

Physics (Subjective)**(GROUP-I)**

Time: 2:40 hours

SECTION-I

2. Write short answers of any eight parts from the following: (8x2=16)
- Why do we find it useful to have two units for the amount of substance, the kilogram and the mole?
 - The period of a simple pendulum is measured by a stop watch. What types of errors are possible in the time period?
 - What are the dimensions and units of gravitational constant G in the formula $F = G \frac{m_1 m_2}{r^2}$?
 - Check the correctness of the relation $V = \sqrt{\frac{F \times l}{m}}$, where V is speed of transverse wave on a stretched string.
 - Can a body rotate about its center of gravity under the action of its weight? Explain.
 - Name the three different conditions that could make $\vec{A}_1 \times \vec{A}_2 = \vec{0}$.
 - Explain briefly the right hand rule to find the direction of vector product.
 - Can the velocity of an object reverse direction when acceleration is constant? If so give an example.
 - Define impulse and show how it is related to linear momentum.
 - What happens when two bodies of same masses collide elastically? xi. Derive a relation for the range of the projectile.
 - A person is standing near a fast moving train. Is there any danger that he will fall towards it? (8x2=16)
3. Write short answers of any eight parts from the following: (8x2=16)
- Prove $P = \vec{F} \cdot \vec{V}$ ii. An object has 1 J of potential energy. Explain what does it mean?
 - A boy uses a catapult to throw a stone which accidentally smashes a green house window. List the possible energy changes.
 - Find out the relation between linear and angular velocity.
 - Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V transmission?
 - Why does a diver change his body positions before and after diving in the pool?
 - What should be the length of a simple pendulum whose period is 1.0 second at a place where $g = 9.8 \text{ ms}^{-2}$?
 - Does frequency depend on amplitude for harmonic oscillators?
 - Can we realize an ideal simple pendulum? x. Write four applications of Doppler's Effect.
 - Explain why sound travels faster in warm air than in cold air. xii. Explain the terms crest, trough node and antinode. (6x2=12)
4. Write short answers of any six parts from the following: (6x2=12)
- What do you understand by the term "selective absorption" in polarization?
 - How would you elaborate optical rotation? iii. Calculate the speed of light in a glass of refractive index 1.5.
 - Can visible light produce interference fringes? Explain your answer with proper reasons.
 - How would you elaborate the use of convex lens as magnifier? Make a diagram to support your answer.
 - State Carnot Theorem and also state extended theorem by Carnot.
 - How would you develop postulates of kinetic theory of gases which can help to formulate a mathematical model.
 - What happens to the temperature of the room, when an air conditioner is left running on a table in the middle of the room?
 - 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)
- (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
 - (a) Define centripetal force and prove that $F_c = \frac{mv^2}{r}$ 5
 - (b) A truck weighing 2500kg and moving with a velocity of 21 ms^{-1} collides with a stationary car weighing 1000kg. The truck and the car move together after the impact. Calculate their common velocity. 3
 - (a) State and explain Bernoulli's equation. (b) Find the average speed of oxygen molecules in air at S.T.P.? 5+3=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 from 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
 - (a) Define telescope. Describe the construction of an astronomical telescope and derive an expression for its magnifying power. 5
 - (b) Sodium light ($\lambda = 589 \text{ nm}$) is incident normally on a grating having 3000 lines per centimeter. What is the highest order of the spectrum obtained with this grating? 3