

LHR-41-11-10

Roll No _____ (To be filled in by the candidate) (Academic Sessions 2015 – 2017 to 2017 – 2019)

PHYSICS 218-(INTER PART – I)

Time Allowed : 20 Minutes

Q.PAPER – I (Objective Type) GROUP – I

Maximum Marks : 17

PAPER CODE = 6475

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 component of the weight which balances the tension in pendulum is : (A) $mg \cos\theta$ (B) $mg \sin\theta$ (C) $mg \tan\theta$ (D) $-mg \sin\theta$
2	Work has the dimensions as that of : (A) Momentum (B) Power (C) Torque (D) Force
3	If red light is used as compared to blue light, then fringe spacing : (A) Increases (B) Decreases (C) Remains same (D) Becomes zero
4	A precise measurement is the one which has : (A) Greater precision (B) Less precision (C) Medium precision (D) More % error
5	The work done in isochoric process is : (A) Constant (B) Variable (C) Zero (D) Depend on condition
6	As we go from pole to equator of earth, the value of 'g' : (A) Increases (B) Decreases (C) Remains constant (D) Zero
7	Maximum number of components of a vector may be : (A) One (B) Two (C) Three (D) Infinite
8	Physical quantity "pressure" in term of base unit is : (A) $Kg^{-1}mS^{-2}$ (B) Kg^2mS^{-3} (C) $Kg^2m^{-2}Sec$ (D) $Kgm^{-1}S^{-2}$
9	When one end of organ pipe is closed, then the frequency of stationary waves of any harmonic in it is given by : (A) $f_n = \frac{nv}{2\ell}$ (B) $f_n = \frac{n\ell}{4v}$ (C) $f_n = \frac{4v}{n\ell}$ (D) $f_n = \frac{nv}{4\ell}$
10	Repeaters are placed in new system at distance of : (A) 30 km (B) 50 km (C) 80 km (D) 100 km
11	The fluid is said to be incompressible, if its density is : (A) Zero (B) Very high (C) Very small (D) Constant
12	The distance covered by a body in time 't' starting from rest is : (A) at^2 (B) $2at^2$ (C) $\frac{1}{2}at^2$ (D) $\frac{1}{2}a^2t$
13	When hot and cold water are mixed, the entropy : (A) Decreases (B) Increases (C) Remains constant (D) Zero
14	The relation between the speed of disc and hoop can be written as : (A) $V_{disc} = \sqrt{\frac{3}{4}}V_{hoop}$ (B) $V_{disc} = \sqrt{\frac{4}{3}}V_{hoop}$ (C) $V_{disc} = V_{hoop}$ (D) $V_{disc} = \frac{1}{2}V_{hoop}$
15	The magnitude of a vector $\vec{r} = 3\hat{i} + 6\hat{j} + 2\hat{k}$ is : (A) -1 (B) -7 (C) 7 (D) 8
16	If a stretched string is 4 m and it has 4 loops of stationary waves, then wavelength is : (A) 1 m (B) 2 m (C) 3 m (D) 4 m
17	The blue colour of sky is due to : (A) Diffraction of light (B) Reflection of light (C) Polarization of light (D) Scattering of light

SECTION – I

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

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- (i) Define and explain scientific notation, also give example.
- (ii) Show that the expression $v_f = v_i + at$ is dimensionally correct.
- (iii) Write any two uses of dimensional analysis.
- (iv) Name several repetitive phenomenon occurring in nature which could serve as reasonable time standards.
- (v) Can the magnitude of a vector have a negative value?
- (vi) The vector sum of three vectors gives a zero resultant. What can be the orientation of the vectors?
- (vii) Define the terms (i) Null vector (ii) Subtraction of vector
- (viii) What happens when a very heavy body collides with lighter stationary body? Explain.
- (ix) Can the velocity of an object reverse direction when acceleration is constant? If so, give an example.
- (x) Define isolated system with example.
- (xi) Two boats moving parallel in the same direction are pulled towards each other. Explain why?
- (xii) Explain the difference between laminar flow and turbulent flow.

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

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- (i) When a rocket re-enters the atmosphere, its nose cone becomes very hot, where does this heat energy come from?
- (ii) What sort of energy is in compressed spring and water in a high dam?
- (iii) Write two merits and demerits of solar cells.
- (iv) Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V. transmission.
- (v) Show that orbital angular momentum $L_o = mvr$
- (vi) Find total kinetic energy of rolling sphere of mass 'm' and radius 'r' on horizontal smooth surface.
- (vii) Prove that $\omega = \sqrt{\frac{k}{m}}$ for mass spring system.
- (viii) How displacement and amplitude are related for mass spring system?
- (ix) What happens to the period of a simple pendulum if its length is doubled? What happens if the suspended mass is doubled?
- (x) Explain the term crest, trough, node and antinode.
- (xi) As a result of a distant explosion an observer senses a ground tremor and then hears the explosion. Explain the time difference.
- (xii) Why does transverse wave reflecting from a denser medium undergo a phase change of 180° ?

