

Name (Print) _____ Name (Sign) _____

Discussion Instructor (CIRCLE ONE): Johnson Spanning Yan

Discussion Section # 5 each

PROBLEM 1

- (a) Calculate the electric force between two electrons $6.00 \times 10^{-10} \text{ m}$ apart.

$$F = \frac{k q^2}{r^2}$$

$$\underline{6.40 \times 10^{-19} \text{ N}}$$

- (b) The electric potential in a region of space is given by $V = -A x^2 y^3$,

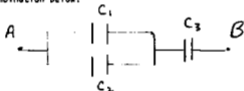
where A is a constant. Calculate the y component of the electric field.

$$E_y = -\frac{\partial V}{\partial y}$$

$$\underline{3Ax^2y^2 \frac{V}{m}}$$

- (c) Calculate the equivalent capacitance between A and B of the combination below.

$$\underline{6.35 \text{ pF}}$$



$$C_1 = 4.0 \text{ pF}$$

$$C_2 = 7.0 \text{ pF}$$

$$C_3 = 15.0 \text{ pF}$$

- (d) In a hydrogen atom, one electron orbits about one proton. If you assume a circular orbit (classical model), and a distance between proton and electron of $0.50 \times 10^{-10} \text{ m}$, calculate the velocity of the electron.

$$F = ma = \frac{mv^2}{r} \quad \therefore v = \sqrt{\frac{r a}{m}} = \sqrt{\frac{r k e^2}{m r^2}} = \underline{2.25 \times 10^6 \frac{m}{s}}$$

- (e) The energy stored in a capacitor is 1.75 J. If the voltage is 175 V, find the value of the capacitance.

$$U = \frac{1}{2} C V^2$$

$$\underline{C = 114 \mu\text{F}}$$