Roll No. of Candidate : _____ GUJ-G1-21 (2)

PHYSICS **(INTERMEDIATE PART - I) 321 - (I)** **Paper- I Group-I**

Time: 20 Minutes **OBJECTIVE ---------- Code: 6471** **Marks: 17**

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

1. 1. Which of the following is correct

(A) $f = V\lambda$ (B) $f = \frac{V}{\lambda}$ (C) $f = \frac{1}{V\lambda}$ (D) $f = \frac{\lambda}{V}$

2. The SI unit of co-efficient of viscosity is

(A) kg m s (B) kg m^{-1} s (C) kg m^{-1} s^{-1} (D) kg m s^{-1}

3. $\overline{A} \times \overline{A} =$

(A) $2\overline{A}$ (B) A^2 (C) $\overline{0}$ (D) 0

4. The direction of a vector in a plane is denoted by the angle which the representative line of the vector makes with

(A) positive x-axis in the anti-clock wise direction
(B) positive x-axis in the clock wise direction
(C) negative x-axis in the anti-clock wise direction
(D) negative x-axis in the clock wise direction

5. If mass m of the water strikes the wall in time ' t ' then force F on the wall is

(A) $F = \frac{mv}{t}$ (B) $F = \frac{mt}{v}$ (C) $F = \frac{vt}{m}$ (D) $F = \frac{m}{vt}$

6. A typical rocket consumes fuel about

(A) 100 kg s^{-1} (B) 1000 kg s^{-1} (C) 10000 kg s^{-1} (D) 100000 kg s^{-1}

7. The value of escape velocity is maximum for

(A) Moon (B) Earth (C) Jupiter (D) Mercury

8. The moment of inertia for a cylinder is

(A) mr^2 (B) $\frac{1}{2}mr^2$ (C) $\frac{2}{5}mr^2$ (D) $\frac{1}{12}mr^2$

9. The rotational K.E. of a disc is

(A) $K.E_{rot} = mv^2$ (B) $K.E_{rot} = \frac{1}{2}mv^2$ (C) $K.E_{rot} = \frac{1}{4}mv^2$ (D) $K.E_{rot} = 2mv^2$

10. The Bernoulli's equation is for a fluid which is

(A) viscous (B) compressible (C) inturbulent flow (D) in steady flow

11. In a microwave oven, the waves produced have a wavelength of

(A) 10 cm (B) 12 cm (C) 14 cm (D) 16 cm

12. It becomes difficult to recognize the beats if the difference between the frequencies of the two sounds is more than about

(A) 6 Hz (B) 8 Hz (C) 4 Hz (D) 10 Hz

13. If a string vibrates in four segments at a frequency of 120 Hz, its fundamental frequency will be

(A) 30 Hz (B) 60 Hz (C) 120 Hz (D) 480 Hz

14. The distance between two adjacent dark fringes is equal to

(A) $\frac{\lambda L}{d}$ (B) $\frac{\lambda d}{L}$ (C) $\frac{dL}{\lambda}$ (D) $\frac{d}{L\lambda}$

15. The equation used to determine the speed of light by Michelson is

(A) $c = 8fd$ (B) $c = 16fd$ (C) $c = \frac{8}{fd}$ (D) $c = \frac{16}{fd}$

16. By kinetic theory of gases, the gas molecules are in

(A) angular motion (B) circular motion (C) random motion (D) linear motion

17. The conversion of available heat energy into work by a petrol engine is about

(A) 10% (B) 15% (C) 20% (D) 25%

(All correct)

GUJ-41-21

PHYSICS **(INTERMEDIATE PART - I) 321 (3)** **Paper- I** **Group - I**

Time: 2:40 Hours **SUBJECTIVE** **Marks: 68**

Note: Section I is compulsory. Attempt any THREE (3) questions from Section II.

