9. Electric Potential

Starter Quiz · 课前小测

AP Physics C: Electricity and Magnetism Name: _____ Score: _____

1. The potential energy of two point charges is proportional to:

   ☐ $1/r^2$

   ☐ $1/r$

   ☐ r

   ☐ r^2

2. Electric potential V is:

   ☐ energy per unit charge

   ☐ force per unit charge

   ☐ charge per unit volume

   ☐ power per second

3. A charge is released in a field (only the electric force acts). As it speeds up, its potential energy:

   ☐ rises

   ☐ falls

   ☐ stays constant

   ☐ becomes infinite

4. Two opposite charges have a potential energy that is:

   ☐ positive

   ☐ negative

   ☐ zero

   ☐ infinite

5. Potentials from several charges add as simple scalars — no vectors needed.

   ☐ True ☐ False

6. A 2 C charge falls through $\Delta V = 5$ V. How much kinetic energy (in J) does it gain?

   _____ J

7. Find U (in J) for a +1 nC and +1 nC charge 1 m apart. Use $k = 9 \times 10^9$.

   _____ J

8. Two charges give $+50$ V and -20 V at a point. Find the total V (in V).

   _____ V

9. The energy an electron gains crossing 1 V is one _____.

   _____

10. The work done by the electric field equals the decrease in potential energy, $W = -\Delta U$.

    ☐ True ☐ False

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Answers · 答案

AP Physics C: Electricity and Magnetism

1. $1/r$

   $U = kq_1q_2/r$ — energy goes as $1/r$ (force goes as $1/r^2$).

2. **energy per unit charge**

   $V = U/q$ — potential energy per unit charge, in volts.

3. **falls**

   $\Delta KE + \Delta U = 0$: as KE rises, U falls.

4. **negative**

   Opposite charges attract, so $U = kq_1q_2/r < 0$ — a bound pair.

5. **True**

   V is a scalar: $V = \sum kQ_i/r_i$, just add the numbers.

6. **10 J**

   $KE = q\,\Delta V = 2 \times 5 = 10$ J.

7. **9e-09 J**

   $U = \dfrac{(9 \times 10^9)(10^{-9})(10^{-9})}{1} = 9 \times 10^{-9}$ J.

8. **30 V**

   Scalars add: $50 + (-20) = 30$ V.

9. **electron-volt**

   That energy is 1 eV $= 1.6 \times 10^{-19}$ J.

10. **True**

    A drop in U releases energy as work: $W = -\Delta U$.