Roll No. | | | | | | | Answer Sheet No._____

Sig. of Candidate._____ Sig. of Invigilator._____

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.

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

(i) The dimension of gravitational constant "G" is_____

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

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

(ii) The S.I unit of time is_____

A. 60 min B. Cesium Sec.

C. Krypton-86 D. 60 Sec.

(iii) A 1 kg block slides down a smooth inclined plane whose height is 5 m. The velocity of the body at the bottom is_____ .

A. $\sqrt{9.8}\ ms^{-2}$ B. $5ms^{-1}$

C. $9.8ms^{-2}$ D. $7\sqrt{2}\ ms^{-1}$

(iv) What is the angle between the two vectors? $\vec{A} = 5\hat{i} + \hat{j}$ and $\vec{B} = 2\hat{i} + 4\hat{j}$?

A. 66^0 B. 52^0 C. 25^0 D. 33^0

(v) A ball is thrown above the horizon, making an angle of 30^0. The height attained by the ball is 11.5 m. The launching velocity of the ball is_____

A. $20ms^{-1}$ B. $60ms^{-1}$ C. $30ms^{-1}$ D. $45ms^{-1}$

(vi) A brick of mass 2.0 kg is dropped from a rest position 5.0m above the ground. Its velocity at a height of 3.0m above the ground will be_____

A. $3.6ms^{-1}$ B. $8.6ms^{-1}$

C. $6.3ms^{-1}$ D. $7.8ms^{-1}$

(vii) The expression for spinning frequency to create artificial gravity in satellite is_____

A. $f = \frac{1}{2\pi}\sqrt{g/R}$ B. $f = 2\pi\sqrt{g/g}$

C. $f = \frac{1}{2\pi}\sqrt{g/g}$ D. $f = 2\pi\sqrt{g/R}$

(viii) A gramophone record turntable accelerates from rest to an angular velocity of 45.0 rev min^{-1} in 1.60 s. The average angular acceleration is_____

A. $29.5rad\,s^{-2}$ B. $2.95rad\,s^{-2}$

C. $2.95rev\,s^{-2}$ D. None of these

(ix) The expression for terminal velocity is_____

A. $V_t = \frac{2r^2\rho}{9\eta g}$ B. $V_t = \frac{2gr^2}{9\eta\rho}$

C. $V_t = \frac{2gr^2\rho}{9\eta}$ D. $V_t = \frac{2g\eta r^2}{9\rho}$

DO NOT WRITE ANYTHING HERE

(x) The instantaneous P.E of spring mass system is given by_____

A. $P.E_{max} = \frac{1}{2}kx_0^2$ B. $P.E = \frac{1}{2}kx_0^2$

C. $P.E = \frac{1}{2}k^2x$ D. $P.E = \frac{1}{2}kx^2$

(xi) A simple pendulum is 50.0cm long. Its frequency of vibration at a place where g= $9.8ms^{-2}$ is_____

A. 0.70 Hz B. 7Hz

C. 6.2 Hz D. 10 Hz

(xii) The temperature at which the velocity of sound in air is two times its velocity at 10^0C is_____

A. 1321 K B. 1213 K

C. 1132 K D. 1231 K

(xiii) For destructive interference path difference between two sound waves is_____

A. $S = n\lambda + \lambda$ B. $S = (2n+1)\frac{\lambda}{2}$

C. $S = (2+\frac{1}{\lambda})n$ D. $S = n\lambda$

(xiv) The frequency for nth mode of vibration for stationary longitudinal waves in a pipe open at both ends is_____

A. $f_n = \frac{nV}{4\ell}$ B. $f_n = \frac{4\ell}{nv}$

C. $f_n = \frac{2\ell}{nv}$ D. $f_n = \frac{nV}{2\ell}$

(xv) In case of X-ray diffraction by crystal the wavelength can be found by using the equation_____

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

C. $2d\cos\theta = n\lambda$ D. $d\cos\theta = n\lambda$

(xvi) An astronomical telescope having magnifying power of 5 consist of two thin lenses 24 cm apart. The focal length of the lenses is_____.

