

Moderate

Assistant Engineer (Electrical), Class 2025

Building Department

The continuity equation is a combination of which of the two laws?

A

Ohm's law and Gauss law

B

Ampere law and Gauss law

Correct

C

Ohm's law and Ampere law

D

Maxwell law and Ampere law

Correct Answer: B

Full Detailed Explanation

Concept & Reasoning: Ampere-Maxwell law states $\nabla \times \mathbf{H} = \mathbf{J} + \frac{d\mathbf{D}}{dt}$. Taking divergence of both sides gives zero on the left because divergence of a curl is always zero. On the right,

$\nabla \cdot (\mathbf{J} + \frac{d\mathbf{D}}{dt}) = 0$. Gauss' law gives $\nabla \cdot \mathbf{D} = \rho$. Substituting produces $\nabla \cdot \mathbf{J} + \frac{d\rho}{dt} = 0$,

the differential continuity equation expressing conservation of charge. Thus

the two field laws used are Ampere-Maxwell and Gauss.

How to Solve It in the Exam: Continuity equation = divergence of Ampere-Maxwell + Gauss law.

Important Exam Point: Remember the vector identity $\nabla \cdot (\nabla \times \mathbf{H}) = 0$.

Related Revision Path: This question sits in the revision path

Electromagnetic Fields > Maxwell Equations > Continuity Equation.

Open live question on website:

<https://sarkariresultout.com/pyq/question/gpsc-ae-electrical-q145-charge-conservation-from-maxwell-equations/>