PHYSICS HSSC–I
SECTION – A (Marks 17)

Time allowed: 25 Minutes | **Version Number** | 3 | 0 | 8 | 1 |

Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which 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.

Q. 1 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

1) The branch of physics which deals with the velocities approaching the velocity of light is called:
A. Quantum mechanics **B.** Relativistic mechanics
C. Classical mechanics **D.** Wave mechanics

2) A force of $5N$ is acting along Y-axis. Its component along X-axis is:
A. $5N$ B. Zero **C.** $10N$ D. $2.5N$

3) If the vectors $\vec{A}$ and $\vec{B}$ are parallel or anti-parallel to each other, then:
A. $\vec{A}.\vec{B}=0$ B. $\vec{A}.\vec{B}=1$ **C.** $\vec{A}.\vec{B}=\pm AB$ D. $\vec{A}.\vec{B}=AB\,Sin\theta$

4) If 'm' is the mass of a gas ejected per second and 'M' is the mass of rocket, the acceleration of the rocket is:
A. $\vec{a}=\frac{m\vec{V}}{t}$ B. $\vec{a}=\frac{m\vec{V}}{M}$ **C.** $\vec{a}=\frac{M\vec{V}}{m}$ D. $\vec{a}=m\vec{V}t$

5) The maximum range of projectile is:
A. $R_{max}=\frac{Vi^2}{g}$ B. $R_{max}=\frac{2Vi}{g}$ **C.** $R_{max}=\frac{Vi}{g}$ D. $R_{max}=\frac{2Vi^2}{g}$

6) The total work done in moving a body along a closed path in a gravitational field is always equal to:
A. Maximum B. Zero **C.** Negative D. One Joule

7) The work needed to lift a body of mass 'm' from the surface of earth to an infinite distance is:
A. K.E of the body **B.** Absolute P.E of the body
C. P.E of the body **D.** Elastic P.E of the body

8) The time period of a circular motion is given by:
A. $T=rV$ B. $T=\omega V$ **C.** $T=2\pi\omega$ D. $T=\frac{2\pi}{\omega}$

9) The terminal velocity of a body falling through a fluid:
A. Increases with increasing mass **B.** Is independent of its mass
C. Decreases with increasing mass **D.** Increases with decreasing mass

10) If A, V, t denote area of a pipe, velocity of the fluid and time of flow respectively, then the rate of flow will be:
A. $\frac{AV}{t}$ B. AV **C.** $\frac{t}{AV}$ D. AVt

11) The time period of mass attached to a spring is:
A. $2\pi\sqrt{\frac{K}{m}}$ B. $2\pi\sqrt{\frac{m}{K}}$ **C.** $\frac{1}{2\pi}\sqrt{\frac{m}{K}}$ D. $\frac{1}{2\pi}\sqrt{\frac{K}{m^2}}$

12) Average value of applied force in a mass–spring system is:
A. Kx B. $+\frac{Kx}{2}$ **C.** 0 D. $-\frac{Kx}{2}$

13) A string of length 'l' can maintain the stationary waves of wavelength 'λ_n' is given by:
A. $\lambda_n=\frac{2l}{n}$ B. $\lambda_n=\frac{2n}{l}$ **C.** $\lambda_n=2ln$ D. $\lambda_n=\frac{l}{2n}$

14) The equation for Michelson's interferometer is:
A. $L=2m\lambda$ B. $L=\frac{1}{2}m\lambda$ **C.** $\lambda L=2m$ D. $\lambda L=\frac{1}{2m}$

15) Cladding in optical fibre is used to:
A. Absorb unnecessary light **B.** Produce total internal reflection
C. Transmit light **D.** Filter light

16) For the phenomenon of total internal reflection, the angle of incidence should be:
A. Equal to the critical angle **B.** Smaller than the critical angle
C. Greater than the critical angle **D.** Zero

17) The Boltzmann constant 'K' in terms of universal gas constant 'R' and Avogadro's number 'N_A' is given by:
A. $K=RN_A$ B. $K=\frac{R}{N_A}$ **C.** $K=\frac{N_A}{R}$ D. $K=nRN_A$

PHYSICS HSSC–I

Time allowed: 2:35 Hours **Total Marks Sections B, C and D: 68**

NOTE: Answer any seven parts each from section B and C and any two questions from section D on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)
(Chapters 1 to 6)

Q. 2 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) Under what conditions zeros are significant?

(ii) Show that the sum and the difference of two perpendicular vectors of equal lengths are also perpendicular and of the same lengths.

(iii) Differentiate between translational and rotational equilibrium.

(iv) State Newton's second law of motion in terms of momentum.

(v) A $20g$ ball hits the wall of a squash court with a large force of $50N$. If time of impact of force is $0.5s$. Find the impulse.

(vi) Prove that $P = \vec{F}.\vec{V}$

(vii) Define escape velocity. Write its two mathematical relations.

(viii) Explain the difference between tangential velocity and the angular velocity.

(ix) Describe and calculate what should be the minimum velocity, for a satellite, to orbit close to the earth around it.

(x) Why does the pipe of paper squeezes when air is blown through it?

SECTION – C (Marks 21)
(Chapters 7 to 11)

Q. 3 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) Does the acceleration of a simple harmonic oscillator remains constant during its motion? Is the acceleration ever zero? Explain briefly.

(ii) How can you compare the masses of two bodies by observing their frequencies of oscillation when supported by a spring?

(iii) Is it possible for two identical waves travelling in the same direction along a string to give rise to a stationary wave?

(iv) Describe the effect of pressure on the speed of sound mathematically.

(v) Explain why two distant flash lights will not produce an interference pattern.

(vi) What do you mean by grating element of a diffraction grating?

(vii) Explain the difference between angular magnification and resolving power of an optical instrument.

(viii) An octagonal mirror is rotating with frequency 'f'. Calculate the time of rotation of one of its sides.

(ix) Prove $< V^2 >= \frac{3P}{\rho}$

(x) Why is the efficiency of Carnot engine less than 100%? Give reasons.

SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. **(13 x 2 = 26)**

Q. 4 **a.** Describe the method of addition of vectors by rectangular components with figure. Also state its different steps for addition of vectors. **(3+1+2)**

b. The line of action of force, $\vec{F} = \hat{i} - 2\hat{j}$, passes through the points whose position vector is $(-\hat{j} + \hat{k})$. Find the moment of $\vec{F}$ about the point whose position vector is $(\hat{i} + \hat{k})$. **(04)**

c. How will you assess the total uncertainty in the final result? Explain it fully in any three cases. **(03)**

Q. 5 **a.** Explain, how can you calculate the work done by a variable force? Also draw its figure. **(5+1)**

b. How large a force is required to accelerate an electron $(m_e = 9.1 \times 10^{-31} kg)$ from rest to a speed of $2 \times 10^7 ms^{-1}$ through a distance of $5 cm$. **(04)**

c. Derive a relation for the force due to water flow on the wall. **(03)**

Q. 6 **a.** What is diffraction of light? Describe a diffraction grating and obtain the grating equation to find the wavelength of light used. **(1+2+3)**

b. A light is incident normally on a grating which has 2500 lines per centimetre. Compute the wave length of a spectral line for which the deviation in second order is $15°$. **(04)**

c. What is the difference between telescope and microscope? **(03)**

—— 1HS 1812 ——