Physics Unit 7*:* Static Electricity *Review*

1. Know about electric potential difference, electric potential energy, equipotential lines, electric field, electric field lines, conductors, insulators
2. What is the charge of an electron?
3. What is the value of k?
4. What are some combinations of charges that attract? Repel?
5. Know the steps to charge by contact and by induction.
6. Be able to draw electric field lines and equipotential lines.
7. Be able to read electric field map and equipotential lines to determine where the E-field is greatest and potential is greatest
8. A conducting sphere has a net charge of -5×10^{-18} C. What is the approximate number of excess electrons on the sphere?
9. At what separation will two charges, each of magnitude 5 mC, exert a force of 10 N on each other?
10. A –10-μC charge is located 0.75 m to the right of a +15-μC charge. What is the magnitude and direction of the electrostatic force on the positive charge?
11. What is the magnitude and direction of the electric force on a −10 μC charge at a point where the electric field is 2100 N/C and is directed along the +x axis.
12. If the work required to move a +3 μC charge from point **A** to point **B** is +500 J, what is the potential difference between the two points?
13. What is the electric potential energy of a 2 μC charge located at a point in space 3 cm away from a charge where the electric potential is 75 V?
14. How far from a 0.3 C charge is the electric potential 5000 V?
15. What is the electric field that accelerates proton from a location with 15 V to a location with 25 V over a distance of 5 cm?
16. Draw an electric field diagram around a +q charge.
17. Draw the electric field around the two charges.

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Answers

2. **-1.6×10^{-19} C**

3. **$k = 8.99\times10^{9}$ Nm²/C²**

4. Attract: +,–; +, 0 from polarization; –, 0 from polarization
   Repel: +,+; –,–

5. Contact: Touch a conductor with a charged object. Charges flow until the charges are the same on each object.
   Induction: Set up two conductors touching each other. Bring a charged object near one conductor on the side opposite the other conductor. The charges will repel to the other conductor. Separate the conductors. Remove the charged object.

6. See notes

7. E-field is greatest where the lines are the closest. Potential is greatest near a positive charge.

8. $\frac{-5\times10^{-18}\ C}{-1.6\times10^{-19}\ C} = 31.25$; **31 electrons** (no partial electrons exist. The decimal is due to precision of the measurements.)

9. $F = \frac{kq_1q_2}{r^2}$

$$10\ N = \frac{\left(8.99\times10^{9}\frac{Nm^2}{C^2}\right)(5\times10^{-3}\ C)(5\times10^{-3}\ C)}{r^2}$$

$$10\ N = \frac{224750\ Nm^2}{r^2}$$

$$(10\ N)r^2 = 224750\ Nm^2$$

$$r^2 = 22475\ m^2$$

$$\boldsymbol{r = 150\ m}$$

10. $F = \frac{kq_1q_2}{r^2}$

$$F = \frac{\left(8.99\times10^{9}\frac{Nm^2}{C^2}\right)(-10\times10^{-6}\ C)(15\times10^{-6}\ C)}{(0.75\ m)^2}$$

$$F = -2.40\ N$$

***F* = 2.40 N to the right** (because opposite charges attract)

11. $E = \frac{F}{q_0}$

$$2100\frac{N}{C} = \frac{F}{-10\times10^{-6}\ C}$$

$$-0.021\ N = F$$

***F* = 0.021 N along –x-axis** (because the negative charge goes the opposite direction of *E*.)

12. $V = \frac{\Delta PE}{q_0}$

$$V = \frac{500\ J}{3\times10^{-6}\ C}$$

$$\boldsymbol{V = 1.67\times10^{8}\ V}$$

13. $V = \frac{\Delta PE}{q_0}$

$$75\ V = \frac{\Delta PE}{2\times10^{-6}\ C}$$

$$\boldsymbol{1.5\times10^{-4}\ J = \Delta PE}$$

14. $V = \frac{kq}{r}$

$$5000\ V = \frac{\left(8.99\times10^{9}\frac{Nm^2}{C^2}\right)(0.3\ C)}{r}$$

$$5000\ V = \frac{2.697\times10^{9}\frac{Nm^2}{C}}{r}$$

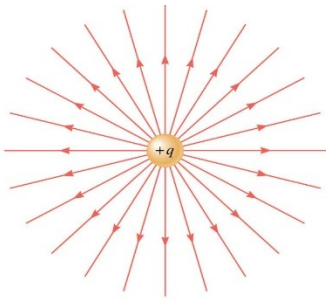
$$(5000\ V)r = 2.697\times10^{9}\frac{Nm^2}{C}$$

$$\boldsymbol{r = 5.39\times10^{5}\ m}$$

15. $E = \frac{\Delta V}{x_f - x_0}$

$$E = \frac{25\ V - 15\ V}{0.05\ m}$$

$$\boldsymbol{E = 200\frac{V}{m}}$$

16. 

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