

Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

**Unit 13**  
**Electric Potential Practice Test**

**Form P**

Some useful constants

$$k = 8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$$

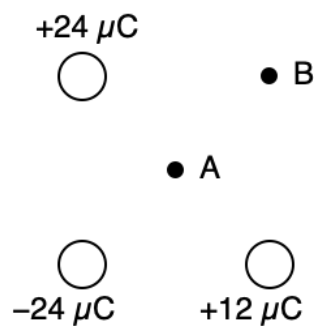
$$1 \text{ elementary charge} = 1.69 \times 10^{-19} \text{ C}$$

1. Suppose that an electron is brought from infinity to a distance of 53 pm from a proton.
  - a. How much work is done in this process?

- b. Who or what is doing this work?

- c. How much work would be done to bring a second electron to the same distance but on the opposite side from the first electron?

2. Three charges are arranged at the corner of a square as shown below. The square has a length of 10.0 cm on each side.



- a. What is the potential at point A, which is at the exact center of the square?

- b. What is the potential at point B, which is at the upper-right corner of the square?

- c. How much work would be needed to move a  $2\mu\text{C}$  charge from point A to point B?

3. A parallel plate  $480\text{-}\mu\text{F}$  capacitor is connected to a  $12\text{-V}$  battery. The plates are separated by a distance of  $0.100\text{ mm}$ .
- What is the charge on this capacitor?
  - How much energy is being stored by this capacitor?
  - How much work would be required to move one more electron from the positive plate over to the negative plate?
  - How much kinetic energy would this electron gain if it were released from the negative plate and allowed to move freely to the positive plate?
  - How fast would this electron be traveling when it arrived at the positive plate?
  - Describe the electric field in the middle of the capacitor.
4. A different parallel plate capacitor is connected to a battery with an unknown voltage. When the plates are separated by  $1.50\text{ cm}$ , the electric field at the center of the capacitor has a magnitude of  $12,000\text{ N/C}$ . The following ions are released from the very center of the capacitor:  $\text{H}^+$ ,  $\text{Cl}^-$ ,  $\text{Mg}^{2+}$ ,  $\text{N}_3^-$ .
- What is the voltage of the battery?
  - What is the potential difference between the center of the capacitor and its positive plate?
  - How much kinetic energy, measured in electron volts, will each of the ions gain as it travels to a capacitor plate?
  - The plates are now pulled apart to a separation of  $4.50\text{ cm}$  while still connected to the battery. What else changes? Why do they change?
  - A dielectric is now placed between the plates while the battery is still connected. What else changes? Why do they change?