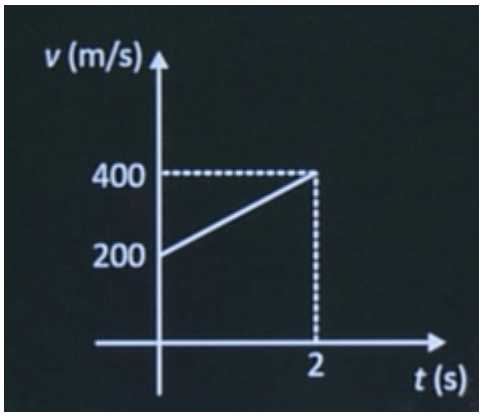
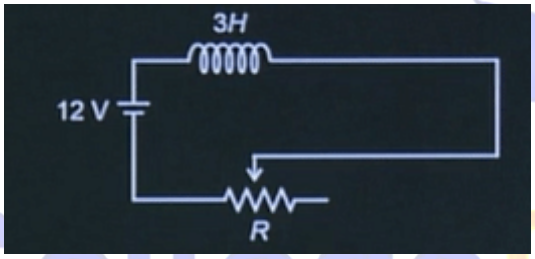
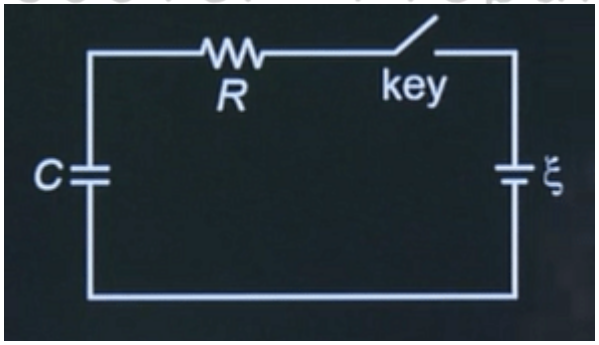
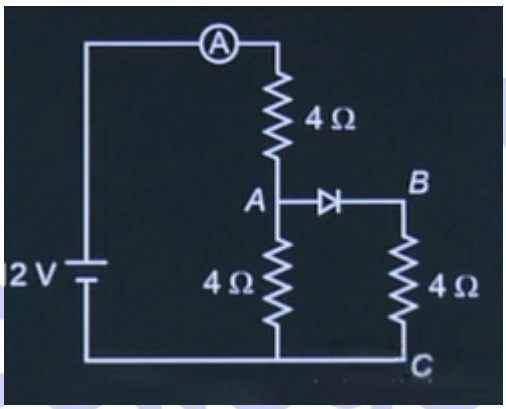
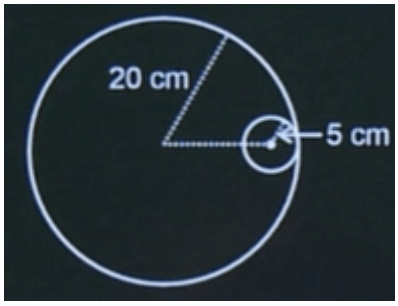
JEE Main 23 January 2025 Shift 1

Physics Question Paper with Answer Key

Q.No.	Questions	Answers
1	Electric flux ϕ is related with linear charge density λ and surface charge density σ as $\phi = \alpha\lambda + \beta\sigma$, where α and β are of appropriate dimensions of (β/a) is	Displacement
2	Match the Column appropriately regarding the thermodynamic process. (P) When volume change is zero - (i) $\Delta W = 0$ (Q) When Pressure is constant - (ii) $\Delta Q = 0$ (R) When no heat is exchanged - (iii) Isobaric (S) Work done by the gas is equal to heat given to the gas - (iv) Isothermal	P(i), Q(iii), R(ii), S(iv)
3	The displacement of a particle as function of time is $x(t) = A \sin(t) + B \cos^2(t) + ct^2 + D$. Find the Dimension of [ABC/D].	L^2T^{-2}
4	The ratio of electric force to gravitational force between two particles having charges q_1, q_2 and masses m_1 and m_2 respectively is	$\frac{q_1 q_2}{4\pi\varepsilon_0 m_1 m_2}$
5	Statement-I: Hot water is less viscous than cold water. Statement-II: Surface tension of soap bubble is more than that of a drop of water.	Statement 1 is true and Statement 2 is false

6	For the given velocity-time (v-t) graph, find distance travelled at 0.5 sec. 	112.5 m
7	In given DC circuit, find the current for R = 12 Ω in a steady state. 	1 A
8	The key shown in the circuit is closed at t = 0. Choose the incorrect option regarding the conditions at t = 0. 	Current in the circuit is zero.
9	Self-inductance depends on _____.	Geometry and Medium property

10	Solid sphere of mass m rolls dawn from rest to achieve speed v_1 an inclined plane of 30°. Sphere achieves speed v_2 an inclined plane of 45° when released from the same height then  is	1
11	Find the equation of magnetic field for the given equation of electric field (for EM wave). $E = E_0(4\hat{i} - 3\hat{j})\cos(\omega t - kz)$	$\vec{B} = \frac{E_0}{c}(3\hat{i} + 4\hat{j})\cos(\omega t$
12	For the circuit shown below  (A) Current in ammeter is 2 A (B) Net resistance is 8 Ω (C) Voltage across BC is 4 V (D) Current through diode is 1 A Choose the correct option.	Only A, C, D are correct.
13	Find the time period of a cube of side length 10 cm and mass 10 g oscillating in water. (Density of water = 10^3 kg/m^3 and g = 10 m/s^2)	π/50 second
14	Adiabatic constant of a gas is 3/2. If volume of gas initially at 0°C is reduced to one-fourth of the original volume then new temperature is	546 K

15	From a uniform circular disc of radius 20 cm a circular portion of radius 5 cm is removed. The shift in the position of centre of mass (in cm). 	1 cm
16	A bullet of kinetic energy of 125 J strikes a lead block where temperature rises by 50°C. If specific heat of lead is 0.1 J/g-°C then mass of lead block is (Assume half of kinetic energy of bullet is converted to heat) m gram then $2m$ is	25
17	Two objects are equal distances from sphere of radius R and refractive index μ such that the image of one object forms on other object. Find the object distance from the surface of sphere.	R/μ-1
18	There is force field $\vec{F} = x^3y\hat{i} + y^2\hat{i}$ in which a particle moves along the line x = y. Find work done by the force as the particle moves from (0, 0) to (2, 2).	136/15
19	In a radioactive decay, decay constant of element A_2 is 3 times that of element A_1. Find the ratio of nuclei of element 1 to element 2 after one half life of A_2. (Assume initial number of nuclei the same for both elements)	$2^{2/3}$