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PH108 : Electricity & Magnetism

Weekly Quiz 2 - Continuity equation & Gauss's law

31 January, 2018

Instructions: Read these before beginning!

1) Fill out the details carefully & correctly, else the quiz will NOT fetch you marks or attendance.

2) You have **5 min** to fill all the answer(s) at the specified location(s), for a total of **1 mark**.

3) There will be NO partial marking. Only answer(s) at specified location(s) will be considered.

4) Any sort of malpractice will be strongly penalised!

All the Best! Use the backside for rough work.

Question

What happens to a little extra charge placed in a conductor?
Consider the continuity equation applied to charge density (ρ) and current density($\vec{J}$),

$$\nabla \cdot \vec{J} + \frac{\partial \rho}{\partial t} = 0$$

We also know that in a conducting material the electric field and current density are related by Ohm's law. $\vec{J} = \sigma \vec{E}$, where the conductivity σ, is a scalar number.

1. Use these two relations in conjunction with Gauss's law to derive an equation for ρ alone. [$\frac{1}{2}$ **mark**]

   Ans:

2. Can you write down the solution of this equation ? [$\frac{1}{2}$ **mark**]

   Ans: $\rho(t) =$

Question Ends Here