Exam 1 Equations

Jason Medcoff

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1 Chapter 15

1.1 Vectors

$$\vec{A} \cdot \vec{B} = AB\cos(\theta)$$

If $\vec{A}$ and $\vec{B}$ are parallel:

$$\vec{A} \cdot \vec{B} = AB$$

If $\vec{A}$ and $\vec{B}$ are perpendicular:

$$\vec{A} \cdot \vec{B} = 0$$

1.2 Electric Force

Magnitude:

$$F = K_e \frac{|q_1||q_2|}{r^2}$$

Vector formulation:

$$\vec{F}_{12} = K_e \frac{q_1 q_2}{r^2} \hat{r}_{12}$$

Direction vector:

$$\hat{r}_{12} = \frac{\vec{r}_2 - \vec{r}_1}{r}$$

1.3 Electric Field

$$\vec{E} = \frac{\vec{F}}{q_0}$$

$$\vec{E} = K_e \frac{q}{r^2} \hat{r}$$

1.4 Electric Flux and Gauss's Law

$$\Phi = EA\cos(\theta)$$

$$\Phi = \frac{q_{enclosed}}{\varepsilon_0}$$

2 Chapter 16

$$\Delta V = -E\Delta x$$

For a point charge q:

$$V = K_e \frac{q}{r}$$

Potential Energy:

$$PE = q\Delta V$$

Capacitance:

$$C = \frac{Q}{|\Delta V|}$$

For parallel plate capacitors:

$$C = \varepsilon \frac{A}{d}$$

$$\varepsilon = \kappa \varepsilon_0$$

Parallel Combinations of Capacitors:

$$C_{eq} = C_1 + C_2 + ...$$

Series Combinations of Capacitors:

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + ...$$

3 Chapter 17

Ohmic Resistors (Ohm's Law):

$$V = IR$$

Power on a resistor:

$$P = IV = I^2R = \frac{V^2}{R}$$

Series resistors:

$$R_{eq} = R_1 + R_2 + ...$$

Parallel Resistors:

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + ...$$

4 Chapter 18

Kirchoff's laws:

$$\sum I_{entering} = \sum I_{leaving}$$

$$\sum_{loop} V = 0$$

5 Constants

$$\varepsilon_0 = 8.8542 \times 10^{-12}\ c^2/Nm^2$$

$$K_e = \frac{1}{4\pi\varepsilon_0} = 8.99 \times 10^9\ Nm^2/c^2$$

$$e = -1.602 \times 10^{-19} C$$

$$p = 1.602 \times 10^{-19} C$$

$$m_e = 9.11 \times 10^{-31} kg$$

$$m_p = 1.67 \times 10^{-27} kg$$