LHR-Gal-11-19

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 η 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) $1.4 Wm^{-2}$	(B) $1400 Wm^{-2}$	(C) $14 kWm^{-2}$	(D) $1.0 kWm^{-2}$
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) π rad	(B) $\frac{3\pi}{2}$ rad	(C) 2π rad	(D) 4π 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) $kg\,ms^{-2}$	(D) kgs^{-2}
12	Speed of sound at 0 °C, in air is :			
	(A) $332\,ms^{-1}$	(B) $280\,ms^{-1}$	(C) $1400\,ms^{-1}$	(D) $5500\,ms^{-1}$
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 $f_o = 100\,cm$; $f_e = 5\,cm$ 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 $P\Delta V$ represents :			
	(A) Work	(B) Density	(C) Power	(D) Temperature

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PHYSICS 219-(INTER PART – I) Time Allowed : 2.40 hours

PAPER – I (Essay Type) GROUP – I Maximum Marks : 68

SECTION – I

16

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 four 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 existed 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 $20\,Nm^{-1}$.

16

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 $20\,ms^{-1}$ to $15ms^{-1}$ 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 = Arc length , r = radius of the circle , 0 = 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 = $340\,ms^{-1}$

(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 : 12

(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 30^0 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 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 $\theta = 0.25°$. The wavelength is 650 nm. Determine the slit separation. 3

LHR-G2-11.19

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PHYSICS 219-(INTER PART – I) Time Allowed : 20 Minutes

Q.PAPER – I (Objective Type) GROUP – II Maximum Marks : 17

PAPER CODE = 6478

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	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) λ	(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 $(km)^2$ is equal to :			
	(A) $1\times10^6 m^2$	(B) $1\times10^5 m^2$	(C) $1\times10^7 m^2$	(D) $1\times10^4 m^2$
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

2. Write short answers to any EIGHT (8) questions : 16

(i) Define light year. Calculate its value. (Speed of light $C = 3\times10^{8} ms^{-1}$)

(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.

3. Write short answers to any EIGHT (8) questions : 16

(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?

4. Write short answers to any SIX (6) questions : 12

(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.

4. Write short answers to any SIX (6) questions : 12

(i) What is Bragg's law? Derive Bragg's equation.

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