTIVE ----- Code: 6472

Marks: 17

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

1. The dimensions of pressure are
(A) MLT^{-2} (B) ML^2T^{-2} (C) $ML^{-1}T^{-2}$ (D) MLT^{-3}
2. If $r = 2.25 \pm 0.01$ cm then (%) percentage uncertainty in r is
(A) 0.225% (B) 22.5% (C) 0.2% (D) 0.4%
3. If $\vec{A} = 4\hat{i} + 3\hat{j}$ then $\hat{A} =$
(A) $\frac{4\hat{i} + 3\hat{j}}{7}$ (B) $\frac{4\hat{i} + 3\hat{j}}{5}$ (C) $\frac{4\hat{i} + 3\hat{j}}{12}$ (D) $\frac{4\hat{i} + 3\hat{j}}{6}$
4. The SI unit for torque is
(A) Nm (B) Nm^{-1} (C) mN^{-1} (D) $N^{-1}m^{-1}$
5. If the water flows out from a pipe at 3 kg s^{-1} and its velocity changes from 5 ms^{-1} to zero on striking the wall then applied force is equal to
(A) 5N (B) 8N (C) 15N (D) 1.66N
6. The fuel consumed by a typical rocket is about
(A) 100 kg s^{-1} (B) 1000 kg s^{-1} (C) 10000 kg s^{-1} (D) 100000 kg s^{-1}
7. Kilowatt hour is a unit for
(A) energy (B) power (C) time (D) momentum
8. One revolution =
(A) $\frac{\pi}{2}$ rad (B) π rad (C) 2π rad (D) 4π rad
9. The moment of inertia of a sphere is given as
(A) $\frac{1}{2}mr^2$ (B) $\frac{2}{5}mr^2$ (C) $\frac{1}{5}mr^2$ (D) $\frac{1}{12}mr^2$
10. Torricelli's theorem can be written as
(A) $V = \sqrt{2g(h_1 - h_2)}$ (B) $V = 2g(h_1 - h_2)$ (C) $V = 2g\sqrt{(h_1 - h_2)}$ (D) $V = \sqrt{2g(h_1 - h_2)}$
11. The total distance travelled by an object with SHM, having amplitude A , in a time equal to its period is
(A) $\frac{A}{4}$ (B) $\frac{A}{2}$ (C) $2A$ (D) $4A$
12. If the wavelength of a wave is 1500 m and moves with a velocity of $3 \times 10^8 \text{ ms}^{-1}$, its frequency will be
(A) $5 \times 10^{-6} \text{ Hz}$ (B) $2 \times 10^5 \text{ Hz}$ (C) $45 \times 10^{10} \text{ Hz}$ (D) $3.15 \times 10^6 \text{ Hz}$
13. Waves transport
(A) energy (B) wavelength (C) power (D) mass
14. Bragg equation is given as
(A) $2d \sin \theta = n\lambda$ (B) $d \sin \theta = n\lambda$ (C) $2d = n\lambda$ (D) $2d = (n + \frac{1}{2})\lambda$
15. The least distance of distinct vision is
(A) 10 cm (B) 15 cm (C) 20 cm (D) 25 cm
16. Operating between the same two temperatures which heat engine is the most efficient?
(A) carnot engine (B) diesel engine (C) petrol engine (D) steam engine
17. The value of universal gas constant 'R' is
(A) $1.6 \text{ J mol}^{-1} \text{ K}^{-1}$ (B) $1.38 \text{ J mol}^{-1} \text{ K}^{-1}$ (C) $8.314 \text{ J mol}^{-1} \text{ K}^{-1}$ (D) $6.02 \text{ J mol}^{-1} \text{ K}^{-1}$

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PHYSICS

Time: 2:40 Hours

60J-42-21
(INTERMEDIATE PART - I) 321

SUBJECTIVE

Paper- I Group - II

Marks: 68

Note: Section I is compulsory. Attempt any THREE (3) questions from Section II.

(SECTION - I)

(2 x 8 = 16)

2. Write short answers to any EIGHT questions.

- Describe the methods to find uncertainty in the average value of many measurements.
- The time of 30 vibrations of simple pendulum recorded by a stop watch accurate upto one tenth of a second is 54.6 seconds. Find its uncertainty.
- By using dimensional analysis, find the dimension of power.
- Find the percentage uncertainty in the volume of a cylinder, if the percentage uncertainties in length and diameter of cylinder are 0.3% and 0.6% respectively.
- Write down the five steps to find addition of vectors by rectangular components.
- If $\vec{A} = 3\hat{i} - \hat{j}$ and $\vec{B} = 5\hat{k}$. Find the dot product of \vec{A} and \vec{B} vectors.
- Suppose the sides of a closed polygon represent vectors arranged by head-to-tail rule. What is the sum of these vectors?
- Show that impulse and momentum has same unit.
- At what point or points in its path does a projectile has its minimum speed, its maximum speed?
- In the absence of friction, then how the vertical and horizontal components of velocity change?
- How does the rocket propulsion take place?
- Explain what do you understand the term viscosity?

(2 x 8 = 16)

3. Write short answers to any EIGHT questions.

- A girl drops a cup from a certain height, which breaks into pieces, what energy changes are involved?
- When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?
- State work energy principle.
- Give the units and dimensions of angular velocity.
- Define moment of inertia. Give its units and dimension.
- Show that orbital angular momentum $L_o = mvr$.
- Define resonance. What are its types?
- What is difference between free and forced oscillations?
- What is relation between total energy, potential energy and kinetic energy of a body executing SHM?
- Why does sound travel faster in solids than in gases?
- How are beats useful in tuning musical instruments?
- Define node and antinode.

(2 x 6 = 12)

4. Write short answers to any SIX questions.

- Explain whether the Young's experiment is an experiment for studying interference or diffraction effects of light.
- The centre of Newton's rings is dark. why?
- How is the distance between interference fringes affected by the separation between the slits of Young's experiment?
- Why would it be advantageous to use blue light with a compound microscope?
- Write down two advantages of fibre optics over radio wave carriers.

(Turn Over)

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- vi. Explain that the average velocity of the molecules in a gas is zero but the average of the square of velocities is not zero.
- vii. Is it possible to convert internal energy into mechanical energy? Explain with an example.
- viii. Define isothermal and adiabatic processes.
- ix. State second law of thermodynamics.

(SECTION - II)

- 5. (a) Define projectile motion. Derive expressions for the height of the projectile and time of flight of the projectile. 1+2+2
- (b) Two forces of magnitude 10 N and 20 N act on a body in directions making angles 30° and 60° with x-axis respectively. Find the resultant force. 3
- 6. (a) Define conservative field and prove that work done is independent of the path followed by the body in gravitational field. 5
- (b) A car of mass 800 kg travelling at 54 km h^{-1} is brought to rest in 60 metres. Find the average retarding force on the car. 3
- 7. (a) State the Stokes' law and derive the equation of continuity. 1+4
- (b) What is the least speed at which an aeroplane can execute a vertical loop of 1.0 km radius So that there will be no tendency for the pilot to fall down at the highest point? 3
- 8. (a) What is simple pendulum? Show that the motion of pendulum is SHM. Also derive relation for its time period. 5
- (b) A heat engine performs 100 J work and at the same time rejects 400 J of heat energy to the cold reservoirs. What is the efficiency of the engine? 3
- 9. (a) Describe the principle, construction and working of Michelson's interferometer. How can you find the wavelength of light used? 5
- (b) An astronomical telescope having magnifying power of 5 consist of two thin lenses 24 cm apart. Find the focal lengths of the lenses. 3

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