

SECTION-I

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

(8x2=16)

- What are the dimensions and units of gravitational constant 'G' in the formula $F = G \frac{m_1 m_2}{r^2}$?
- How many years are in 1 second?
- Define light year. What are units and dimensions of light year?
- Show that $S = V_i t + \frac{1}{2} a t^2$ is dimensionally correct.
- Write down the steps for addition of vectors by rectangular component method.
- Is it possible to add a vector quantity to a scalar quantity? Explain.
- Can a body rotate about its center of gravity under the action of its weight?
- An object is thrown vertically upward. Discuss the sign of acceleration due to gravity, relative to velocity, while the object is in air.
- At what point or points in its path does a projectile has its minimum speed, its maximum speed?
- A rubber ball and lead ball of same size are moving with same velocity. Which ball has great momentum and why?
- Show that $\vec{l} = \Delta \vec{p}$
- Why fog droplets appear to be suspended in air?

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

(8x2=16)

- Calculate the work done in kilo joules in lifting a mass of 10 kg (at a steady velocity) through a vertical height of 10m.
- A girl drops a cup from a certain height, which breaks into pieces. What energy changes are involved?
- Describe the negative work with an example?
- What is meant by moment of inertia? Explain its significance.
- When mud flies off the tyre of a moving bicycle, in what direction does it fly?
- If a person is falling in an elevator freely. What will be his weight? Measured by himself.
- Does frequency depend on amplitude for harmonic oscillators?
- Describe two common phenomena in which resonance plays an important role.
- How long must a simple pendulum be in order to have a period of one second?
- How are beats useful in tuning musical instruments?
- Explain the term trough and node.
- What happens when a pebble is dropped into a quiet pond?

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

(6x2=12)

- An oil film spreading over a wet footpath shows colour. Explain how does it happen?
- How would you manage to get more orders of spectra using a diffraction grating?
- How coherent light beams can be produced? Explain.
- Why would it be advantageous to use blue light with a compound microscope?
- What do you mean by length of telescope?
- Explain the average velocity of the molecules in a gas is zero but the average of the square of velocities is not zero?
- Give an example of a process in which no heat is transferred to or from the system but the temperature of the system changes.
- Does entropy of a system increases or decreases due to heat engine?
- Define the 2nd law of thermodynamics.

SECTION-II

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

(8x3=24)

- Discuss the inter-conversion of potential energy and kinetic energy for falling object when friction force is not considered.
 - Find the angle between two forces of equal magnitude when the magnitude of their resultant is also equal to the magnitude of either of these forces.
- What is meant by artificial gravity? Prove that $f = \frac{1}{2\pi} \sqrt{\frac{g}{R}}$
 - A ball is thrown with a speed of 30 m.s^{-1} in a direction 30° above the horizon. Determine the height to which it rises and time of flight.
- Show that the product of cross sectional area of the pipe and fluid speed at any point along the pipe is constant.
 - 336J of energy is required to melt 1g of ice at 0°C . What is change in entropy of 30g of water as it is changed to ice at 0°C by a refrigerator?
- Why simple pendulum is called simple? Also derive the relation for time period and discuss how the time period depends upon length and gravity.
 - Find the temperature at which the velocity of sound in air is two times its velocity at 10°C .
- What is simple microscope? Calculate its magnifying power.
 - 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?