(SECTION – I)

2. Write short answers to any EIGHT questions. **(2 x 8 = 16)**

i. Calculate the dimension of physical quantities, if possible, 2π and rupees hundred.

ii. Add the following masses given in kg upto appropriate precision 2.189, 0.089, 11.8 and 5.32.

iii. State the principle of homogeneity of physical quantities equation.

iv. What are the dimensions and units of gravitational constant G in the formula $F = \frac{G m_1 m_2}{r^2}$?

v. Find the dot product of two vectors, if $\vec{A} = 3\hat{K}$ and $\vec{B} = -5\hat{j}$.

vi. Write down the five steps to find addition of vectors by rectangular components.

vii. Suppose the sides of a closed polygon represent vectors arranged by head-to-tail rule. What is the sum of these vectors?

viii. Add a vector $\vec{A} = 2\hat{i} + 3\hat{j}$ and thirty chairs.

ix. When two identical masses collide with each other in elastic collision. What will be the velocities after collision?

x. Is momentum is conserved in an inelastic collision? Explain the reason.

xi. How the hair acts like a crumple zone on your skull?

xii. Is law of conservation of momentum is valid in an inelastic collision?

3. Write short answers to any EIGHT questions. **(2 x 8 = 16)**

i. An object has one J of potential energy. Explain what does it mean?

ii. Calculate the work done in kilo joules in lifting a mass of 10 kg through a vertical height of 10 m.

iii. State law of conservation of energy.

iv. Define escape velocity. Give its units.

v. State law of conservation of angular momentum. Also define isolated system.

vi. State the direction of following in simple situation, angular momentum, angular velocity.

vii. Is it possible for two identical waves travelling in same direction along a string to give rise to a stationary wave?

viii. How are beats useful in tuning musical instruments?

ix. What is relation between total energy, potential energy and kinetic energy of a body executing SHM?

x. What is meant by phase angle; does it define angle between maximum displacement and driving force?

xi. Describe some common phenomena in which resonance plays an important role.

xii. Define free and forced oscillations.

4. Write short answers to any SIX questions. **(2 x 6 = 12)**

i. How would you get more orders of spectra using a diffraction grating?

ii. Could you obtain Newton's rings with transmitted light? If yes, would the pattern be different from that obtained with reflected light?

iii. Define diffraction grating. Write the formula for grating element.

iv. Why would it be advantageous to use blue light with compound microscope?

(Turn Over)

v. Define isothermal process and adiabatic process.

vi. Differentiate between reversible and irreversible processes.

vii. Is it possible to construct a heat engine that will not expel heat into the atmosphere?

viii. Briefly explain total internal reflection.

ix. Derive Boyles law from kinetic molecular theory of gases.

(SECTION - II)

5. (a) Define elastic collision. Show that relative speed of approach is equal to relative speed of separation for one dimensional collision. 5

(b) The magnitude of dot and cross product of two vectors are $6\sqrt{3}$ and 6 respectively. Find the angle between the vectors. 3

6. (a) Define stationary waves. Show that frequencies of stationary waves in a stretched string are quantized. 1+4

(b) A car of mass 800 kg travelling at 54 km h^{-1} is brought to rest in 60 metres. Find the average retarding force on the car. 3

7. (a) Define moment of inertia. Give its unit and dimension. Derive its relation for a rigid body. 5

(b) Certain globular protein particle has a density of 1246 kg m^{-3}. It falls through pure water ($\eta = 8.0 \times 10^{-4}$ kg m^{-1} s^{-1}) with a terminal speed 3.0 cm h^{-1}. Find radius of the particle. 3

8. (a) What is SHM? Derive a relation for instantaneous velocity and acceleration in terms of ω in SHM and uniform circular motion. 1+4

(b) A thermodynamic system under goes a process in which its internal energy decreases by 300 J. If at the same time 120 J of work is done on the system. Find the heat lost by the system. 3

9. (a) What is a simple microscope? Calculate its magnifying power. 5

(b) A second order spectrum is formed at an angle of 38° when light falls normally on a diffraction grating having 5400 lines per centimetre. Determine wavelength of the light used. 3

