

Topic 5.1 – Electric fields

Formative Assessment

NAME: _____ TEAM: _____

THIS IS A PRACTICE ASSESSMENT. Show formulas, substitutions, answers (in spaces provided) and units!

A balloon becomes charged to 125 mC by rubbing it on Albert the Physics Cat.



1. What is the sign of the charge the balloon acquires? 1. _____
2. How many electrons are transferred between the balloon and Albert?
2. _____
3. How do the charges of the balloon and Albert compare?
3. _____

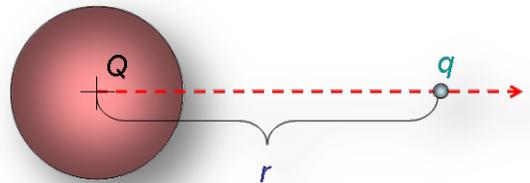
The following questions are about electric current.

4. A +125 μC charge is moved past a point in a conductor in 25.0 ms. What is the value of the electric current involved in this movement? 4. _____
5. An electrical discharge between a cloud and a lightning rod has a current of 1250 A for a time of 1.25 ms. How much electric charge was involved in this lightning strike? 5. _____

Two equal point charges of +125 μC are placed 0.625 mm apart.

6. If the charges are located in air, or vacuum, what is their electric force? Is it attractive or repulsive?
6. _____
7. If the charges now have a 0.625 mm layer of mica between them, what is the new electric force between them? Assume this purity of mica has a permittivity of 7.50 times that of free space.
7. _____

A conducting sphere of radius 0.125 m holds an electric charge of $Q = +80.0 \mu\text{C}$. A charge $q = +20.0 \mu\text{C}$ is located in the vicinity of Q .



8. Find the electric force between the two charges if q is located 0.25 m from the surface of Q .
8. _____
9. Find the electric force between the two charges if q is moved onto the surface of Q .
9. _____
10. If the mass of q is 0.250 g what is its initial acceleration if released from this new position?
10. _____

A +50 μC charge is located in free space.

11. Find the electric field strength 0.25 m from the charge. 11. _____
12. Find the force acting on an electron that is 0.25 m from the charge. Is it attractive, or is it repulsive?
12. _____

Two charges of -0.64 C each are located at opposite corners of a square having a side of 0.0225 m .

13. Find the electric field strength at the center of the square. 13. _____

14. Find the electric field strength at one of the unoccupied corners. 14. _____

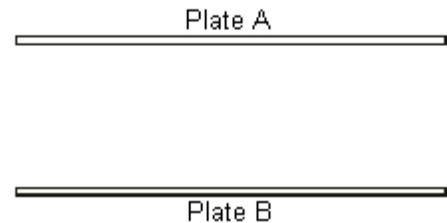
The following question is about sketching electric field lines.

15. Charge A is -3 C , charge B is $+3\text{ C}$, charge C is -6 C and charge D is $+6\text{ C}$. Assume the charges are far enough apart that their fields do not affect one another. Sketch in the electric field lines about all four charges so that their densities are correct relative to one another.



15. In figure

A charge of $q = -25.0\ \mu\text{C}$ and $m = 0.00125\text{ g}$ is moved from Plate A, having a voltage (potential) of 250.0 V to Plate B, having a voltage (potential) of 0.000 V . The distance from A to B is 0.125 cm .



16. Sketch in the electric field lines, both in between the plates, and partially outside them. 16. In figure

17. What is the potential difference undergone by the charge? 17. _____

18. What is the work done in moving the charge from A to B? Express your answer in both J and eV. 18. _____

19. What is the magnitude of the electric field between the plates? 19. _____

20. What is the acceleration of the charge q ? Ignore the weight of the charge. 20. _____

Suppose the current in a 1.85 mm diameter copper wire is 2.00 A is used to light a bulb, and the number density of the free electrons in the metal of the wire is $2.50 \times 10^{25}\text{ m}^{-3}$.

21. Find the drift velocity of the electrons. 21. _____

22. How long would it take an electron with this drift velocity to travel 4.50 m from an on-off switch through a wire to the bulb? 22. _____

23. Explain, then, why the bulb lights up immediately when the switch allows the current to begin flowing.
