EvaluAIde Beta Bonus Assignment – College Physics II: Electrostatics

Instructions:

- Answer all questions in detail. Show your work and reasoning for each part.
- Your submission must be a single PDF file. You may type your solutions or handwrite and scan them.
- This assignment is for bonus credit and will help improve our grading tools—thank you for participating!
- Submit your PDF via the usual course submission portal by the posted deadline.

Questions

1. **Coulomb's Law:** Two point charges, $q_1 = +2.0\ \mu C$ and $q_2 = -3.0\ \mu C$, are placed $0.50\ m$ apart in vacuum.
   a) Calculate the magnitude and direction of the electrostatic force on each charge.
   b) Is the force attractive or repulsive?

2. **Electric Field of a Point Charge:** What is the magnitude and direction of the electric field at a point $0.30\ m$ away from a $+5.0\ \mu C$ point charge?

3. **Electric Field from Multiple Charges:** Two charges, $+1.0\ \mu C$ and $-2.0\ \mu C$, are fixed $0.40\ m$ apart.
   a) Find the electric field at the midpoint between them (magnitude and direction).
   b) If a $+1.0\ nC$ test charge is placed at the midpoint, what force does it experience (magnitude and direction)?

Amount of energy per unit charge

4. **Electric Potential (Point Charges):** $V_P = \frac{kQ}{R}$

   What is the electric potential at a point 0.25 (r) m from a -4.0 ($\times 1\times10^{-6}$) μC point charge? (Assume zero potential at infinity.)

   $\frac{(9\times10^9 \frac{Nm^2}{C^2})(-4.0\times10^{-6}\,C)}{0.25\,m}$ $\quad \frac{-36000}{0.25} = -144000\ V$

5. **Potential Difference and Work:**

   An electron moves from point A (potential = $+100$ (V_A) V) to point B (potential = -50 (V_B) V).

   a) What is the potential difference $V_B - V_A$? $-50\ V - 100\ V = -150\ V$

   b) How much work is done by the electric field on the electron ($-$ (−)) during this move?

   $-1.6\times10^{-19}\,C$

   $W_{AB} = q(V_B - V_A)$

   $= (-1.6\times10^{-19}\,C)(-150\,V)$

   $= 2.4\times10^{-17}\,J$