

FSP

FRD-41-21

12

Objective
Paper Code
6475

Intermediate Part First

Roll No. : _____

PHYSICS (Objective) GROUP - I

Time: 20 Minutes

Marks: 17



Q.No.1

You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.

S.#	Questions	A	B	C	D
1	The moment of inertia of a ring is equal to:	$\frac{1}{12}mr^2$	mr^2	$\frac{1}{2}mr^2$	$\frac{2}{5}mr^2$
2	1kWh = :	3.6μJ	3.6mJ	3.6kJ	3.6MJ
3	The rate of change of momentum of a body equals to:	Work done	Applied power	Applied force	Impulse
4	The range of projectile is maximum when projectile is thrown at an angle of:	30°	45°	60°	90°
5	If $\vec{A} = 2\hat{i} - \hat{j} + 2\hat{k}$ then $A =$:	2	3	5	9
6	The area of the parallelogram formed with \vec{A} and \vec{B} as two adjacent sides is equal to:	$AB \sin \theta$	$AB \cos \theta$	$AB \tan \theta$	AB
7	The units of gravitational constant have units:	Nm^2kg^{-1}	$Nmkg^{-2}$	Nm^2kg^2	Nm^2kg^{-2}
8	Work have same dimensions as that of:	Momentum	Power	Torque	Impulse
9	Carnot engine consists of:	Two steps	Three steps	Four steps	Five steps
10	For adiabatic process, the first law of thermodynamics gives:	$Q = W$	$W = -\Delta U$	$Q = \Delta U$	$Q = \Delta U + W$
11	If N is the number of rulings on the grating, then the resolving power in the mth order diffraction is equal to:	$R = \frac{N}{m}$	$R = \frac{m}{N}$	$R = mN$	$R = \frac{1}{mN}$
12	The light from the Sun reaches the Earth with:	Circular wave fronts	Plane wave fronts	Spherical wave fronts	Elliptical wave fronts
13	The distance between a node and the next antinode is:	4λ	2λ	$\frac{\lambda}{4}$	$\frac{\lambda}{2}$
14	The increase in the speed of sound for one degree Celsius rise in temperature by:	$0.61cms^{-1}$	$0.61ms^{-1}$	$0.16cms^{-1}$	$0.16ms^{-1}$
15	If the length of a simple pendulum is doubled, its period:	Will not change	Will also be doubled	Will be halved	Will increase by 1.4 times
16	A chimney works best when it is:	Tall	Wide	Short	Narrow
17	The SI unit of angular displacement is:	Meter	Degree	Radian	Revolution

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PHYSICS (Subjective) GROUP - I

Time: 02:40 Hours

Marks: 68 **FBD-91**

SECTION – I

Write short answers to any EIGHT parts.

16

- (i) Show that the expression $v_f = v_i + at$ is dimensionally correct, where v_i is the initial velocity at $t = 0$, "a" is the acceleration and v_f is the velocity at time "t".
- (ii) The wavelength λ of the wave depends on the speed v of the wave and frequency f . Decide which of the following is correct? $f = v\lambda$ or $f = \frac{v}{\lambda}$
- (iii) Find the dimensions and hence the SI unit of coefficient of viscosity.
- (iv) Does a dimensional analysis give any information on constant of proportionality that may appear in an algebraic expression? Explain.
- (v) Define null vector. What is the difference between null vector and zero vector?
- (vi) Write the position vector in one coordinate system, two coordinate system and three coordinate system.
- (vii) If $\vec{A} = 2\hat{i} - 10\hat{j}$ and $\vec{B} = 6\hat{k}$. Find $\vec{A} \times \vec{B}$ (cross product).
- (viii) Explain how the swing is produced in a fast moving cricket ball?
- (ix) Show that the range of projectile is maximum when projectile is thrown at an angle of 45° with the horizontal.
- (x) Describe a case when a massive body collide with light body at rest.
- (xi) How the helmet safe from injury in accident?
- (xii) Water flows out from a pipe at 3 kgs^{-1} and its velocity changes from 5 ms^{-1} to zero on striking the wall. Find the force exerted by the water.

3. Write short answers to any EIGHT parts.

16

- (i) A girl drops a cup from a certain height which breaks into pieces. What energy changes are involved?
- (ii) When rocket re-enters the atmosphere, its nosecone becomes very hot. Where does this energy come from?
- (iii) Define absolute potential energy. Give its unit.
- (iv) Define angular momentum. What is its direction?
- (v) Define angular velocity and angular acceleration.
- (vi) What is meant by moment of inertia? Explain its significance.
- (vii) Under what conditions does the addition of two simple harmonic motions produce a simple harmonic motion also?
- (viii) Describe some common phenomena in which resonance plays an important role.
- (ix) Does the acceleration of simple harmonic oscillator remain constant? Is the acceleration zero anywhere?
- (x) What is period of 250 cycles per second of sound waves?
- (xi) Find the temperature at which the velocity of sound in air is two times its velocity at 0°C .
- (xii) If velocity of sound is 332 ms^{-1} at 0°C then what will be its velocity at 10°C ?