A. 4cm B. 20cm

C. 16 cm D. None of these

(xvii) An ideal reversible heat engine has_____

A. 100% efficiency

B. Highest efficiency

C. An efficiency which depends on the nature of working substance

D. None of these

For Examiner's use only:

Total Marks:	17
Marks Obtained:	

PHYSICS HSSC–I

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

NOTE:- 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 Attempt any FOURTEEN parts. The answer to each part should not exceed 3 to 4 lines. (14 x3 = 42)

(i) Why do we find it useful to have two units for the amount of substance, the kilogram and the mole?

(ii) Show that the famous "Einstein equation" $E = mc^2$ is dimensionally correct.

(iii) Find the projection of vector $\vec{A} = 2\hat{i} - 8\hat{j} + \hat{k}$ in the direction of the vector $\vec{B} = 3\hat{i} - 4\hat{j} - 12\hat{k}$

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

(v) A 1500 kg car has its velocity reduced from $20ms^{-1}$ to $15ms^{-1}$ in 3.0 sec. How large was the average retarding force?

(vi) Can the velocity of an object reverse the direction when acceleration is constant?

(vii) What is meant by Projectile motion?

(viii) Human metabolism provides an example of law of conservation of energy. Explain on the basis of the 1st law of thermodynamics.

(ix) How does Diesel engine work?

(x) A thermos flask containing milk as a system is shaken rapidly. Does the temperature of milk rise?

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

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

(xiii) A disc and a hoop start moving down from the top of an inclined plane at the same time. Which one will be moving faster on reaching the bottom?

(xiv) A boy uses a catapult to throw a stone which accidentally smashes a greenhouse window. List the possible energy changes.

(xv) What happens to the period of a simple pendulum if its length is doubled? What happens if the suspended mass is doubled?

(xvi) Why would it be advantageous to use blue light with a compound microscope?

(xvii) In "Newton's rings" at the point of contact of the lens and the glass plate, the spot is dark. Why?

(xviii) How are beats useful in tuning musical instruments?

(xix) How should a sound source move with respect to an observer so that the frequency of its sound does not change?

SECTION – C (Marks -26)

Note:- Attempt any TWO questions. All questions carry equal marks. (2 x13 = 26)

Q. 3 a. Define Torque. Explain the idea of torque due to a force F acting on a rigid body. Discuss two of its special cases. **(08)**

b. A load of 10.0 N is suspended from a clothes line. This distorts the line so that it makes an angle of 15^0 with the horizontal at each end. Find the tension in the clothes line. **(05)**

Q. 4 a. Explain Young's double slit interference experiment and show that the bright and dark fringes are of equal width and are equally spaced. **(09)**

b. Estimate the average speed of nitrogen molecules in air under standard conditions of pressure and temperature $(K = 1.38 \times 10^{-23} JK^{-1})$ **(04)**

Q. 5 a. Write five postulates of "Kinetic Molecular theory". Also prove that pressure exerted by the gas is directly proportional to the average translational kinetic energy of the gas molecules. **(08)**

b. A church organ consists of pipes, each open at one end, of different lengths. The minimum length is 30 mm and the longest is 4m. Calculate the frequency range of the fundamental notes. (Speed of sound= $340ms^{-1}$) **(05)**

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Roll No. | | | | | | |

Answer Sheet No._____

Sig. of Candidate._____

Sig. of Invigilator._____

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.**

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

(i) Base unit of linear momentum is _____

A. NS^2 B. kg m/s

C. kg m^2/s D. None of these

(ii) Displacement covered by a body during two rotations on a circle of radius r is _____

A. πr B. $2\pi r$

C. $4\pi r$ D. None of these

(iii) Kilowatt hour is the unit of _____

A. Energy B. Power

C. Force D. None of these

(iv) Analogue of moment of inertia in linear motion is _____

A. Inertia B. Momentum

C. Moment of force D. None of these

(v) Which of the following is a Non-conservative force?

A. Gravitational B. Frictional

C. Magnetic D. Electric

(vi) Which factor does not change during resonance?

