Roll No. | | | | | | |

Answer Sheet No._____

Sig. of Candidate._____

Sig. of Invigilator._____

17

PHYSICS HSSC–I

SECTION – A (Marks 17)

Time allowed: 25 Minutes

NOTE: Sections–A is compulsory and comprises page 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.

Q. 1 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) $\vec{A}.\hat{j} =$ _____?

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 rev / min = _____ 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_o ?

A. zero B. x_o C. $2x_o$ D. $4x_o$

(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. $2\pi ft$

(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. 36000 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 "Q_3" 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. $273\frac{Q}{Q_3}$ B. $273.16\frac{Q_3}{Q}$ C. $273.61\frac{Q_3}{Q}$ D. $273.16\frac{Q}{Q_3}$

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

A. $J\,kg^{-1}k^{-1}$ B. $J\,k^{-1}$ C. $J\,kg^{-1}$ D. $J\,kgk^{-1}$

For Examiner's use only:

Total Marks:	17
Marks Obtained:	

PHYSICS HSSC–I

18

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

NOTE: Sections B and C comprise pages 1-2. Answer any fourteen parts from Section 'B' and any two questions from Section 'C' 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 42)

Q. 2 Answer any FOURTEEN parts. The answer to each part should not exceed 3 to 4 lines. (14 x3 = 42)

(i) What does dimension of a physical quantity mean? Give two uses of dimensional 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. Using dimensional analysis, determine the powers of "r" and "v".

(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 suspended 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 $\vec{v}$ and acceleration $\vec{a}$ 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 a 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 0.25 m. 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 instead of diffraction grating?

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

(xvii) An oil film spreading over a wet footpath shows colours. Briefly describe 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. All questions carry equal marks.** **(2 x 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 expressions for magnitude and direction of velocity at any instant "t". Also derive the expressions for the following: **08**

(i) Height of Projectile (ii) Time of flight of 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^{o} with the horizontal at each end. Find the tension in the clothes line. **05**

Q.4 **a.** What is Simple Pendulum? Show that its motion is simple harmonic. Derive the formula for its time period. On what factors does it depend? **08**

b. A steel wire hangs vertically from a fixed point, supporting a weight of 80 N at its lower end. The diametre of the wire is 0.50 mm and its length from the fixed point to the weight is 1.5 m. Calculate the fundamental frequency emitted by the wire when it is plucked.

(Density of steel wire = $7.8\times10^{3} kgm^{-3}$) **05**

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 $C_p - C_v = R$ **08**

b. Light of wavelength 450 nm is incident on a diffraction grating on which 5000 lines / cm have been ruled: **05**

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

(ii) Determine the angle corresponding to each order.

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Answer Sheet No._____ 19

Sig. of Candidate._____

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PHYSICS HSSC–I

SECTION – A (Marks 17)

Time allowed: 25 Minutes

NOTE: Sections–A is compulsory and comprises page 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.

Q. 1 Circle the correct option i.e. A / B / C / D. Each part carries one mark.

(i) Steradian is the unit of:

A. Plane angle B. Solid angle

C. Angular velocity D. Angular acceleration

(ii) What are the dimensions of coefficient of viscosity?

A. ML^2T^{-2} B. ML^2T^{-1} C. $M^{-1}L^3T^{-2}$ D. $ML^{-1}T^{-1}$

(iii) If x - component of a vector (F_x) is positive and its y -component (F_y) is negative and $\tan^{-1}\left(\frac{F_y}{F_x}\right)=\phi$ then the angle θ which the resultant vector makes with the positive $x-axis$ is given by:

A. $\theta=\phi$ B. $\theta=180^o-\phi$ C. $\theta=180^o+\phi$ D. $\theta=360^o-\phi$

(iv) $\vec{A}.\hat{k}=$ _____?

A. A_x B. A_y C. A_z D. zero

(v) The product of Force and Time is called:

A. Impulse B. Linear Momentum

C. Angular momentum D. Torque

(vi) For which of the following pairs of angles is range of Projectile the same?

A. 0^o and 45^o B. 15^o and 60^o

C. 35^o and 55^o D. 30^o and 75^o

(vii) A particle of mass "m" has momentum "p". Its kinetic energy is given by:

A. $\frac{1}{2}mp$ B. $\frac{1}{2}mp^2$ C. $\frac{2p^2}{m}$ D. $\frac{1}{2}\frac{p^2}{m}$

(viii) What is the commercial unit of electrical energy?

A. Watt B. Kilowatt

C. Kilowatt hour D. Horse power

DO NOT WRITE ANYTHING HERE

(ix) A stone tied to the end of 20 cm long string is whirled in a horizontal circle. If the centripetal acceleration is $9.8\,m.s^{-2}$, then its angular velocity in $rad.s^{-1}$ will be:

A. 0.49 B. 7 C. 14 D. 21

(x) The terminal velocity of a fog droplet of radius "r" and density ρ moving in a fluid having coefficient of viscosity η is given by:

A. $\frac{2gr^2\rho}{9\eta}$ B. $\frac{mg}{6\pi\eta rv}$ C. $\frac{4g}{3\pi\eta r}$ D. $\frac{2\eta r^2}{9\rho}$

(xi) $1\ torr =$ _____ $N.m^{-2}$

A. 1.33 B. 13.33 C. 133.3 D. 1.0

(xii) The maximum velocity "v_o" of the vibrating mass "m" attached to the end of an elastic spring is given By:

A. $x_o\sqrt{\frac{m}{k}}$ B. $x_o\sqrt{\frac{k}{m}}$ C. $x\sqrt{\frac{k}{m}}$ D. $x\sqrt{\frac{m}{k}}$

(xiii) The periodic vibrations of sound between maximum and minimum loudness are called:

A. Intensity level B. Diffraction C. Beats D. Polarization

(xiv) Bragg's equation is given by:

A. $d\sin\theta = n\lambda$ B. $2d\sin\theta = n\lambda$

C. $L = m\frac{\lambda}{2}$ D. $\Delta y = \frac{\lambda L}{d}$

(xv) The equation used by Michelson to determine the speed of light is given by: $c =$ _____.

