

Physics

Paper : I

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 (To be filled in by the candidate)

HSSC (11th) 2nd Annual 2022 Time : 2:40 Hours

Subjective Marks : 68

Note: Section B is compulsory. Attempt any 3 questions from Section C.

SECTION-B

2. Write short answers to any Eight parts. (8 x 2 = 16)

- i. What are the main frontiers of fundamental science?
- ii. What are the main causes of errors in measurements?
- iii. Give drawbacks to use the period of a pendulum as a time standard.
- iv. How many nanoseconds in one year? Calculate.
- v. Differentiate between elastic and inelastic collision with examples.
- vi. Discuss force due to water flow.
- vii. What is the difference between uniform and variable velocity?
- viii. At what point or points in its path does a projectile have its minimum speed and maximum speed?
- ix. Why entropy of universe always increases?
- x. Why Carnot's engine is also called four stroke engine?
- xi. Explain the average velocity of the molecules in a gas is zero, but the average of the square of velocities is not zero?
- xii. Is it possible to convert internal energy into mechanical energy? Explain with an example.

3. Write short answers to any Eight parts. (8 x 2 = 16)

- i. Name the three different conditions that could make $\vec{A}_1 \times \vec{A}_2 = \vec{0}$
- ii. Can a body rotate about its centre of gravity under the action of its weight? Explain it briefly.
- iii. Prove that vector addition is commutative.
- iv. What is non-conservative force? Give two examples.
- v. Describe in brief the common methods for the conversion of biomass into fuels.
- vi. A girl drops a cup from a certain height which breaks into pieces. What energy changes are involved?
- vii. Derive the relation for the rotational kinetic energy of the disc.
- viii. Discuss in brief the weightlessness in a satellite?
- ix. Why does a diver change his body positions before and after diving in the pool?
- x. How would you manage to get more orders of spectra using a diffraction grating?
- xi. Why the polaroid sunglasses are better than ordinary sunglasses?
- xii. Describe the uses of X-rays diffraction by crystals.

4. Write short answers to any Six parts. (6 x 2 = 12)

- i. What is spectrometer? Write the name of its main parts.
- ii. A magnifying glass gives a five times enlarge image at a distance of 25cm from the lens. Find, by ray diagram, the focal length of the lens.
- iii. Discuss briefly the effects of density and temperature on speed of sound in gases.
- iv. Explain the terms Crest, Trough, Node and Antinode.
- v. How should a sound source move with respect to an observer so that frequency of its sound does not change?
- vi. Write an application of damping.
- vii. Name two characteristics of simple harmonic motion.
- viii. If a mass spring system is hung vertically and set into oscillations. Why does the motion eventually stop?
- ix. Write the properties of an ideal fluid.

SECTION-C

(Each question carries Eight (8) Marks)

5. (a) How scalar product of two vectors is defined? Write down the four characteristics of scalar product. 5

(b) How large a force is required to accelerate an electron ($m = 9.1 \times 10^{-31}$ kg) from rest to a speed of 2×10^7 m s⁻¹ through a distance of 5.0 cm? 3

6. (a) Define and explain Law of Conservation of Linear Momentum. 5

(b) The Earth rotates on its axis once a day. Suppose by some process the Earth contracts so that its radius is only half as large as at present. How fast will it be rotating then? (For sphere $I = \frac{2}{5} MR^2$) 3

7. (a) Derive the formula for the speed of sound in air by Laplace correction. 5

(b) What gauge pressure is required in the city mains for a stream from a fire hose connected to the mains to reach a vertical height of 15.0 m? 3

8. (a) What is simple pendulum? Derive the relations for the time period and frequency. 5

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

9. (a) Describe the construction and working of an astronomical telescope. Also derive the relation for its magnifying power. 5

(b) Estimate the average speed of nitrogen molecules in air under standard conditions of pressure and temperature. 3

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