4. Write short answers to any SIX parts.

12

- (i) Under what conditions two or more sources of light behave as coherent sources?
- (ii) How would you manage to get more order of spectra using a diffraction grating?
- (iii) State Huygen's principle.
- (iv) If a person was looking through a telescope at the full moon. How would the appearance of the moon be changed by covering half of the objective lens?
- (v) Why is the astronomical telescope preferred to use in normal adjustment?
- (vi) Why does the pressure of a gas in a car tyre increase when it is driven through some distance?
- (vii) Is it possible to construct a heat engine that will not expel heat into the atmosphere?
- (viii) State Carnot's theorem.
- (ix) Differentiate between internal energy of a substance and internal energy of an ideal gas.

SECTION – II Attempt any THREE questions. Each question carries 08 marks.

5. (a) Define scalar product of two vectors with examples. Write any four characteristics of scalar product. 01,04
- (b) Two spherical balls of 2.0kg and 3.0kg masses are moving towards each other with velocities of 6.0 m/sec and 4 m/sec respectively. What must be the velocity of smaller ball after collision if velocity of bigger ball is 3.0 m/sec. 03
6. (a) Describe the stationary waves produced in a stretched string and prove that their frequencies are quantized. 05
- (b) A 70kg man runs up a long flight of stairs in 4.0 s. The vertical height of the stairs is 4.5m. Calculate his power output in watts. 03

(Continued P.....2)

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7. (a) Define laminar and turbulent flow and derive an expression for Bernoulli's equation. 05
(b) A 1000kg car travelling with a speed of 144kmh^{-1} rounds a curve of radius 100m. Find the necessary centripetal force. 03
8. (a) Define molar specific heats of a gas. Also show that $C_p - C_v = R$ 05
(b) A block of mass 4kg is dropped from a height of 0.80m on to spring of spring constant $k = 1960\text{Nm}^{-1}$. Find the maximum distance through which the spring will be compressed. 03
9. (a) What is compound microscope? Describe its construction and working. Also calculate its magnifying power. 05
(b) Sodium light ($\lambda = 589\text{nm}$) is incident normally on a grating having 3000 lines per centimeter. What is the highest order of the spectrum obtained with this grating? 03

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Objective
Paper Code
6476

Intermediate Part First
PHYSICS (Objective) GROUP – II
Time: 20 Minutes Marks: 17

F00-42-21

Roll No. : _____



Q.No.1

You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.

S.#	Questions	A	B	C	D
1	If $\vec{A} \cdot \vec{B} = \vec{A} \times \vec{B} $ then angle between \vec{A} and \vec{B} is:	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	π
2	Dimensions of ratio of angular momentum to linear momentum is:	$[M^{\circ}LT^{\circ}]$	$[M^1L^1T^1]$	$[M^1L^2T^1]$	$[M^{-1}L^{-1}T^1]$
3	Dimensions of $\sqrt{F \frac{\ell}{m}}$ are:	$[M^{\circ}LT^{-1}]$	$[ML^{-1}T]$	$[ML^2T^{-3}]$	$[ML^{-1}T^{-1}]$
4	Magnifying power of telescope is:	$\frac{f_e}{f_o}$	$\frac{f_o}{f_e}$	$f_e f_o$	$\frac{1}{f_o f_e}$
5	In Michelson interferometer a fring is shifted each time the mirror is displaced through:	$\frac{\lambda}{2}$	$\frac{\lambda}{4}$	$\frac{\lambda}{2}$	Zero
6	If pendulum vibrate with frequency 0.5Hz, then its length will be:	10cm	50cm	80cm	99cm
7	Bernoulli's equation is based upon law of conservation of:	Momentum	Energy	Mass	Charge
8	If speed of moving body is doubled its K.E. is:	Doubled	Halved	Unchanged	4 times
9	SI unit of molar specific heat is:	$J \text{ mol}^{-1}K^{-1}$	$J \text{ mol } K^{-1}$	$J \text{ mol } K$	$J \text{ mol}^{-1}$
10	Highest efficiency of heat engine whose lower temperature is $17^{\circ}C$ and higher temperature is $200^{\circ}C$ is:	70%	100%	35%	38%
11	The stretched string of length 2m vibrates in 2 segments. The distance between two consecutive nodes is:	1m	2m	0.5m	4m
12	Tuning fork is source of:	Heat	Light	Sound	Electro-magnetic waves
13	Rotational kinetic energy of the hoop moving down on inclined plane is:	$\frac{1}{2}mv^2$	mv^2	$\frac{1}{4}mv^2$	$\frac{3}{4}mv^2$
14	Pull of the Earth on 20kg body on surface of Earth is:	20N	196N	19.6N	1960N
15	Rate of change of momentum is called:	Force	Pressure	Tension	Impulse
16	Mass of fuel consumed by a typical rocket to overcome earth's gravity is:	1000kg/s	100kg/s	10000kg/s	10kg/s
17	$\hat{i} \cdot \hat{i} = \hat{j} \cdot \hat{j} = \hat{k} \cdot \hat{k}$ is equal to:	0	1	-1	2

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SECTION – I

Write short answers to any EIGHT parts.

