

Federal Board HSSC-I (2015)

PHYSICS HSSC-I

SECTION-A (Marks 17)

Time allowed: 25 Minutes

NOTE: - Section-A is compulsory and comprises pages 1-2. All parts of this section are to be answered on the question paper itself. It should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q1. Circle the correct option i.e. A / B / C / D. Each part carries one mark.

(i) Colour printing uses just following four colours to produce the entire range of colours:

- A. Violet - Magenta - Yellow - Black
B. Indigo-Blue-Green-Red
C. Black - Yellow - Magenta - cyan
D. Cyan - Magenta - Red - Violet

(ii) Light year is the unit of:

- A. Time
B. Distance
C. Angular displacement
D. Velocity

(iii) $\vec{A} \cdot \vec{j} = \underline{\hspace{2cm}}$?

- A. Zero
B. A_x
C. A_y
D. A_z

(iv) Two forces each of magnitude F act perpendicular to each other. Their resultant vector will have magnitude:

- A. $2F$
B. $2F^2$
C. $\sqrt{2}F$
D. $\frac{F}{\sqrt{2}}$

(v) A body is moving with constant velocity of 10 ms^{-1} in the North West direction. After 3 seconds its acceleration will be:

- A. 10 ms^{-2}
B. 20 ms^{-2}
C. 30 ms^{-2}
D. zero

(vi) Time taken by the projectile to move from its point of projection to the point of maximum height is given by:

- A. $\frac{2v_i \sin \theta}{g}$
B. $\frac{v_i \sin \theta}{g}$
C. $\frac{v_i \sin \theta}{2g}$
D. $\frac{v_i^2}{g} \sin 2\theta$

(vii) Maximum range of projectile is given by:

- A. $\frac{v_i^2}{2g}$
B. $\frac{2v_i}{g}$
C. $\frac{v_i^2}{g}$
D. $\frac{2v_i^2}{g}$

(viii) $45 \text{ rev / min} = \underline{\hspace{2cm}} \text{ rad / s.}$

- A. 90π
B. 4.71
C. 0.75
D. 90

(ix) For which position will the maximum blood pressure in the body have the smallest value?

- A. Standing upright
B. Sitting
C. Lying horizontally
D. Lying inclined

(x) What is the total distance travelled by an object moving with simple harmonic motion in a time equal to its time period, if its amplitude is x_0 ?

- A. zero
B. x_0
C. $2x_0$
D. $4x_0$

(xi) The projection of a particle moving in a circle executes simple harmonic motion. Its time period "T" = _____?

- A. $\frac{\omega}{2\pi}$
B. $\frac{2\pi}{\omega}$
C. $2\pi f$
D. $2\pi / t$

(xii) _____ of light proves that light consists of transverse electromagnetic waves.

- A. Interference
B. Diffraction
C. Polarization
D. Dispersion

(xiii) The distance between the objective and eye-piece of a telescope in normal adjustment is:

- A. $f_o + f_e$
B. $\frac{f_o}{f_e}$
C. $f_o - f_e$
D. $\frac{f_e}{f_o}$

(xiv) Nowadays, a new type of optical fibre is being used in which the central core has high refractive index and its density gradually decreases towards its periphery. This type of optical fibre is called:

- A. Single mode step index fibre
B. Multimode step index fibre
C. Multimode graded index fibre
D. Double step index fibre

(xv) For a geostationary satellite, the orbital radius measured from the centre of the Earth is:

- A. 38000 km
B. 42300 km
C. 64000 km
D. 72000 km

(xvi) If heat "Q" is absorbed or rejected by the system at corresponding temperature "T" when the system is taken through a Carnot cycle and "Q₁" is the heat absorbed or rejected by the system when it is at the temperature

of triple point of water, then unknown temperature "T" in Kelvin is given by:

- A. $273 \frac{Q}{Q_1}$
B. $273.16 \frac{Q_1}{Q}$
C. $273.61 \frac{Q_1}{Q}$
D. $273.16 \frac{Q}{Q_1}$

(xvii) What is S.I unit of Entropy?

