

Version No.			
3	0	8	1

ROLL NUMBER					



- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

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۔ کٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیز پینسل 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? $kg\ ms^{-1}$ $kg\ m^{-1}s^{-2}$ $kg\ m^2\ s^{-2}$ $kg\ m^{-2}s^{-1}$

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%

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

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° 45° 60° 90°

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

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

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: $1600\ ms^{-1}$ $1800\ ms^{-1}$ $2000\ ms^{-1}$ $2263\ ms^{-1}$

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

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

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

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°C rise in temperature is: 1.61ms^{-1} 61.0ms^{-1} 0.61ms^{-1} 0.16ms^{-1}
14. The distance between two consecutive crests or troughs is equal to: λ 2λ $\frac{\lambda}{2}$ $\frac{\lambda}{4}$
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:

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

—1HA-I 2208-3081 (L)—

ROLL NUMBER

--	--	--	--	--	--



Solved.PK

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 η ?
 - \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 49kg and radius 50cm 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 lines/cm is 32° . 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 32.4cm long at 0°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:

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

Version No.			
7	0	8	1

ROLL NUMBER					



- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

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

جسے اہل لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر ناظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ گھسنے کی اجازت نہیں ہے۔ لیڈ پینسل کا استعمال ممنوع ہے۔

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

Fill the relevant bubble against each question:

- Which of the following pairs has same dimension? Pressure, Density Impulse, Momentum Stress, Strain Momentum, Inertia
- The number of significant figures in 0.000125010 are: 3 4 5 6
- Two forces of magnitudes F_1 and F_2 acting at right angle to each other have the resultant of the magnitude: $\frac{F_1 + F_2}{2}$ $F_1^2 + F_2^2$ $\sqrt{F_1^2 + F_2^2}$ $\frac{F_1^2 + F_2^2}{2}$
- The distance covered by a body in time t , starting from rest is: at^2 $2at^2$ a^2t $\frac{1}{2}at^2$
- The horizontal range of projectile is same for the angles: 30° and 40° 40° and 50° 60° and 70° 80° and 90°
- A ball of mass 100g is thrown vertically upward at a speed of $25ms^{-1}$. If no energy is lost, determine the height it would reach. (Loss in K.E=Gain in P.E) 31.9m 1.28m 63.78m 321.5m
- The mass of a body is m , its speed is v and K.E is E . When mass is doubled and its speed is reduced to half, then K.E will be: $2E$ $\frac{E}{2}$ $4E$ $\frac{E}{4}$
- The angular displacement of one radian is: 47.3° 57.3° 67.3° 77.3°
- The ratio of the linear velocities of the points at distances r and $\frac{r}{4}$ from the axis of rotation of a rigid body is: 0.25 0.5 2 4
- Two rain drops have radii in the ratio 2:3. The ratio between their terminal velocities will be: 2:3 3:2 4:9 9:4

11. The length of a second pendulum is: 70cm 80cm 90cm 100cm
-
12. When amplitude of a wave becomes double, its energy becomes: 2 times $\frac{1}{2}$ times 4 times $\frac{1}{4}$ times
-
13. According to Laplace correction, sound travels in air under the condition of: Isothermal process Adiabatic process Isochoric process Isobaric process
-
14. The velocity of sound in air would become double to its velocity at 0°C at temperature: 313°C 586°C 819°C 1172°C
-
15. Fringe spacing = $L\frac{\lambda}{D}$ $D\frac{\lambda}{L}$ $\frac{\lambda}{DL}$ $\frac{L}{\lambda D}$
-
16. According to first law of thermodynamics, Which one is correct? $C_p + C_v = R$ $C_p = 1 + \frac{R}{C_v}$ $R = \frac{C_v}{C_p}$ $C_p = R + C_v$
-
17. A Carnot engine works between ice point and steam point. Its efficiency will be: 26.81% 53.36% 62.46% 71.23%

Important formulae:

- $P = \frac{F}{A}$
- $Density = \frac{M}{V}$
- $\vec{P} = m\vec{v}$
- $\delta = \frac{F}{A}$
- $\varepsilon = \frac{\Delta L}{L}$
- $\vec{J} = \vec{F} \times \Delta t$
- $v_t = v_o + (0.61)t$
- $T = 2\pi\sqrt{\frac{l}{g}}$
- $P.E = mgh$
- $\frac{v_t}{v_o} = \sqrt{\frac{T}{T_o}}$
- $g = 9.8\text{ms}^{-2}$
- $R = \frac{v^2 \sin(2\theta)}{g}$
- $\%Efficiency = \left(\frac{T_1 - T_2}{T_1}\right) 100\%$
- $S = r\theta$
- $\omega = \frac{\theta}{t}$
- $K.E = \frac{1}{2}mv^2$
- $v_o = 332\text{ms}^{-1}$ at 0°C
- $S = v_t t + \frac{1}{2}at^2$
- $2\pi \text{ radians} = 360^{\circ}$
- $V_{terminal} = \frac{2\rho gr^2}{9\eta}$