16

- (i) Show that formula $T = 2\pi \sqrt{\frac{l}{g}}$ is dimensionally correct.
- (ii) Add the following velocities given in m/s up to appropriate precision: 23.1 , 0.002 , 0.00023 , 5 – 12
- (iii) Define the terms (a) Precision (b) Dimensions of physical quantities.
- (iv) Write the dimensions of (a) Coefficient of viscosity η (b) Energy.
- (v) Define the terms (a) Resultant vector (b) Subtraction of vector.
- (vi) What is the unit vector in the direction of the vector $\vec{A} = 4\hat{i} - 3\hat{j}$?
- (vii) Suppose the sides of a closed polygon represent vector arranged head to tail. What is the sum of these vectors?
- (viii) Define the terms (a) The time of flight (b) The range of projectile.
- (ix) What happened when light body collides with a massive body at rest?
- (x) Find the time of flight of projectile when it is thrown at an angle of 30° with horizontal.
- (xi) Explain the difference between laminar flow and turbulent flow.
- (xii) Explain what do you understand by rocket motion?

3. Write short answers to any EIGHT parts.

16

- (i) Calculate the work done in kilo joules in lifting a mass of 10kg through a vertical height of 10m.
- (ii) A person holds a bag of groceries while standing still, talking a friend. A car is stationary with its engine running. From the stand point of work, how are these two situations similar?
- (iii) Derive the mathematical expression for escape velocity.
- (iv) What is meant by moment of inertia? Explain its significance.
- (v) What is meant by angular momentum? Also define law of conservation of angular momentum.
- (vi) Define angular acceleration. How angular and linear velocities are related? Explain.
- (vii) What should be the length of a simple pendulum whose period is 1 second at a place where $g = 9.8\text{ms}^{-2}$.
- (viii) If a mass spring system is hung vertically and set into oscillations, why does the motion eventually stop?
- (ix) Describe two common phenomena in which resonance plays an important role.
- (x) Is it possible for two identical waves travelling in the same direction along a string to give rise to a stationary wave? Explain.
- (xi) Find the frequencies produced in organ pipe when it is open at both ends.
- (xii) What are beats? Also mention one use of beats.

4. Write short answers to any SIX parts.

12

- (i) In the Young's experiment, one of the slits is covered with blue filter and other with red filter. What would be the pattern of light intensity on the screen?
- (ii) Differentiate the interference and diffraction patterns of light.
- (iii) Write the conditions for detectable interference of light waves.
- (iv) Why would it be advantageous to use blue light with a compound microscope?
- (v) How convex lens act as a magnifying glass? Explain.
- (vi) Give an example of a process in which no heat is transferred to or from the system but the temperature of the system changes.
- (vii) Is it possible to convert internal energy into mechanical energy? Explain with an example.
- (viii) Define internal energy of a substance. Is it state function?
- (ix) How first law of thermodynamics explains human metabolism? Explain.

SECTION – II Attempt any THREE questions. Each question carries 08 marks.

5. (a) State and prove law of conservation of linear momentum. 05
(b) Two forces of magnitude 10N and 20N act on a body in directions making angle 30° and 60° with x-axis respectively. Find the resultant force. 03
6. (a) Explain the interconversion of potential energy and kinetic energy (i) When there is no frictional force 05
(ii) When frictional force is present.
(b) The frequency of the note emitted by a stretched string is 300Hz. What will be the frequency of the note when the length of the wave is reduced by one third without changing the tension? 03

(Continued P 2)

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7. (a) State and prove Torricelli's Theorem with diagram. 05
(b) Calculate the angular momentum of a star of mass 2.0×10^{30} kg and radius 7.0×10^5 km, if it makes one complete rotation about its axis once in 20 days. What is its kinetic energy? 03
8. (a) Define simple pendulum. Show that its motion is SHM. Discuss its working derive relation for its time period. 05
(b) Estimate average speed of nitrogen molecules in air under standard conditions of pressure and temperature. 03
9. (a) Explain the diffraction of X-rays by crystal and derive Bragg's law. What are the uses of diffraction of X-rays. 02,02,01
(b) A simple astronomical telescope in normal adjustment has an objective of focal length 100cm and eye piece of focal length 5.0cm.
(i) Where is the final image formed? (ii) Calculate the angular magnification. 03

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