Physics (Objective)   (For All Sessions)   (Group-I)   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. Which one of the following cannot be polarized?

(A) UV Rays   (B) Radio Waves   (C) T.V waves   (D) Sound waves

2. The speed of light in a medium of refractive index 1.3 is:

(A) $1.3\,C$ (B) $\dfrac{1.3}{C}$ (C) $\dfrac{C}{1.3}$ (D) C

3. If the temperature of the source increases then efficiency of a Carnot engine:

(A) Increases   (B) Decreases   (C) Remains constant   (D) First increases then decreases

4. The S.I unit of molar specific heat is: (A) $J\,mol^{-1}\,K^{-1}$ (B) $J\,mol\,K^{-1}$ (C) $J\,mol\,K$ (D) $J\,mol$

5. The number of significant zeros in the number 0.00904 is / are:

(A) 1   (B) 2   (C) 3   (D) 4

6. The dimension of angular momentum "$\vec{L}$" are:

(A) $[ML\,T^{-1}]$ (B) $[ML^2\,T^{-1}]$ (C) $[ML^2\,T^{-2}]$ (D) $[ML^{-2}\,T]$

7. If $\vec{A} = 6\hat{i}$ and $\vec{B} = +6\hat{j}$ then angle of $\vec{A} + \vec{B}$ with $Y-axis$ is:

(A) 0^0 (B) 15^0 (C) 30^0 (D) 45^0

8. If $\vec{A}.\vec{B} = 0$ and $\vec{A}.\vec{C} = 0$ then vector $\vec{A}$ is parallel to:

(A) $\vec{B}$ (B) $\vec{C}$ (C) $\vec{B} \times \vec{C}$ (D) $\vec{B}.\vec{C}$

9. The velocity of an object dropped from a building at any instant 't' will be:

(A) $\dfrac{1}{2}\,g\,t$ (B) gt (C) $\dfrac{1}{2}\,gt$ (D) at

10. The slope of velocity-time graph of a body is constant. The body is moving with:

(A) Uniform velocity   (B) Variable acceleration   (C) Uniform acceleration   (D) Negative variable acceleration

11. Tidal energy is due to the gravitational pull of:

(A) Sun   (B) Earth   (C) Mars   (D) Moon

12. The angular velocity of the minute hand of a clock is:

(A) $2\pi\,rad\,S^{-1}$ (B) $\pi\,rad\,S^{-1}$ (C) $\dfrac{\pi}{60}\,rad\,S^{-1}$ (D) $\dfrac{\pi}{1800}\,rad\,S^{-1}$

13. If the linear velocity and radius are both made half for a body moving in a circle then centripetal force will be:

(A) $2F_c$ (B) $\dfrac{F_c}{2}$ (C) $\dfrac{F_c}{4}$ (D) F_c

14. The dimensions of 'sgh' are similar to that of:

(A) Pressure   (B) K.E   (C) Torque   (D) Power

15. If a pendulum oscillates with a frequency 0.5 Hz then its length will be:

(A) 10 cm   (B) 50 cm   (C) 80 cm   (D) 100 cm

16. Speed of sound at 10 degree Celsius is:

(A) $332\,ms^{-1}$ (B) $339\,ms^{-1}$ (C) $349\,ms^{-1}$ (D) $360\,ms^{-1}$

17. Velocity of sound has maximum value at 20^0C in:

(A) Lead   (B) Copper   (C) Glass   (D) Iron

Physics (Subjective)   **(GROUP-I)**   Time: 2:40 hours

SECTION-I   Rwp-11-1-23

2. Write short answers of any eight parts from the following: (8x2=16)

i. Why do we find it useful to have two units for the amount of substance, the kilogram and the mole?

ii. The period of a simple pendulum is measured by a stop watch. What types of errors are possible in the time period?

iii. What are the dimensions and units of gravitational constant G in the formula $F = G m_1 m_2/r^2$

iv. Check the correctness of the relation $V = \sqrt{\frac{F \times l}{m}}$, where V is speed of transverse wave on a stretched string.

v. Can a body rotate about its center of gravity under the action of its weight? Explain

vi. Name the three different conditions that could make $\vec{A}_1 \times \vec{A}_2 = \vec{0}$

vii. Explain briefly the right hand rule to find the direction of vector product.

viii. Can the velocity of an object reverse direction when acceleration is constant? If so give an example.

ix. Define impulse and show how it is related to linear momentum.

x. What happens when two bodies of same masses collide elastically?   xi. Derive a relation for the range of the projectile.

xii. A person is standing near a fast moving train. Is there any danger that he will fall towards it?

3. Write short answers of any eight parts from the following: (8x2=16)

i. Prove $P = \vec{F} \cdot \vec{V}$ ii. An object has 1 J of potential energy. Explain what does it mean?

iii. A boy uses a catapult to throw a stone which accidentally smashes a green house window. List the possible energy changes.

iv. Find out the relation between linear and angular velocity.

v. Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V transmission?

vi. Why does a diver change his body positions before and after diving in the pool?

vii. What should be the length of a simple pendulum whose period is 1.0 second at a place where $g = 9.8ms^{-2}$?

viii. Does frequency depend on amplitude for harmonic oscillators?

ix. Can we realize an ideal simple pendulum?   x. Write four applications of Doppler's Effect.

xi. Explain why sound travels faster in warm air than in cold air.   xii. Explain the terms crest, trough node and antinode.

4. Write short answers of any six parts from the following: (6x2=12)

i. What do you understand by the term "selective absorption" in polarization?

ii. How would you elaborate optical rotation?   iii. Calculate the speed of light in a glass of refractive index 1.5.

iv. Can visible light produce interference fringes? Explain your answer with proper reasons.

v. How would you elaborate the use of convex lens as magnifier? Make a diagram to support your answer.

vi. State Carnot Theorem and also state extended theorem by Carnot.

vii. How would you develop postulates of kinetic theory of gases which can help to formulate a mathematical model.

viii. What happens to the temperature of the room, when an air conditioner is left running on a table in the middle of the room?

ix. Can the mechanical energy be converted completely into heat energy? If so, give an example.

SECTION-II

Note   Attempt any three questions. Each question carries equal marks: (8x3=24)

5. (a) What is scalar product of two vectors? Write down its characteristics.   5

   (b) A force (thrust) of 400 N is required to overcome road friction and air resistance in propelling an automobile at 80 km / h. What power (KW) must the engine develop?   3

6. (a) Define centripetal force and prove that $Fc = \frac{mv^2}{r}$ 5

   (b) A truck weighing 2500kg and moving with a velocity of $21ms^{-1}$ collides with a stationary car weighing 1000kg. The truck and the care move together after the impact. Calculate their common velocity.   3

7. (a) State and explain Bernoulli's equation.   (b) Find the average speed of oxygen molecules in air at S.T.P.?   5+3=8

8. (a) How stationary waves are produced in a string? Show that harmonics are integral multiples of fundamental frequency?   5

   (b) A block of mass 4.0 kg is dropped for a height of 0.80m on to a spring of spring constant $= 1960 Nm^{-1}$. Find the maximum distance through which the spring will be compressed.   3

9. (a) Define telescope. Describe the construction of an astronomical telescope and derive an expression for its magnifying power.   5

   (b) Sodium light ($\lambda = 589\ nm$) is incident normally on a grating having 3000 lines per centimeter. What is the highest order of the spectrum obtained with this grating?   3