

Roll No \_\_\_\_\_ (To be filled in by the candidate) (Academic Sessions 2015 – 2017 to 2018 – 2020)

PHYSICS

219-(INTER PART – I)

Time Allowed : 20 Minutes

Q.PAPER – I ( Objective Type )

GROUP – I

Maximum Marks : 17

PAPER CODE = 6471

Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	The ratio of 1 femtometer to 1 nanometer is : (A) $10^{-6}$ (B) $10^6$ (C) $10^{-7}$ (D) $10^8$
2	In the relation $F = 6\pi\eta r v$ . Dimensions of coefficient of viscosity $\eta$ is : (A) $[M^{-1}LT^{-1}]$ (B) $[ML^{-1}T]$ (C) $[M^{-1}L^{-1}T]$ (D) $[ML^{-1}T^{-1}]$
3	If $\vec{F} = (2\hat{i} + 4\hat{j})N$ ; $\vec{d} = (5\hat{i} + 2\hat{j})m$ work done is : (A) 15 J (B) 18 J (C) Zero (D) -18 J
4	The sum of two perpendicular forces 8 N and 6 N is : (A) 2 N (B) 14 N (C) 10 N (D) -2 N
5	The distance covered by a freely falling body in first 2 seconds, when its initial velocity was zero : (A) 9.8 m (B) 39.2 m (C) 19.6 m (D) 4.9 m
6	Value of solar constant is : (A) $1.4Wm^{-2}$ (B) $1400Wm^{-2}$ (C) $14kWm^{-2}$ (D) $1.0kWm^{-2}$
7	Relation between the speed of disc and hoop at the bottom of an incline is : (A) $V_{disc} = \sqrt{\frac{3}{4}}V_{hoop}$ (B) $V_{disc} = \sqrt{\frac{4}{3}}V_{hoop}$ (C) $V_{disc} = \sqrt{\frac{2}{5}}V_{hoop}$ (D) $V_{disc} = 2V_{hoop}$
8	2 revolutions are equal to : (A) $\pi$ rad (B) $\frac{3\pi}{2}$ rad (C) $2\pi$ rad (D) $4\pi$ rad
9	Terminal velocity $V_t$ is related with the radius $r$ of a spherical object as : (A) $v_t \propto r^2$ (B) $v_t \propto r$ (C) $v_t \propto \frac{1}{r}$ (D) $v_t \propto \frac{1}{r^2}$
10	The unit of $\frac{1}{2}\rho V^2$ in Bernoulli's equation is same as that of : (A) Energy (B) Pressure (C) Work (D) Power
11	Base units of spring constant is : (A) $kg^{-1}s^{-2}$ (B) $kg^{-1}ms^{-2}$ (C) $kgms^{-2}$ (D) $kg s^{-2}$
12	Speed of sound at $0^\circ C$ , in air is : (A) $332ms^{-1}$ (B) $280ms^{-1}$ (C) $1400ms^{-1}$ (D) $5500ms^{-1}$
13	Two identical waves moving in same direction produce : (A) Interference (B) Beats (C) Stationary waves (D) Diffraction
14	Bragg's equation is : (A) $2d \sin \theta = n \frac{\lambda}{2}$ (B) $d \sin \theta = n\lambda$ (C) $d \sin \theta = n \frac{\lambda}{2}$ (D) $d \sin \theta = 2\lambda$
15	If $f_o = 100cm$ ; $f_e = 5cm$ length and magnifying power of an astronomical telescope is : (A) 0.05 cm ; 20 (B) 95 cm ; 20 (C) 20 cm ; 500 (D) 105 cm ; 20
16	Root mean square velocity is related to the absolute temperature of an ideal gas as : (A) $V_{rms} \propto T$ (B) $V_{rms} \propto T^2$ (C) $V_{rms} \propto \sqrt{T}$ (D) $V_{rms} \propto \frac{1}{\sqrt{T}}$
17	If P = Pressure ; V = Volume of a gas PΔV represents : (A) Work (B) Density (C) Power (D) Temperature

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SECTION - I

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2. Write short answers to any EIGHT (8) questions :

- (i) Write down the two uses of dimensional analysis.
- (ii) What are the characteristics of an ideal standard?
- (iii) If  $\vec{A} = 4\hat{i} - 4\hat{j}$ , what is the orientation of  $\vec{A}$ ?
- (iv) Define resultant vector and component of a vector.
- (v) The magnitude of the sum of two vectors is zero. What are the conditions to get this?
- (vi) A car is moving along a circle of radius  $r$ . It completes <sup>four</sup> revolutions and terminates its journey at starting point. How much work is done by the car? Explain.
- (vii) How energy is obtained by water waves and what is the source of this energy?
- (viii) Explain the term systolic and diastolic pressure.
- (ix) Two row boats moving parallel in the water are pulled towards each other. Explain why?
- (x) Is any relation/ <sup>existed</sup> between damping and resonance? Explain.
- (xi) In relation to SHM, explain the equation  $y = A \sin(\omega t + \phi)$ .
- (xii) A mass-spring system is vibrating with amplitude 10 cm. Find its K.E. and P.E at equilibrium position, when spring constant is  $20 \text{ Nm}^{-1}$ .