Roll No. of Candidate : _____ 4UJ-42-21

PHYSICS **(INTERMEDIATE PART - I) 321 - (I)** **Paper- I Group-II**

Time: 20 Minutes **OBJECTIVE ----- Code: 6472** **Marks: 17**

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

1. 1. The dimensions of pressure are
(A) MLT^{-2} (B) ML^2T^{-2} (C) $ML^{-1}T^{-2}$ (D) MLT^{-3}

2. If $r = 2.25 \pm 0.01$ cm then (%) percentage uncertainty in r is
(A) 0.225% (B) 22.5% (C) 0.2% (D) 0.4%

3. If $\vec{A} = 4\hat{i}+3\hat{j}$ then $\hat{A}$ =
(A) $\frac{4\hat{i}+3\hat{j}}{7}$ (B) $\frac{4\hat{i}+3\hat{j}}{5}$ (C) $\frac{4\hat{i}+3\hat{j}}{12}$ (D) $\frac{4\hat{i}+3\hat{j}}{6}$

4. The SI unit for toque is
(A) Nm (B) Nm^{-1} (C) mN^{-1} (D) $N^{-1}m^{-1}$

5. If the water flows out from a pipe at 3 kg s^{-1} and its velocity changes from 5 ms^{-1} to zero on striking the wall then applied force is equal to
(A) 5N (B) 8N (C) 15N (D) 1.66N

6. The fuel consumed by a typical rocket is about
(A) 100 kg s^{-1} (B) 1000 kg s^{-1} (C) 10000 kg s^{-1} (D) 100000 kg s^{-1}

7. Kilowatt hour is a unit for
(A) energy (B) power (C) time (D) momentum

8. One revolution =
(A) $\frac{\pi}{2}$ rad (B) π rad (C) 2π rad (D) 4π rad

9. The moment of inertia of a sphere is given as
(A) $\frac{1}{2}mr^2$ (B) $\frac{2}{5}mr^2$ (C) $\frac{1}{5}mr^2$ (D) $\frac{1}{12}mr^2$

10. Torricelli's theorem can be written as
(A) $V = \sqrt{2g(h_1-h_2)}$ (B) $V = 2g(h_1-h_2)$ (C) $V = 2g\sqrt{(h_1-h_2)}$ (D) $V = \sqrt{2g}(h_1-h_2)$

11. The total distance travelled by an object with SHM, having amplitude A, in a time equal to its period is
(A) $\frac{A}{4}$ (B) $\frac{A}{2}$ (C) 2A (D) 4A

12. If the wavelength of a wave is 1500 m and moves with a velocity of 3×10^8 ms^{-1}, its frequency will be
(A) 5×10^{-6} Hz (B) 2×10^5 Hz (C) 45×10^{10} Hz (D) 3.15×10^6 Hz

13. Waves transport
(A) energy (B) wavelength (C) power (D) mass

14. Bragg equation is given as
(A) $2d\,Sin\theta = n\lambda$ (B) $d\,Sin\theta = n\lambda$ (C) $2d = n\lambda$ (D) $2d = (n+\frac{1}{2})\lambda$

15. The least distance of distinct vision is
(A) 10 cm (B) 15 cm (C) 20 cm (D) 25 cm

16. Operating between the same two temperatures which heat engine is the most efficient?
(A) carnot engine (B) diesel engine (C) petrol engine (D) steam engine

17. The value of universal gas constant 'R' is
(A) 1.6 J mol^{-1} k^{-1} (B) 1.38 J mol^{-1} k^{-1} (C) 8.314 J mol^{-1} k^{-1} (D) 6.02 J mol^{-1} k^{-1}

GUJ-42-21

PHYSICS **(INTERMEDIATE PART - I) 321** (3) **Paper- I Group - II**

Time: 2:40 Hours **SUBJECTIVE** **Marks: 68**

Note: Section I is compulsory. Attempt any THREE (3) questions from Section II.