A. Amplitude B. Velocity

C. Acceleration D. Time period

(vii) In stationary waves, the distance between consective node and antinode is _____

A. $\frac{\lambda}{2}$ B. λ

C. $\frac{\lambda}{4}$ D. 4λ

(viii) When Newton's ring interference pattern is viewed, the central spot is ____

A. Bright B. Dark

C. Multicolour D. None of these

DO NOT WRITE ANYTHING HERE

(ix) Instrument used to analyze spectra is called _____

A. Spectrometer B. Photometer

C. Electron microscope D. Barometer

(x) The practical form of Boyle's Law is _____process.

A. Isobaric B. Isothermal

C. Adiabatic D. Isochoric

(xi) If the magnitude of resultant of forces is equal to x-component then angle of force with x-axis is _____

A. 30° B. 60°

C. 90° D. 0°

(xii) The weight of a freely falling object _____

A. increase B. Decrease

C. Zero D. No change

(xiii) The points of maximum vibration of a string vibrating in its standing mode are known as _____

A. Crest B. Node

C. Antinode D. Trough

(xiv) When a wave reflects from a denser medium then its phase change _____

A. 0° B. 90°

C. 180° D. 45°

(xv) An object in equilibrium may not have _____

A. Velocity B. Acceleration

C. Any force acting on it D. Any torque acting on it

(xvi) If time period of a simple pendulum is 1 sec, then its frequency is _____

A. 0.25 Hz B. 2 Hz

C. 1 Hz D. None of these

(xvii) The Centripetal force is equal to_____

A. $mr\omega^2$ B. ma

C. $\frac{mv^2}{r^2}$ D. None of these

For Examiner's use only:

Total Marks: 17

Marks Obtained:

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

(i) Three students measured the length of a needle with a scale of least count 1 cm and recorded as (i) 0.2145m (ii) 0.21 m (iii) 0.214 m. Which record is correct and why?

(ii) Under what circumstances the x-component of a force is double of its y-component?

(iii) An object has 1.0 J of P.E. What does it mean?

(iv) Under what circumstances, the horizontal range of projectile is half of maximum range?

(v) When mud flies off the tyre of a moving bicycle, in what direction does it fly? Explain.

(vi) How does swing produce in cricket ball?

(vii) If frequency of oscillation is 10 Hz then what is distance covered by the body when time is equal to time period and amplitude of oscillation is A.

(viii) As a result of a distant explosion, an observer senses a ground tremor and then hears the explosion. Explain the time difference.

(ix) Can visible light produce interference fringes? Explain.

(x) How is the light signal transmitted through the optical fibre?

(xi) Why does the pressure of a gas in a car tyre increase when it is driven through some distance?

(xii) Explain the principle of the dimensional homogeneity of physical equation.

(xiii) Can we realize an ideal simple pendulum?

(xiv) Why does temperature drop in an adiabatic expansion process?

(xv) Draw velocity-time graph for a body which is thrown vertically upward.

(xvi) Differentiate between Petrol engine and Diesel engine.

(xvii) A football is thrown upward with an angle of 30° with respect to horizontal. To throw a 40 m pass, what must be the initial speed of the ball?

(xviii) Prove that 1 radian= 57.3 degree.

(xix) Find amplitude, frequency and period of an object vibrating at the end of a spring, if the equation for its position w.r.t. time is $x=0.25\cos(\frac{\pi}{8})t$

SECTION – C (Marks 26)

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

Q. 3 a. State and prove Bernoulli's equation. **07**

b. How does the normal Blood Pressure of persons change with the age? **02**

c. What gauge pressure is required in the city mains for a stream from a fire hose connected to the mains to reach a vertical height of 15.0 m. **04**

Q. 4 a. Explain Projectile motion and find out: **1+2+2+2=7**

i. Speed of body at instant of time t ii. Time of flight of the body

iii. Horizontal range

b. Show that range of Projectile is maximum at $\theta=45^{O}$ **02**

c. A ball is thrown horizontally from a height of 10 m with velocity of 21 m/sec. How far off it hit the ground and with what velocity? **04**

Q. 5 a. Prove that $C_P - C_V = R$ **07**

b. Explain heat death of universe. **02**

c. A Carnot engine whose low temperature reservoir is at 7° C 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? **04**