(Turn Over)

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

- (i) Differentiate between polarized and unpolarized light.
- (ii) What aspect of nature of light is proved by the phenomena of polarization?
- (iii) Explain briefly whether the Young's experiment is an experiment for studying interference or diffraction effects of light.
- (iv) Differentiate between linear magnification and angular magnification.
- (v) Why would it be advantageous to use blue light with a compound microscope?
- (vi) Derive Charles's law from kinetic theory of gases.
- (vii) Define internal energy of a substance.
- (viii) Give an example of a natural process that involves an increase in entropy.
- (ix) Is it possible to construct a heat engine that will not expel heat into the atmosphere?

SECTION – II

Note : Attempt any THREE questions.

- 5. (a) Define elastic and inelastic collision. Discuss elastic collision in one dimension and show that velocity of approach is equal to the velocity of separation. 5
- (b) A load of 10 N is suspended from a clothline. This distorts the line so that it makes an angle of 15° with each end. Find tension in the clothline. 3
- 6. (a) What is escape velocity? Derive an expression for it and calculate its value on the surface of the earth. 5
- (b) A 1000 kg car travelling with a speed of 144 kmh^{-1} round a curve of radius 100 m. Find the necessary centripetal force. 3
- 7. (a) What is petrol engine? Describe its working by elaborating its four strokes and what is main difference between petrol engines and diesel engines. 5
- (b) 336 J of energy is required to melt 1 gm of ice at 0°C . What is the change in entropy of 30 gm of water at 0°C as it is changed to ice at 0°C by a refrigerator? 3
- 8. (a) What is Doppler Effect? Discuss the case when : 5
 - (i) observer is moving towards a stationary source,
 - (ii) observer is moving away from stationary source.
- (b) A simple pendulum is 50.0 cm long. What will be its frequency of vibration at a place where $g = 9.8 \text{ ms}^{-2}$? 3
- 9. (a) Explain a simple microscope. Derive formula for its magnification. 5
- (b) Sodium light of wavelength $\lambda = 589 \text{ nm}$, is incident normally on a grating having 3000 lines per centimeter. What is highest order of the spectrum obtained with this grating? 3

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PHYSICS

218-(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	Intensity of light depends on : (A) Wavelength (B) Amplitude (C) Velocity (D) Frequency
2	The ratio of angular frequency and linear frequency is : (A) 2π (B) π (C) $\frac{1}{2\pi}$ (D) $\frac{\pi}{2}$
3	Which shows correct relation between H and T of projectile : (A) $H = \frac{gT^2}{8}$ (B) $H = \frac{8T^2}{g}$ (C) $H = \frac{8g}{T^2}$ (D) $H = \frac{8}{gT^2}$
4	Velocity of sound is independent of : (A) Temperature (B) Density (C) Pressure (D) Medium
5	If the radius of droplet becomes half, then its terminal velocity will be : (A) Double (B) Half (C) One fourth (D) Four time
6	The percentage uncertainty in measurement of mass and velocity are 2% and 3%, the maximum uncertainty in the measurement of kinetic energy is : (A) 11% (B) 8% (C) 6% (D) 1%
7	SI unit pressure of gas is : (A) Nm^{-2} (B) Nm (C) N^2m^{-1} (D) N^2m
8	Hot igneous rocks usually in molten or partly molten state are found in the depth of : (A) 5 km (B) 10 km (C) 15 km (D) 20 km
9	Angle between ray of light and wave front is : (A) 0° (B) 60° (C) 120° (D) 90°
10	Solid angle subtended at the center by a sphere is : (A) 2π (B) 4π (C) 6π (D) 8π
11	If 30 waves per second pass through a medium at speed of $30ms^{-1}$, the wavelength is : (A) 30 m (B) 15 m (C) 1 m (D) 900 m
12	$\hat{i} \cdot (\hat{j} \times \hat{k})$ is equal to : (A) \hat{k} (B) 1 (C) Null vector (D) Zero
13	Information carrying capacity of optical fibre is called : (A) Capacity (B) Band width (C) Immunity (D) Ability
14	Radar system is an application of : (A) Interference (B) Beats (C) Stationary waves (D) Doppler's effect
15	For an ideal gas, the potential energy associated with its molecules is : (A) Maximum (B) Zero (C) $\frac{1}{2}KX_o^2$ (D) $\frac{1}{2}KX_o$
16	A wheel of radius 50 cm having an angular speed 5 rad / sec will have linear speed : (A) $1.5ms^{-1}$ (B) $2.5ms^{-1}$ (C) $3.5ms^{-1}$ (D) $4.5ms^{-1}$
17	The resultant of two forces 3N and 4N acting parallel to each other is : (A) 7N (B) 1N (C) 5N (D) 4N