(SECTION – I)

2. Write short answers to any EIGHT questions. **(2 x 8 = 16)**

i. Describe the methods to find uncertainty in the average value of many measurements.

ii. The time of 30 vibrations of simple pendulum recorded by a stop watch accurate upto one tenth of a second is 54.6 seconds. Find its uncertainty.

iii. By using dimensional analysis, find the dimension of power.

iv. Find the percentage uncertainty in the volume of a cylinder, if the percentage uncertainties in length and diameter of cylinder are 0.3% and 0.6% respectively.

v. Write down the five steps to find addition of vectors by rectangular components.

vi. If $\vec{A} = 3\hat{i} - \hat{j}$ and $\vec{B} = 5\hat{K}$. Find the dot product of $\vec{A}$ and $\vec{B}$ vectors.

vii. Suppose the sides of a closed polygon represent vectors arranged by head-to-tail rule. What is the sum of these vectors?

viii. Show that impulse and momentum has same unit.

ix. At what point or points in its path does a projectile has its minimum speed, its maximum speed?

x. In the absence of friction, then how the vertical and horizontal components of velocity change?

xi. How does the rocket propulsion take place?

xii. Explain what do you understand the term viscosity?

3. Write short answers to any EIGHT questions. **(2 x 8 = 16)**

i. A girl drops a cup from a certain height, which breaks into pieces, what energy changes are involved?

ii. When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?

iii. State work energy principle.

iv. Give the units and dimensions of angular velocity.

v. Define moment of inertia. Give its units and dimension.

vi. Show that orbital angular momentum $L_o = mvr$.

vii. Define resonance. What are its types?

viii. What is difference between free and forced oscillations?

ix. What is relation between total energy, potential energy and kinetic energy of a body executing SHM?

x. Why does sound travel faster in solids than in gases?

xi. How are beats useful in tuning musical instruments?

xii. Define node and antinode.

4. Write short answers to any SIX questions. **(2 x 6 = 12)**

i. Explain whether the Young's experiment is an experiment for studying interference or diffraction effects of light.

ii. The centre of Newton's rings is dark. why?

iii. How is the distance between interference fringes affected by the separation between the slits of Young's experiment?

iv. Why would it be advantageous to use blue light with a compound microscope?

v. Write down two advantages of fibre optics over radio wave carriers.

(Turn Over)

vi. Explain that the average velocity of the molecules in a gas is zero but the average of the square of velocities is not zero.

vii. Is it possible to convert internal energy into mechanical energy? Explain with an example.

viii. Define isothermal and adiabatic processes.

ix. State second law of thermodynamics.

(SECTION - II)

5. (a) Define projectile motion. Derive expressions for the height of the projectile and time of flight of the projectile. **1+2+2**

   (b) Two forces of magnitude 10 N and 20 N act on a body in directions making angles 30° and 60° with x-axis respectively. Find the resultant force. **3**

6. (a) Define conservative field and prove that work done is independent of the path followed by the body in gravitational field. **5**

   (b) A car of mass 800 kg travelling at 54 km h^{-1} is brought to rest in 60 metres. Find the average retarding force on the car. **3**

7. (a) State the Stokes' law and derive the equation of continuity. **1+4**

   (b) What is the least speed at which an aeroplane can execute a vertical loop of 1.0 km radius So that there will be no tendency for the pilot to fall down at the highest point? **3**

8. (a) What is simple pendulum? Show that the motion of pendulum is SHM. Also derive relation for its time period. **5**

   (b) A heat engine performs 100 J work and at the same time rejects 400 J of heat energy to the cold reservoirs. What is the efficiency of the engine? **3**

9. (a) Describe the principle, construction and working of Michelson's interferometer. How can you find the wavelength of light used? **5**

   (b) An astronomical telescope having magnifying power of 5 consist of two thin lenses 24 cm apart. Find the focal lengths of the lenses. **3**