Exam I
Spring 2007
Physics 100B

Student's Name: _____ .

Problem	Value	Score
I	35	
II	20	
III	25	
TOTAL	100	

1. Giving or receiving aid in any examination is cause for dismissal from the university.
2. Perform the necessary calculation in the spaces provided. If additional space is required, use the backs of the questions sheets.
3. All work must be shown in order to receive **FULL** credit. Work must be legible and comprehensible, and answers should be clearly indicated.

USEFUL EQUATIONS AND CONSTANTS

$k = 8.99 \times 10^9 \ \frac{Nm^2}{C^2}$ $\quad \varepsilon_0 = 8.85 \times 10^{-12} \ \mathrm{C^2 / N \cdot m^2}$

$q_e = -1.6 \times 10^{-19}$ C $\quad q_p = +1.6 \times 10^{-19}$ C

$m_e = 9.1 \times 10^{-31}$ kg $\quad m_p = 1.7 \times 10^{-27}$ kg $\quad 1 \text{ eV} = 1.60 \times 10^{-19}$ J

Coulomb's Law:	$F = k\frac{\lvert q_1 \rvert \lvert q_2 \rvert}{r^2}$	$k = 8.99 \times 10^9 \ \mathrm{N \cdot m^2 / C^2}$
Superposition:	$\vec{F}_1 = \vec{F}_{12} + \vec{F}_{13} + \vec{F}_{14}$	Vector Sum
Electric Field:	$\vec{F} = q\vec{E}$	Definition
Electric Field:	$E = k\frac{\lvert q \rvert}{r^2}$	Magnitude (for point charge)
Superposition:	$\vec{E} = \vec{E}_1 + \vec{E}_2 + \vec{E}_3$	Vector Sum
Potential Difference:	$\Delta V = \frac{\Delta U}{q_0} = -\frac{\Delta W_{\text{by electric force}}}{q_0}$	Definition
Potential Energy	$U = q\,V$	
	$\Delta V = -E\Delta s\cos\theta$	Uniform Electric Field
Electric Potential:	$V = k\frac{q}{r}$	Point Charge

$$V = k\frac{q_1}{r_1} + k\frac{q_2}{r_2} + k\frac{q_3}{r_3}$$ Superposition

Energy Conservation: $\Delta K + \Delta U = 0$ $K = \frac{1}{2}mv^2$

Capacitance: $C = \frac{Q}{V}$ Definition

$C = \varepsilon_0 \frac{A}{d}$ Parallel Plate,

Dielectric: $C = \kappa C_0$ $\kappa =$ Dielectric Constant

Energy Stored: $U = \frac{1}{2}QV = \frac{1}{2}CV^2 = \frac{1}{2}\frac{Q^2}{C}$

Energy Density: $u = \frac{1}{2}\varepsilon_0 E^2$

Ohm's Law: $\mathcal{E} = IR$

Current: $I = \frac{\Delta Q}{\Delta t}$

Ohm's Law: $V = IR$

Resistance: $R = \rho\frac{L}{A}$ $\rho =$ Resistivity

Power: $P = IV = I^2R = V^2/R$

Resistors in Series: $R_{eq} = R_1 + R_2 + R_3 + \ldots$

Resistors in Parallel: $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots$

Capacitors in Series: $\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \ldots$

Capacitors in Parallel: $C_{eq} = C_1 + C_2 + C_3 + \ldots$