—1HA-I 2208-3081 (HA)—

ROLL NUMBER					



Solved.PK

PHYSICS HSSC-I

22

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)
- Briefly describe necessary conditions for SHM.
 - What is torque? Define torque as vector product of \vec{r} and \vec{F} .
 - For \vec{A} show that $|\vec{A}| = \sqrt{A_x^2 + A_y^2}$
 - Find the change in momentum for an object subjected to a given force for a given time and state law of motion in terms of momentum.
 - Two balls are projected in directions at 15° and 45° with the horizontal. If both attained the same range then find the ratio of their initial speeds.
 - Calculate the work done in kilojoules in lifting a mass of 10kg at a steady velocity through a vertical height of 10m?
 - If radius of moon is $\frac{1}{6}$ times radius of earth and gravity on moon is $\frac{1}{5}$ times gravity on earth, then find the escape velocity at the surface of moon?
 - Show that angular momentum $L = mvr$
 - Find the relation between linear velocity and angular velocity.
 - Discuss working principle of aerofoil.
 - Show that in SHM, the acceleration is zero when the velocity is greatest and the velocity is zero when the acceleration is greatest.
 - Discuss the interchanging between K.E. and P.E during SHM.
 - As a result of distant explosion, an observer senses a ground tremor and then hears the explosion. Explain the time difference in it.
 - The speed of sound in air at 0°C is 332ms^{-1} . What will be its speed at 25°C ?
 - Under what conditions two or more sources of light behave as coherent sources?
 - In Young's double slit experiment, if the distance between the slits is halved and distance between slit and screen is doubled, then find the change in fringe width?
 - A garden hose of inner radius 1.25cm carries water at 2.60ms^{-1} . The nozzle at the end has radius 0.30cm. How fast does the water emerge out through the nozzle?
 - Show that $\frac{n_2}{n_1} = \tan i_p$ (polarization of transverse waves)
 - Is it possible to convert internal energy (ΔU) into mechanical energy? Explain with an example.
 - Describe the terms 'specific heat' and 'molar specific heat' of gases.

SECTION - C (Marks 26)

- Note: Attempt any TWO questions. All questions carry equal marks. (2 x 13 = 26)
- Q. 3 a. Explain vector and scalar products of two vectors with neat diagrams. (05)
 b. Describe two conditions of equilibrium. (04)
 c. What are the dimensions and units of gravitational constant G in the formula $F = \frac{Gm_1m_2}{r^2}$? (04)
- Q. 4 a. Explain and derive a mathematical relation for Absolute Potential Energy. (05)
 b. What is meant by moment of inertia of a body? Derive a formula for it. (04)
 c. What is the aero foils lift (in newtons) on a wing of area 88m^2 if the air passes at speed over its top surface at 280ms^{-1} and bottom surface at 150ms^{-1} ? (04)
- Q. 5 a. Explain Doppler's effect in detail with its special cases. (05)
 b. The radius of sphere ' r ' is measured with a Vernier Callipers as $(r \pm \Delta r) = (2.25 \pm 0.01)\text{cm}$. Calculate the volume of sphere. (04)
 c. A Carnot engine utilizes an ideal gas. The source temperature is 227°C and sink temperature is 127°C . Find the efficiency of the engine. Also find heat input from the source and heat rejected to the sink when 10000J of work is done? (04)

Important formulae:

$$\begin{aligned} & \bullet \text{ Fringe Spacing} = L \frac{\lambda}{D} & \bullet R = \frac{v_i^2 \sin(2\theta)}{g} & \bullet \text{ Work} = \vec{F} \cdot \vec{d} & \bullet v_i = v_o + (0.61)t & \bullet v = r\omega \\ & \bullet v_{esc} = \sqrt{2gR} & \bullet \text{ Weight} = mg & \bullet v_o = x_o \sqrt{\frac{k}{m}} & \bullet \% \text{ Efficiency} = \left(\frac{T_1 - T_2}{T_1} \right) \times 100\% = \left(\frac{Q_1 - Q_2}{Q_1} \right) \times 100\% \end{aligned}$$