

Version No.			
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Answer Sheet No. \_\_\_\_\_

Sign. of Candidate \_\_\_\_\_

Sign. of Invigilator \_\_\_\_\_

Section - A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

**PHYSICS HSSC-I**  
**SECTION - A (Marks 17)**  
**Time allowed: 25 Minutes**

حصہ اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر ناظم مرکز کے حوالے کریں۔ کات کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیزہ پنسل کا استعمال ممنوع ہے۔

ہر سوال کے سامنے دیے گئے درست دائرہ کو پر کریں۔

Fill the relevant bubble against each question:

1. Which of the following is the base unit of pressure?   $kg\ ms^{-1}$    $kg\ m^{-1}s^{-2}$    $kg\ m^2\ s^{-2}$    $kg\ m^{-2}\ s^{-1}$

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2. Error in the measurement of radius of sphere is 1%. The error in the calculated value of its volume is:  1%  2%  3%  4%

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3. If  $A_x = A_y$ , then the angle between vector  $\vec{A}$  and X-axis is:   $30^\circ$    $45^\circ$    $60^\circ$    $90^\circ$

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4. If the magnitudes of scalar and vector products of two vectors  $\vec{A}$  and  $\vec{B}$  are same, then angle between them will be:   $30^\circ$    $45^\circ$    $60^\circ$    $90^\circ$

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5. Distance covered by a freely falling body in 2 seconds will be:  9.8 m  4.9 m  29.4 m  19.6 m

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6. If a ball is thrown with a speed of  $30\ ms^{-1}$  in a direction  $30^\circ$  with X-axis, then time of flight is:  3s  4s  5s  6s

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7. If the radius of moon is 1600 km and g on the surface of moon is  $1.6\ ms^{-2}$ , then the escape velocity on moon is:   $1600\ ms^{-1}$    $1800\ ms^{-1}$    $2000\ ms^{-1}$    $2263\ ms^{-1}$

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8. The angular velocity of the second hand of a clock, in radians per second, is:   $\frac{\pi}{2}$    $\frac{\pi}{3}$    $\frac{\pi}{4}$    $\frac{\pi}{30}$

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9. Which of the following is TRUE for orbital velocity?   $v \propto r$    $v \propto \frac{1}{\sqrt{r}}$    $v \propto \frac{1}{r}$    $v \propto \sqrt{r}$

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10. A 2m high tank is full of water. If a hole appears at its middle, then the speed of efflux is:   $2.42\ ms^{-1}$    $3.42\ ms^{-1}$    $4.42\ ms^{-1}$    $5.42\ ms^{-1}$

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11. For what displacement the P.E becomes one fourth of its maximum value?   $x = x_0$    $x = \frac{x_0}{2}$    $x = \frac{x_0}{\sqrt{2}}$    $x = \frac{x_0}{4}$

12. A simple pendulum suspended from the ceiling of a lift has time period  $T$ , when the lift is at rest. When the lift falls freely, the time period is:  0   $\frac{T}{g}$    $\frac{g}{T}$   Infinite
13. Increase in velocity of sound in air for  $1^\circ\text{C}$  rise in temperature is:   $1.61\text{ms}^{-1}$    $61.0\text{ms}^{-1}$    $0.61\text{ms}^{-1}$    $0.16\text{ms}^{-1}$
14. The distance between two consecutive crests or troughs is equal to:   $\lambda$    $2\lambda$    $\frac{\lambda}{2}$    $\frac{\lambda}{4}$
15. It is possible to distinguish between transverse and longitudinal waves from the property of:  Refraction  Reflection  Polarization  Diffraction
16. For isothermal process, first law of thermodynamics can be written as:   $\Delta Q = \Delta U$    $\Delta Q = 0$    $\Delta Q = -\Delta U$    $\Delta Q = \Delta W$
17. According to first law of thermodynamics:   $\Delta U = \Delta W - \Delta Q$    $\Delta U = \Delta Q - \Delta W$    $\Delta W = \Delta Q + \Delta U$    $\Delta Q = \Delta U - \Delta W$

Important formulae:

- $V_{\text{sphere}} = \frac{4}{3}\pi r^3$
- $T_{\text{flight}} = \frac{2v_i \sin \theta}{g}$
- $v_{\text{esc}} = \sqrt{2gR}$
- $v_2 = \sqrt{2g(h_1 - h_2)}$
- $P.E_{\text{inst}} = \frac{1}{2}kx^2$
- $\omega = \frac{\theta}{t}$
- $v_o = 332\text{ms}^{-1}$  at  $0^\circ\text{C}$
- $C_p - C_v = R$
- $g = 9.8\text{ms}^{-2}$
- $|\vec{A} \cdot \vec{B}| = AB \cos \theta$
- $|\vec{A} \times \vec{B}| = AB \sin \theta$
- $S = r\theta$
- $P.E_{\text{max}} = \frac{1}{2}kx_o^2$
- $v_t = v_o + (0.61)t$
- $T = 2\pi\sqrt{\frac{l}{g}}$