- A. $\text{J kg}^{-1} \text{K}^{-1}$
B. J K^{-1}
C. J kg^{-1}
D. J kg K^{-1}

PHYSICS HSSC-I

Time allowed: 2:35 Hours Total Marks: Section B & C: 68

NOTE: - Section 'B' and 'C' comprises pages 1-2 and questions therein are to be answered on the separately provided answer book. Answer all questions from Section 'B' and Section 'C'. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers your neatly and legibly.

SECTION - B (Marks 42)

Q.2 Attempt any FOURTEEN parts. The answer to each part should not exceed 5 to 6 lines each. (14 × 3 = 42)

(i) What does dimension of physical quantity mean? Give two uses of dimension analysis.

(ii) Suppose we are told that the acceleration of a particle moving in a circle of radius "r" with uniform speed "v" is proportional to some power of "r", say r^n , and some power of "v", say v^m .

(iii) If $|\vec{A}| = |\vec{B}| = |\vec{R}|$ where $|\vec{R}|$ = Magnitude of the resultant vector. Find the angle between $|\vec{A}|$ and $|\vec{B}|$. Draw vector diagram also.

(iv) A picture is suspend from a wall by two strings. Show by diagram the configuration of the strings for which the tension in the strings will be minimum.

(v) Why is it useful to wear safety helmet while driving motorcycle?

(vi) Briefly describe the circumstances in which the velocity v and acceleration a of a car are:

- a. Parallel
b. Anti-parallel
c. Perpendicular to one another

(vii) What is Salter's duck? How is it used to run electricity generators.

(viii) What are photovoltaic cells? How can solar energy be stored to use it as electrical energy in the absence of sunlight?

(ix) Briefly describe gravity free system.

(x) How is the aeroplane lifted upwards?

(xi) Using Bernoulli's principle briefly describe the working of a carburetor of a motor car.

(xii) Draw the graph to discuss the effect of damping on the amplitude of a vibrating body. What do you conclude?

(xiii) What do "RADAR" and "SONAR" stand for? Which has larger wavelength: Sound or Light?

(xiv) A closed organ pipe has a length of 0.25m. Determine the frequencies of the fundamental and first two harmonics. (Speed of sound in air = 340 ms^{-1})

(xv) Why are natural crystals used for x-ray diffraction grating?

(xvi) State Huygen's principle. Also draw figure.

(xvii) An oil film spreading over a wet footpath shows colours. Explain how does it happen?

(xviii) What are the problems faced by astronomers while designing a telescope? Briefly describe their remedies.

(xix) Thermal pollution is an inevitable consequence of 2nd law of thermodynamics. How?

SECTION - C (Marks 26)

Note: Attempt any TWO questions. (2×13=26)

Q.3 a. What is Projectile motion? If a projectile is fired with velocity v_i which makes an angle θ with the horizontal, find the expression for the magnitude and direction of velocity at any instant "t". Also derive the expression for the following:

- (i) Height of the projectile
(ii) Time of flight of the projectile

b. A load of 10.0N is suspended from a clothes line. This distorts the line so that it makes an angle of 15° with the horizontal at each end. Find the tension in the clothes line.

Q.4 a. What is Simple Pendulum? Show that its motion is SHM? Derive the formula for its time period. On what factors does it depend?

b. A steel wire hangs vertically from a fixed point, supporting a weight of 80 N at its lower end. The diameter of the wire is 0.50

mm and its length from the fixed point to the weight is 1.5m. Calculate the fundamental frequency emitted by the wire when it is plucked.

Q.5 a. Why is it customary to define the molar specific heats of a gas in two ways? Define " C_v " and " C_p ". Why $C_p > C_v$? Prove that $C_p - C_v = R$

b. Light of wavelength 450 nm is incident on a diffraction grating on which 5000 lines/cm have been ruled.

(i) How many orders of spectra can be observed on either side of the direct beam?

(ii) Determine the angle corresponding to each other.