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Crash Course Physics #37: Maxwell's Equations

Name: _____ Date: _____

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1. A changing magnetic field induces an _____, which can produce an electric current.
2. Electric flux through a closed surface is proportional to the total _____ enclosed by that surface.
3. The _____ of free space is a constant that relates electric charge to electric fields.
4. Magnetic field lines form _____, always looping from north to south poles.
5. The total magnetic flux through a closed surface is always equal to _____.
6. Faraday's Law states that a changing magnetic field will induce an _____ field.
7. The emf in a closed loop is equal to the _____ integral of the electric field.
8. Maxwell added the concept of _____ current to Ampère's Law to account for changing electric fields.
9. The displacement current is proportional to the rate of change of _____ flux over time.
10. Electromagnetic waves consist of oscillating electric and magnetic fields that are _____ to each other.
11. The direction of propagation of an electromagnetic wave is _____ to both the electric and magnetic fields.
12. The speed of electromagnetic waves in a vacuum is equal to the inverse square root of the product of _____ and _____ of free space.
13. The equation for wave speed equals frequency multiplied by _____.
14. The _____ of an electromagnetic wave is the energy transported per unit time per unit area.
15. The _____ of the electric and magnetic fields can be used to calculate the energy density of an electromagnetic wave.

Crash Course Physics #37: Maxwell's Equations KEY

1. A changing magnetic field induces an **electromotive force**, which can produce an electric current.
2. Electric flux through a closed surface is proportional to the total **charge** enclosed by that surface.
3. The **permittivity** of free space is a constant that relates electric charge to electric fields.
4. Magnetic field lines form **loops**, always looping from north to south poles.
5. The total magnetic flux through a closed surface is always equal to **zero**.
6. Faraday's Law states that a changing magnetic field will induce an **electric** field.
7. The emf in a closed loop is equal to the **line** integral of the electric field.
8. Maxwell added the concept of **displacement** current to Ampère's Law to account for changing electric fields.
9. The displacement current is proportional to the rate of change of **electric** flux over time.
10. Electromagnetic waves consist of oscillating electric and magnetic fields that are **perpendicular** to each other.
11. The direction of propagation of an electromagnetic wave is **perpendicular** to both the electric and magnetic fields.
12. The speed of electromagnetic waves in a vacuum is equal to the inverse square root of the product of **permittivity** and **permeability** of free space.
13. The equation for wave speed equals frequency multiplied by **wavelength**.
14. The **intensity** of an electromagnetic wave is the energy transported per unit time per unit area.
15. The **magnitude** of the electric and magnetic fields can be used to calculate the energy density of an electromagnetic wave.

15 Questions

Answer Key Included

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