SECTION – I

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

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- (i) Calculate the distance covered by the light in free space in one year.
- (ii) Show that the Einstein's equation $E = mc^2$ is dimensionally correct.
- (iii) What do you mean by random error and systematic error?
- (iv) Add the following upto appropriate precision 3.125, 1.2, 0.038.
- (v) What is the unit vector in the direction of vector $\vec{A} = 2\hat{i} - \hat{j} + 2\hat{k}$?
- (vi) Can the dot product of two vectors be equal to the product of their magnitudes? Explain.
- (vii) State first and second condition of equilibrium alongwith their equation.
- (viii) Water flows out from a pipe at 5 kgs^{-1} and its velocity changes from 4 ms^{-1} to zero on striking the wall. Find the force exerted by the water on the wall.
- (ix) Show that range R and maximum range R_{max} are related as $\frac{R}{R_{\text{max}}} = \sin 2\theta$
- (x) Can the velocity of an object reverse the direction when acceleration is constant? If so give an example?
- (xi) Define viscosity and drag force.
- (xii) Explain the working of carburetor of a motorcar using Bernoulli's principle.

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

16

- (i) Derive work energy principle.
- (ii) Explain methods of : (i) Direct combustion.
(ii) Fermentation to convert biomass into fuels.
- (iii) A cup is dropped from a certain height, which breaks into pieces. What energy changes are involved?
- (iv) When mud flies off the tyre of a moving bicycle, in what direction does it fly?
- (v) What is difference between spin angular momentum and orbital angular momentum?
- (vi) Define radian and find how many degrees are in one radian.
- (vii) Does period depend on amplitude of vibrating body? Explain.
- (viii) Define restoring force and what is its direction?
- (ix) At which positions the velocity of a simple harmonic oscillator is maximum and minimum?
- (x) How are beats useful in tuning musical instruments?
- (xi) Astronomers use the Doppler effect to calculate the speed of distance stars. How?
- (xii) What is the affect on phase of a wave when it is reflected from a boundary?

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

- (i) Under what conditions two or more sources of light behave as coherent sources?
- (ii) Why the Polaroid sunglasses are better than ordinary sunglasses?
- (iii) An oil film spreading over a wet footpath shows colours. Explain how does it happen?
- (iv) One can buy a cheap microscope for the use by the children. The images seen in such a microscope have coloured edges. Why is this so?
- (v) How the light signal is transmitted through the optical fibre?
- (vi) Give an example of a natural process that involves an increase in entropy.
- (vii) Why is the average velocity of the molecules in a gas zero but the average of the square of velocities is not zero?
- (viii) Give the statement of second law of thermodynamics and Carnot's theorem.
- (ix) Is it possible to convert internal energy into mechanical energy? Explain with an example.

SECTION - II

Note : Attempt any THREE questions.

- 5. (a) Define vector product or cross product. Explain with right hand rule and give four characteristics of cross product. 5
- (b) Find angle of projection of a projectile for which its maximum height and the horizontal range are equal. 3
- 6. (a) What is absolute gravitational potential energy? Derive an expression for it. 5
- (b) What would be the orbiting speed to launch a satellite in a circular orbit 900 km above the surface of the earth? Mass of earth = 6×10^{24} kg , Radius of earth = 6400 km 3
- 7. (a) Define and explain entropy with an example. Does entropy decrease for reversible process? Why absolute value of entropy can not be determined? 5
- (b) A heat engine performs 100 J of work and at the same time rejects 400 J of heat energy to the cold reservoir. What is the efficiency of the engine? 3
- 8. (a) What is simple pendulum? Show that its motion is simple harmonic. Also derive an expression for its time period. 5
- (b) An organ pipe has a length of 50 cm, Find the frequency of its fundamental note and the next harmonic when it is ^{opened} at both ends. Speed of sound = 350 ms^{-1} . 3
- 9. (a) Discuss in detail the Young's double slit experiment to study the interference of light. 5
- (b) A glass light pipe in air will totally internally reflect a light ray if its angle of incidence is at least 39° . What is minimum angle for total internal reflection if pipe is in water ($n = 1.33$)? 3