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.

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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.

   F=k(|q1q2/r2), k=8.99e9

   q1= 2.0e-6, q2= -3.0e-6

   r=(.50^2)= 0.25

   (2.0e-6*3.0e-6)= 6.0e-12 → (6.0e-12*8.99e9)= 5.39e-2

   5.39e-2 / 0.25 = .2156 N

   a) Calculate the magnitude and direction of the electrostatic force on each charge.

   F=0.22 N

   b) Is the force attractive or repulsive?

   Attractive

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?

   E=k(q1/r2), k=8.99e9

   r=(.30^2)= .09

   E=8.99e9*5.0e6 = 44950

   44950/.09= 499444 → 4.99e5 N/C

   E= 5.0e5 N/C, outward (away from charge)

3. **Electric Field from Multiple Charges:**

   Two charges, $+1.0\ \mu C$ and $-2.0\ \mu C$, are fixed 0.40 m apart.

   r=.40/2 → midpoint=.20

   E=k(q1/r2), k=8.99e9

   E=8.99e9(1.0e-6/.2^2)= 224750 N/C

   E=8.99e9(|-2.0e-6|/.2^2)= 449500 N/C

   224750+449500 = 674250 N/C

   a) Find the electric field at the midpoint between them (magnitude and direction).

   E= 674250 N/C, toward negative (q2=-2.0e-6)

   b) If a +1.0 nC test charge is placed at the midpoint, what force does it experience (magnitude and direction)?

   F=qE, q=1.0e-9, E=674250 → F=(1.0e-6)(674250)

   F= 6.7e-4 N, toward negative (q2=-2.0e-6)

4. **Electric Potential (Point Charges):**

   What is the electric potential at a point 0.25 m from a $-4.0\ \mu C$ point charge? (Assume zero potential at infinity.)

   V=kq/r, k=8.99e9, q=-4.0e-6, r=.25m

   V=8.99e9(-4.0e-6/.25)= 143840 V

   V=143840 V, negative electric potential

5. **Potential Difference and Work:**

   An electron moves from point A (potential = +100 V) to point B (potential = −50 V).

6. a) What is the potential difference $V_B - V_A$?

(-50)-(+100) = -150 V

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

W=q(delta V)

Electron (q)= 1.60e-19

W=(1.60e-19*-150)

W= -2.4e-17 J