Name _____

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Quiz 2: Potential

$$\Delta V_{BA} = V_B - V_A = -\int_A^B \vec{E} \cdot d\vec{l} \qquad V(r) = \frac{k_e q}{r} \quad \text{point charge } q \text{ at } r = 0$$

$$\vec{E} = \frac{dV}{dx}\,\hat{\boldsymbol{x}} + \frac{dV}{dy}\,\hat{\boldsymbol{y}} + \frac{dV}{dz}\,\hat{\boldsymbol{z}} \qquad KE = \frac{1}{2}mv^2 \quad m_{\text{electron}} \ll m_{\text{proton}}$$

1. In a certain region of space, the electric potential is zero everywhere along the x axis. From this we can conclude that the x component of the electric field in this region is

- zero
- in the x direction
- in the $-x$ direction.

2. In a certain region of space, the electric field is zero. From this we can conclude that the electric potential in this region is

- zero
- constant
- positive
- negative.

3. 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

4. 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.

5. A spherical balloon contains a positively charged object at its center. As the balloon is inflated to a greater volume while the charged object remains at the center, does the electric potential at the surface of the balloon:

- increase
- decrease
- remain the same