

Physics (Objective)

(Group-I)

RWP-1-24

Time: 20 Minutes

Marks : 17

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

- 1.1 When temperature of air increases then the speed of sound will:
 (A) Decrease (B) Increase (C) Remain same (D) Be Zero
2. The distance between first and third crest in transverse wave is:
 (A) 2λ (B) 3λ (C) 4λ (D) 8λ
3. Wave front and light rays are always:
 (A) Parallel (B) Perpendicular (C) Antiparallel (D) At 120°
4. The advantage of graded index fibre over the step index fibre is due to no :
 (A) Refraction (B) Dispersion (C) Multiple reflection (D) Scattering
5. In the gas equation $Pv = RT$, where v represents volume of:
 (A) 1 g of gas (B) 1 mole of gas (C) 1 liter of gas (D) Any mass of gas
6. If $T_1 > T_2$ then $\frac{Q}{T_2} - \frac{Q}{T_1}$ is always:
 (A) Zero (B) Infinity (C) Negative (D) Positive
7. The dimension of $\sqrt{\frac{r \times t}{m}}$ is
 (A) $[LT^{-3}]$ (B) $[LT^{-2}]$ (C) $[MLT^{-1}]$ (D) $[LT^{-1}]$
8. The least count of a balance A is 10kg, of B is 1 kg, of C is 0.1 kg and of D is 0.01kg, which is most precise:
 (A) A (B) B (C) C (D) D
9. $\hat{i} \times (\hat{j} + \hat{k})$ is equal to:
 (A) 1 (B) 0 (C) $\hat{j} - \hat{k}$ (D) $\hat{k} - \hat{j}$
10. $\vec{A} = 5\hat{i} + 7\hat{j} - 3\hat{k}$ and $\vec{B} = 2\hat{i} + 2\hat{j} - a\hat{k}$ are perpendicular vectors, the value of 'a' is:
 (A) -2 (B) 8 (C) -7 (D) -8
11. A body is moving with uniform velocity, its acceleration will be:
 (A) Variable (B) Zero (C) Uniform (D) Positive
12. Which of the following can be determined by finding the slope of the tangent of the velocity time graph at a point is:
 (A) Acceleration (B) Momentum (C) Displacement (D) Average velocity
13. The work done in taking a body from the floor to the table top depends on:
 (A) The path taken (B) Height of the table (C) Speed of the particle (D) Time taken for work
14. " $mr\omega^2$ " is an expression for:
 (A) Gravitational force (B) Centripetal force (C) Newton's force (D) Apparent force
15. The rate of change of angular momentum is:
 (A) Force (B) Torque (C) Pressure (D) Density
16. The terminal velocity of an object in a fluid of greater viscosity is:
 (A) Large (B) Small (C) Maximum (D) Zero
17. A body performing SHM, the distance covered by body in complete vibration is 20 cm. its amplitude will be:
 (A) 5 cm (B) 10 cm (C) 20 cm (D) 40 cm

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Physics (Subjective)**Group-I**

RWP-1-24

Time: 2:40 hours

SECTION-I

(8x2=16)

2. Write short answers of any eight parts from the following:

- Does all physical measurements are accurate or precise, yes or not, explain.
- How do you calculate final uncertainty in a timing experiment?
- Find the dimension of coefficient of viscosity η in the relation $F = 6\pi\eta r v$.
- Name several repetitive phenomenon occurring in nature which could serve as reasonable time standards.
- How do you multiply a vector by a scalar number? vi. Can the magnitude of a vector have a negative value?
- Can a body rotate about its center of gravity under the action of its weight?
- Explain the circumstances in which the velocity and acceleration of a car are (i) Parallel (ii) Anti-parallel.
- Define impulse and how it is related to linear momentum? x. What is meant by a ballistic missile, how it works?
- An object has 1J of potential energy. Explain what does it mean? How much power does it have?
- A girl drops a cup from certain height, which breaks into pieces. Why it happens & what energy changes are involved?

(6x2=16)

3. Write short answers of any eight parts from the following:

- What is meant by angular momentum? Explain the law of conservation of angular momentum.
- When mud flies off the tyre of a moving bicycle, in what direction does it fly? Explain.
- Differentiate between tangential velocity and angular velocity. iv. Prove that $2 \text{ radian} = 114.6^\circ$
- A person is standing near a fast moving train. Is there any danger that he will fall towards it?
- What are systolic and diastolic pressures? vii. Does frequency depend on amplitude for harmonic oscillators?
- What is meant by phase angle? Does it define angle between maximum displacement and the driving force?
- Show that when a pendulum moves from mean position to half of amplitude, time taken by it is, $t = T/12$.
- A wave is produced along a stretched string but some of its particles permanently show zero displacement. What type of wave is it?
- Why does sound travels faster in solids than in gases?
- Find the temperature of air, if the velocity of sound is 340 ms^{-1} at the temperature.

(6x2=12)

4. Write short answers of any six parts from the following:

- Under what conditions two or more sources of light behave as coherent sources?
- How would you manage to get more orders of spectra using a diffraction grating?
- What is graphical representation of diffraction pattern of monochromatic light produced due to a single slit?
- What do you understand by linear magnification and angular magnifications?
- How power is lost in optical fiber through dispersion? Explain. vi. Name the parts of a spectrometer?
- Does entropy of a system increases or decreases due to friction?
- Is it possible to construct a heat engine that will not expel heat into the atmosphere?
- Draw a PV-diagram in case of isothermal process and adiabatic process.

SECTION-II

(8x3=24)

Note Attempt any three questions. Each question carries equal marks:

- (a) Derive the expression for the final velocities of two hard smooth balls after their elastic collision in one dimension. (5)
(b) Find the angle between the two vectors. $\vec{A} = 5\hat{i} + \hat{j}$ and $\vec{B} = 2\hat{i} + 4\hat{j}$ (3)
- (a) Which field is produced by the earth? Prove that the work done in this field is independent of the path followed and work done in a closed path be zero. (5)
(b) A stationary wave is established in a string which is 120cm long and fixed at both ends. The string vibrates in four segments, at a frequency of 120 Hz. Determine its wavelength and fundamental frequency. (3)
- (a) What is resonance phenomenon? Explain it with examples. (5)
(b) A gramophone record turntable accelerates from rest to an angular velocity of 45.0 rev / min in 1.60 seconds. What is the average angular acceleration. (3)
- (a) How does the pressure of a gas in a container is directly proportional to average translational kinetic energy. (5)
(b) An airplane wing is designed so that when the speed of the air across the top of the wing is 450 ms^{-1} , the speed of air below the wing is 410 ms^{-1} . What is the pressure difference between the top & bottom of the wings? (Density of air $= 1.29 \text{ kg m}^{-3}$) (3)
- (a) Discuss Michelson's interferometer in detail. (5)
(b) An astronomical telescope having magnifying power of 5 consist of two thin lenses 24cm apart. Find focal lengths of lenses. (3)