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3. Write short answers to any EIGHT (8) questions :

- (i) What is the difference between uniform velocity and uniform acceleration?
- (ii) Show that time rate of change of momentum of a body equals the applied force.
- (iii) A 1500 kg car has its velocity reduced from  $20 \text{ ms}^{-1}$  to  $15 \text{ ms}^{-1}$  in 3.0 seconds. How large was the average retarding force?
- (iv) Can the velocity of an object reverse the direction when acceleration is constant? If so, give an example.
- (v) Write down the uses of telecommunication satellites.
- (vi) Show that  $S = r\theta$  where  $S = \text{Arc length}$ ,  $r = \text{radius of the circle}$ ,  $\theta = \text{angle in radian}$ .
- (vii) What do you mean INTELSAT VI? What are the frequencies on which it operates?
- (viii) A disc without slipping rolls down a hill of height 10.0 m. If the disc starts from rest at the top of the hill, what is the speed at the bottom?
- (ix) How the speed of sound change with the density of the medium?
- (x) A pipe has a length of 1 m. Determine the frequencies of the fundamental, if the pipe is open at both ends. Speed of sound =  $340 \text{ ms}^{-1}$
- (xi) State Doppler Effect. Write down its one application.
- (xii) How Doppler effect can be used to monitor blood flow?

(Turn Over)

4. Write short answers to any SIX (6) questions :

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- (i) What is Bragg's law? Derive Bragg's equation.
- (ii) Explain whether the Young's experiment is an experiment for studying interference or diffraction effects of light.
- (iii) How would you manage to get more orders of spectra during a diffraction grating?
- (iv) Write two differences between angular magnification and resolving power.
- (v) How a single bi-convex lens can be used as a magnifying glass?
- (vi) Derive Charles' law from kinetic theory of gases.
- (vii) Justify! Work and heat are similar.
- (viii) Show that : Change in entropy is always positive.
- (ix) What happens to the temperature of the room when an air-conditioner is left running on a table in the middle of the room?

SECTION - II

Note : Attempt any THREE questions.

5. (a) Prove that molar specific heat of a gas at constant pressure  $C_p$  is greater than molar specific heat at constant volume  $C_v$  by an amount equal to universal gas constant R. 5
- (b) 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  $v^m$ . determine the powers of  $r$  and  $v$ . 3
6. (a) Explain the method of vector addition by rectangular components. 5
- (b) A foot ball is thrown upward with an angle of  $30^\circ$  with respect to the horizontal. To throw a 40 m pass what must be the initial speed of the ball? 3
7. (a) Define absolute potential energy. Derive relation for absolute P.E. of a body of mass  $m$ . 5
- (b) A stationary wave is established in a string which is 120 cm long and fixed at both ends. The string vibrates in four segments, at a frequency of 120 Hz. Determine its wavelength and the fundamental frequency. 3
8. (a) Define SHM. Prove that total energy remains conserved in mass-spring system, oscillating with SHM. 5
- (b) A gramophone record turntable accelerate from rest to an angular velocity of  $45.0 \text{ rev min}^{-1}$  in 1.60 s. What is its average angular acceleration? 3
9. (a) What is compound microscope? Describe its construction and working also calculate its magnification. 5
- (b) In a double slit experiment the second order maximum occurs at  $\theta = 0.25^\circ$ . The wavelength is 650 nm. Determine the slit separation. 3