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# PHYSICS HSSC-I

20

Time allowed: 2:35 Hours

Total Marks Sections B and C: 68

NOTE: Answer any FOURTEEN parts from Section 'B' and attempts any TWO questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

### SECTION – B (Marks 42)

- Q. 2 Answer any FOURTEEN parts. All parts carry equal marks. (14 x 3 = 42)
- From the Stokes' law, the drag force can be expressed as  $F_D = 6\pi\eta r v$ , then find the dimensions of coefficient of viscosity  $\eta$ ?
  - $\vec{A}$  and  $\vec{B}$  are two mutually perpendicular vectors equal in magnitude. Show their sum and difference through Head to Tail Rule with neat diagram.
  - Given  $|\vec{A}| = 3.2$ ,  $|\vec{B}| = 5.1$  and  $\theta = 60^\circ$  between  $\vec{A}$  and  $\vec{B}$ . Find  $|\vec{A} \cdot \vec{B}|$  and  $|\vec{A} \times \vec{B}|$
  - Briefly explain the circumstances in which velocity  $\vec{v}$  and acceleration  $\vec{a}$  of a car are:
    - Parallel
    - Anti parallel
  - The horizontal range of a projectile is 4 times of its maximum height ( $R = 4H$ ). What is its angle of projection?
  - When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?
  - Express power ( $P$ ) as scalar product of force ( $\vec{F}$ ) and velocity ( $\vec{v}$ ).
  - Derive a mathematical relation for orbital velocity and prove that  $v_o \propto \frac{1}{\sqrt{r}}$
  - A circular disc of  $49\text{kg}$  and radius  $50\text{cm}$  is rotating at a speed of  $120$  rev/min. Calculate its K.E?
  - Explain how swing is produced in a fast moving cricket ball? (Bernoulli effect)
  - What is meant by banking of roads? Also show that  $v = \sqrt{gr \tan \theta}$
  - The deviation of second order diffracted image formed by an optical grating having  $5000\text{lines/cm}$  is  $32^\circ$ . Calculate the wavelength of light used.
  - A body of mass  $m$  suspended from a spring with force constant  $k$ , vibrates with  $f_1$ . When its length is cut into half and same body is suspended from one of the halves, the frequency is  $f_2$ . Find out  $\frac{f_1}{f_2}$ ?
  - Why does sound travel faster in solids than in gases?
  - What will be the wavelength of the note emitted by a closed organ pipe  $32.4\text{cm}$  long at  $0^\circ\text{C}$ ?
  - Prove that speed of sound through Hydrogen is 4 times as compared to its speed in Oxygen. Whereas  $\rho_{\text{Hydrogen}} : \rho_{\text{Oxygen}} = 1 : 16$
  - An oil film spreading over a wet footpath shows colours. Explain how does it happen?
  - If the Young's double slit experiment is performed in water, what will happen to the interference pattern?
  - Briefly explain the working principle of Carnot engine.
  - Discuss that increase in entropy means degradation of energy.

### SECTION – C (Marks 26)

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

- Q. 3
- Explain vector and scalar products of two vectors with neat diagrams. (05)
  - Describe time of flight and range of projectile using diagram. Derive mathematical formulae for both. (04)
  - Show that  $S = v_i t + \frac{1}{2} a t^2$  is dimensionally correct. (04)
- Q. 4
- State and explain Bernoulli's Equation giving all details of it with diagram. (05)
  - Show that earth's gravitational field is a conservative field. (04)
  - The earth rotates on its axis once a day so that its original time  $T_1 = 24$  hours. Suppose, by some process the earth expands so that the radius becomes double as large as at present. Determine  $T_2$  (new time required for one revolution) after expansion using law of conservation of angular momentum. (04)
- Q. 5
- Show that motion of a simple pendulum is SHM. Derive formulae for its time period. (05)
  - Prove that  $v_t = v_0 + (0.61)t$  (04)
  - Derive  $C_p - C_v = R$  (04)

#### Important formulae:

$v_{\text{orbital}} = \sqrt{\frac{GM_e}{r}}$	$\omega = \frac{2\pi}{T}$	$\sin(2\theta) = 2 \sin \theta \cos \theta$
$R = \frac{v_i^2 \sin(2\theta)}{g}$	$H = \frac{v_i^2 \sin^2 \theta}{2g}$	$K.E_{\text{rot}} = \frac{1}{2} I \omega^2$
$I_{\text{disc}} = \frac{1}{2} m r^2$	$I_{\text{sphere}} = \frac{2}{5} m r^2$	