Name ______________________________ Date ______________

PH 102 Quiz 3: Potential and so forth

$\Delta V = k_e \frac{q}{r}$ $\quad k_e = 8.9875 \times 10^9 \,\frac{\mathrm{N}\cdot\mathrm{m}^2}{\mathrm{C}^2}$ $\quad q\Delta V = PE$ $\quad Q = C\Delta V$ $\quad C = \kappa\epsilon_0 \frac{A}{d}$ $\quad e = 1.6 \times 10^{-19}\,C$

$C_{\text{eq, parallel}} = C_1 + C_2$ $\quad C_{\text{eq, series}} = \frac{C_1 C_2}{C_1 + C_2}$ $\quad E_C = \frac{1}{2} Q\Delta V = \frac{1}{2} C(\Delta V)^2$ $\quad -W = \Delta PE = -qE_x\Delta x = q\Delta V$

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1. Capacitors connected in parallel *must always* have the same:

- ◯ Charge
- ⊗ Potential difference
- ◯ Energy stored
- ◯ None of the above

2. An ideal parallel plate capacitor is completely charged up, and then disconnected from a battery. The plates are then pulled a small difference apart. What happens to the capacitance, C, and charge stored, Q, respectively?

- ◯ decreases; increases
- ◯ increases; decreases
- ⊗ decreases; stays the same
- ◯ stays the same; decreases

3. An isolated conductor has a surface electric potential of 10 Volts. An electron on the surface is moved by 0.1 m. How much work must be done to move the charge? Note that e is the charge on an electron.

- ◯ $1e$ Joules
- ◯ $0.1e$ Joules
- ◯ $10e$ Joules
- ⊗ 0

4. An electron initially at rest is accelerated through a potential difference of 1 V, and gains kinetic energy KE_e. A proton, also initially at rest, is accelerated through a potential difference of -1 V, and gains kinetic energy KE_p. Which of the following must be true?

- ◯ $KE_e < KE_p$
- ⊗ $KE_e = KE_p$
- ◯ $KE_e > KE_p$
- ◯ not enough information

5. Consider a collection of charges in a given region, and suppose all other charges are distant and have negligible effect. The electric potential is taken to be zero at infinity. If the electric potential at a given point in the region is zero, which of the following statements must be true? (Only one is *always* true.)

- ◯ The electric field is zero at that point.
- ◯ The electric potential energy is a minimum at that point.

- ◯ There is no net charge in the region.
- ⊗ Some charges in the region are positive and some are negative.
- ◯ The charges have the same sign and are symmetrically arranged around the given point.