

## JEE Main 31 January 2024 Shift 2 Answer Key

### Physics

Q.1: If in the given expression,  $E = b - x^2 / t$  at E represents energy, x represents length and t represents time then, find  $[a/b]$  where a and b are variables.

A.1:  $[a/b] = [M^{-1} \cdot C^2 T^1]$

Q.2: What will be the value of x when 3 moles of oxygen gas and 2 moles of argon gas are mixed together, and if the total energy of the mixture is  $xRT$ ?

A.2:  $x = 10.5$

Q.3: Find the mass number of nucleus Y when A nucleus X has mass number 192 and a second nucleus Y has radius half of X,

A.3:  $y = 24$

Q.4: Determining the power delivered when Force on a 2 kg particle varies with time as  $\vec{F}(\text{vector}) = 6t\hat{i}(\text{cap}) - 6t^2\hat{j}(\text{cap})$ .

P = -120

Q.5: If the mass of the moon is  $1/144$  times of a planet, and the diameter of the moon is  $1/16$  times of the diameter of a given planet, then find the escape velocity on the moon if the escape velocity on the planet is v.

A.5:  $v/3$

Q.6: A particle is projected at an angle of  $45^\circ$  with horizontal speed u. Find the angular momentum of the particle about the point of projection at the time when it reaches maximum height.

A.6:  $L_0 = \frac{mv^3}{4\sqrt{2}g}$

Q.7: Magnetic flux passing through a loop of resistance 8 Ohms is given by  $\Phi = 5t^2 - 36t + 5$ . Find the current in the loop at  $t = 2$  sec.

A.7: 2 A

Q.8: For the block shown,  $F_1$  is the minimum force required to move the block upward and  $F_2$  is the minimum force required to prevent it from slipping find  $|F_1 \text{ (vector)} - F_2 \text{ (vector)}|$

A.8:  $5\sqrt{3}$

Q.9: What is the speed of sound at STP if the  $\gamma$  of air is 1.4 (given  $R = 80134 \text{ J/mol-K}$ )

A.9:  $\sqrt{\frac{3}{5}k}$

Q.10: A point object is placed at 100 cm from a convex spherical refractive surface having radius of curvature 200 cm and refractive index of the refractive surface is 1.5. Find image distance.

A.10:  $v = -300 \text{ cm}$

Q.11: Statement 1: EM waves possess energy. Statement 2: When EM waves strike a surface they apply pressure on it

A.11: Both statements are correct

Q.12: The force between two charged particles separated by a distance  $r$  when placed in air is  $F$ . If these charges are immersed in a medium of dielectric constant  $k = 5$  then find the separation between them to keep the force the same.

A.12:  $r\sqrt{5}$