

11181
PHYSICS
PART-I

P-424
(A) 2010

NOTE: Attempt all questions of Section-A by filling the corresponding bubble on the MCQ ANSWER SHEET and return it to the Superintendent within given time, even if you have not attempted any question.

SECTION-A

Time: 20 Minutes

Marks: 18

- The unit of solid angle is A) pascal, B) coulomb, C) radian, D) steradian
- One tera is equal to 10^{-18} , 10^{12} , C) 10^{-12} , D) 10^{18}
- A projectile is thrown so that it travels a maximum range of 2000m. How high will it rise? A) 250m, B) 400m, C) 500m, D) none
- If force and displacement of particle in the direction of force are doubled, then work would be A) half, B) $\frac{1}{4}$ times, C) double, D) 4 times
- The moment of inertia of a solid sphere is equal to A) MR^2 , B) $\frac{1}{2}MR^2$, C) $\frac{2}{5}MR^2$, D) $\frac{1}{2}MI^2$
- With the increase of temperature, viscosity A) increases, B) decreases, C) doubles, D) remains same
- The time period of a simple pendulum is 2 seconds. If its length is increased by 4 times then its period becomes A) 4s, B) 8s, C) 12s, D) 16s
- A sound source is moving towards stationary listener with $\frac{1}{10}$ th of the speed of sound. The ratio of apparent to real frequency is A) $\frac{11}{10}$, B) $\left[\frac{11}{10}\right]^2$, C) $\left[\frac{9}{10}\right]^2$, D) $\frac{10}{9}$
- Coloured fringes observed in soap bubbles are the example of A) diffraction, B) interference, C) polarization, D) reflection
- In an isothermal change, internal energy A) decreases, B) increases, C) becomes zero, D) remains constant
- Unit of entropy is A) JK, B) J/K, C) Nm/S, D) $\text{kgm}^2/\text{s}^2\text{k}$
- Which equation represents first law of thermodynamics? A) $\Delta Q = \Delta u + \Delta w$, B) $\Delta u = \Delta Q - \Delta w$, C) $\Delta W = \Delta Q + \Delta u$, D) all of these
- In Young's double slit experiment, the condition for constructive interference is A) $d \sin \theta = \lambda$, B) $d \sin \theta = m\lambda$, C) $d \sin \theta = m + \frac{1}{2}\lambda$, D) $d \sin \theta = (2m + 1)\frac{\lambda}{2}$
- The distance between adjacent node and anti-node is equal to A) λ , B) $\frac{\lambda}{2}$, C) 2λ , D) $\frac{\lambda}{4}$
- Artificial satellite moves around A) moon, B) sun, C) stars, D) earth
- One horse power is equal to A) 746 Watts, B) 746 J, C) 746 KW, D) 746 Foot Pounds
- If R_x is positive and R_y is negative, then θ lies in the quadrant A) I, B) II, C) III, D) IV
- What is the angle between A and B for which $|\vec{A} + \vec{B}| = |\vec{A} - \vec{B}|$? A) 30° , B) 45° , C) 60° , D) 90°

Time: 2-Hours 40 Minutes

SECTION-B

Marks: 40

1. Attempt any ten of the following. All carry equal marks.
- Show that the famous "Einstein equation" $E=mc^2$ is dimensionally consistent.
 - Explain why do buses and heavy trucks have large steering wheels?
 - Show that rate of change of linear momentum is equal to force acting on the body.
 - Why are energy savers used instead of normal bulbs?
 - Show that $S=r\theta$
 - Why does the pipe of paper squeezes when air is blown through it?
 - Explain what is meant by damped oscillations?
 - Explain the difference between longitudinal and transverse waves.
 - How can you explain Brewster's law of polarization?
 - What is heat death of the universe?
 - Differentiate between year and light year.
 - Discuss the effects of various factors on speed of sound in air.
 - What is the angle for which the maximum height reached and corresponding range are equal?

SECTION-C

Marks: 27

NOTE: Attempt any three of the following questions. All questions carry equal marks.

- Define escape velocity. Calculate the values of the escape velocity of a body and show that it is equal to 11.2 km/s.
 - A body of mass 'm' drops from bridge into water of the river. The bridge is 10m high from the water surface. Find the speed of the body 5m above the water surface.
- State and explain simple harmonic motion.
 - Calculate the length of a second pendulum having time period 2 seconds at a place where $g=9.8\text{ms}^{-2}$.
- Explain diffraction of x-rays by crystal and derive an expression for Bragg's law.
 - In a ripple tank 500 waves pass through a certain point in 10 seconds. If the speed of the wave is 3.5 m/s, then find the wavelength of the waves.
- What is meant by a heat engine? Explain construction, principle, working and efficiency of heat engine.
 - Find the efficiency of a Carnot's heat engine working between the steam and ice points.