A. $16fd$ B. $\frac{16f}{d}$ C. $\frac{fd}{16}$ D. $\frac{16d}{f}$

(xvi) The efficiency of diesel engine is about:

A. 20 % to 25 % B. 25 % to 30 % C. 30 % to 35 % D. 35 % to 40 %

(xvii) What is S.I Unit of latent heat of fusion?

A. $J\,kgk^{-1}$ B. $J\,kg^{-1}$ C. $J\,kg^{-1}k^{-1}$ D. $cal.gm.^oC^{-1}$

For Examiner's use only:

Total Marks:	17
Marks Obtained:	

PHYSICS HSSC–I

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

NOTE: Sections B and C comprise pages 1-2. Answer any fourteen parts from Section 'B' and any two questions from Section 'C' 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 42)

Q. 2 Answer any FOURTEEN parts. The answer to each part should not exceed 3 to 4 lines. (14 x3 = 42)

(i) If $\vec{A} = A_x\hat{i} + A_y\hat{j} + A_z\hat{k}$ then prove that $|\vec{A}| = \sqrt{A_x^2 + A_y^2 + A_z^2}$

(ii) If $\vec{A} = \hat{i} + \hat{j} + \hat{k}$

$\vec{B} = 2\hat{i} - 3\hat{j} + \hat{k}$

$\vec{C} = 4\hat{i} + \hat{j} - 5\hat{k}$

then show that $\vec{A}$, $\vec{B}$ and $\vec{C}$ are mutually perpendicular.

(iii) What is meant by Ballistic flight? Define Ballistic missile.

(iv) What is the effect on the speed of a fighter plane chasing another when it opens fire? What happens to the speed of pursued plane when it returns the fire?

(v) By using formula, describe, at what point or points in its path does a projectile have its:

a. Minimum speed b. Maximum speed

(vi) How much solar energy does enter the Earth's atmosphere at normal incidence and how much this value is reduced on reaching the Earth's surface? Give reason for this reduction.

(vii) Why does a diver change his body positions before and after diving in the pool?

(viii) Briefly describe how swing is produced in a fast moving cricket ball.

(ix) Name the medical terms for high and low blood pressures. What are their ranges for a normal healthy person? Why do these values change as the person gets older?

(x) Shock absorber of a car is an application of which type of oscillation? What does the shock absorber do?

(xi) Briefly describe the principle and working of microwave oven.

(xii) Find the temperature at which the velocity of sound in air is two times its velocity at $10^{o}C$.

(xiii) Briefly explain the terms "**Blue Shift**" and "**Red Shift**".

(xiv) Why does the centre of Newton's ring appear dark?

(xv) Why are the polarized sunglasses better than ordinary sunglasses?

(xvi) Describe with the help of diagrams, how:

a. A single biconvex lens can be used as a magnifying glass?

b. Biconvex lens can be arranged to form a microscope?

(xvii) Name and define the major components of a fibre optic communication system.

(xviii) The maximum efficiency of a Carnot's engine can never be 100 %. Why?

(xix) What is the average translational kinetic energy of molecules in a gas at temperature of $27^{o}C$?

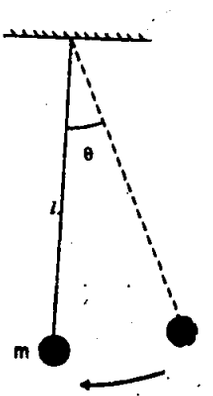
(K=Boltzman's Constant= $1.38\times10^{-23}\,Jk^{-1}$)

SECTION – C (Marks 26)

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

Q.3 **a.** Two forces $\vec{A}$ and $\vec{B}$ are acting on a body. The angle between them is "θ ". Assuming $\vec{A}$ along the positive $x-axis$, derive the expressions for magnitude and direction of the resultant force. **08**

b. Derive a relation for the time period of a simple pendulum using dimensional analysis. The various possible factors on which the time period "T" may depend are: **05**



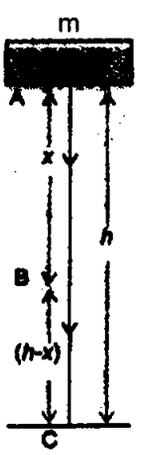
(i) Length of the pendulum (l)

(ii) Mass of the bob (m)

(iii) Angle 'θ' which the thread makes with the vertical

(iv) Acceleration due to gravity (g)

Q.4 **a.** Consider a body of mass "m" at rest, at a height "h" above the surface of the Earth as shown in the figure. When it falls under the action of gravity, calculate the **Potential energy**, **Kinetic energy** and **Total energy** at positions "A", "B" and "C". Also draw conclusions when: **08**



(i) There is no frictional force

(ii) Frictional force " f " is present

b. A compound microscope has lenses of focal length 1.0 cm and 3.0 cm. An object is placed 1.2 cm from the object lens. If a virtual image is formed 25 cm from the eye, calculate the separation of the lenses and the magnification of the instrument. **05**

Q. 5 **a.** What is Doppler's effect? Obtain an expression for modified frequency in the following cases: **08**

(i) If an observer moves towards the source with velocity u_o.

(ii) If the source moves towards the observer with velocity u_s.

b. A Carnot engine whose low temperature reservoir is at 7^oC has an efficiency of 50%. It is desired to increase the efficiency to 70%. By how many degrees the temperature of the source be increased? **05**