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1-1	Fringe spacing increases if we use : (A) Red light (B) Blue light (C) Yellow light (D) Green light
2	The expression for centripetal force is given by : (A) $\frac{mv^2}{r^2}$ (B) $\frac{m^2v^2}{r}$ (C) $\frac{m^2v^2}{r^2}$ (D) $mr\omega^2$
3	Rocket ejects the burnt gasses at a speed of over ( consuming fuel at rate of 10000 kg / s ) : (A) 4000 m/s (B) 400 m/s (C) 4000 cm/s (D) 400 cm/s
4	Distance between adjacent node and antinode is : (A) $\lambda$ (B) $\frac{\lambda}{2}$ (C) $\frac{\lambda}{4}$ (D) $\frac{\lambda}{3}$
5	Equation of continuity gives the conservation of the : (A) Mass (B) Energy (C) Speed (D) Volume
6	Which pair has same unit : (A) Work and power (B) Momentum and impulse (C) Force and torque (D) Torque and power
7	Efficiency of diesel engine is : (A) 25% to 30% (B) 30% to 35% (C) 35% to 40% (D) 40% to 50%
8	The ratio between orbital velocity and escape velocity is : (A) 1 (B) $\frac{1}{2}$ (C) $\sqrt{\frac{1}{2}}$ (D) $\sqrt{2}$
9	Types of wave used in sonar are : (A) Sound waves (B) Light waves (C) Heat waves (D) Water waves
10	The quantity $1 \text{ (km)}^2$ is equal to : (A) $1 \times 10^6 m^2$ (B) $1 \times 10^5 m^2$ (C) $1 \times 10^7 m^2$ (D) $1 \times 10^4 m^2$
11	1 torr is equal to : (A) $133.3 Nm^{-2}$ (B) $133.3 Nm^2$ (C) $133.3 Nm$ (D) $133.3 N^2m$
12	If $R_x$ and $R_y$ both are negative then resultant lies in the quadrant : (A) 1st (B) 2nd (C) 3rd (D) 4th
13	Product of number of rulings "N" and the order of diffraction "m" is equal to : (A) Resolving power (B) Magnification (C) Near point (D) Magnifying power
14	In order to double period of a simple pendulum the length of the pendulum should be increased by : (A) Four times (B) Three times (C) Two times (D) Eight times
15	Difference between $C_p$ and $C_v$ is equal to : (A) Avogadro's number (B) Planck's constant (C) Universal gas constant (D) Boltzman's constant
16	Ratio of disk velocity to hoop velocity ( in case of rotational kinetic energy ) is : (A) $\sqrt{\frac{4}{3}}$ (B) $\frac{1}{2}$ (C) 2 (D) $\sqrt{\frac{3}{4}}$
17	Cross product of $\hat{j} \times \hat{k}$ is : (A) Zero (B) 1 (C) $\hat{i}$ (D) $-\hat{i}$

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SECTION – I

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2. Write short answers to any EIGHT (8) questions :

- (i) Define light year. Calculate its value. (Speed of light  $C = 3 \times 10^8 \text{ ms}^{-1}$ )
- (ii) Give the definition of unit of solid angle.
- (iii) How a vector is subtracted from another vector? Explain using diagram.
- (iv) Find unit vector in the direction of the vector  $\vec{A} = 12\hat{i} - 5\hat{j}$
- (v) Name three different conditions that could make  $\vec{A}_1 \times \vec{A}_2 = \vec{0}$
- (vi) Calculate the work done in kilo joules in lifting a mass of 10 kg ( at steady velocity) through a vertical height of 10 m.
- (vii) Prove that 1 kWh = 3.6 MJ
- (viii) How does a chimney work?
- (ix) Explain, how the swing is produced in a fast moving cricket ball?
- (x) What happens to the period of a simple pendulum if its length is doubled? What happens if the suspended mass is doubled?
- (xi) Does frequency depend on amplitude for harmonic oscillator?
- (xii) Define angular frequency. Give its formula and unit.

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3. Write short answers to any EIGHT (8) questions :

- (i) A rubber ball and lead ball of same size, are moving with same velocity. Which ball have greater momentum and why?
- (ii) A bullet is fired from a rifle. Derive the relation for velocity of rifle.
- (iii) Define range of projectile. In which situations its value is maximum and minimum.
- (iv) Define impulse of the force and how can it relate with momentum.
- (v) Define radian and degree and what is relation between them.
- (vi) Define critical velocity and find its value.
- (vii) What is difference between Newton's and Einstein's views of gravitation?
- (viii) Define geo-synchronous satellite and what is the height of such satellite above the earth?
- (ix) What are the conditions for interference of two sound waves?
- (x) What is effect of temperature on speed of sound?
- (xi) What is effect on frequency of sound waves, when source and observer are moving towards each other?
- (xii) How are beats useful in tuning musical instruments?

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4. Write short answers to any SIX (6) questions :

- (i) 5000 lines per centimeter has been ruled on a diffraction grating. Find its grating element.
- (ii) What is optically active crystals?
- (iii) State Huygen's principle.

(Turn Over)

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