Charges and Coulomb's Law

1. **An ion has a charge of + 3.2 x 10^{14} C. Another charge is brought near it and experiences a repulsive electrostatic force. This other charge must be**

   a) positive b) negative c) neutral d) either positive or negative

2. **An electron has a charge which is**

   a) positive b) negative c) neutral d) either positive or negative

3. **A proton has a charge which is**

   a) positive b) negative c) neutral d) either positive or negative

4. **A neutron has a charge which is**

   a) positive b) negative c) neutral d) either positive or negative

5. **An ion consist of 12 electrons. What is the charge on the ion?**

12 x -1.6x10^{-19}C = 1.92x10^{-18}C

6. **An ion has 18 protons and 13 electrons. What is the charge on the ion?**

5 extra protons
5 x +1.6x10^{-19}C = +8x10^{-19}C

7. **An ion has a charge of -9.6 x 10^{-9} C. How many excess electrons does the ion have? (1e=1.6x10^{-19})**

(-9.6x10^{-9}C)/(-1.6x10^{-19}C) = 6x10^{10} electrons

8. **An ion has a charge of 6.4 x 10^{-17} C. 8.2 x 10^{-4} meters away is a second charge with a charge of 9.6 x 10^{-16} C.**

   a. **What is the strength of the electrostatic force between the ions?**

F= $\frac{k(6.4x10^{-17})(9.6x10^{-16})}{(8.2x10^{-4})^2}$ = 8.21x10^{-16}N

   b. **Is the force attractive or repulsive?**

Repulsive

9. **According to the Coulomb's Law formula, if you double the charge on one of the two ions, how will this affect the electrostatic force between the two ions?**

    a) **The F_E will be four times large**
    b) **The F_E will be one forth as large**
    c) **The F_E will be twice as large**
    d) **The F_E will be one half as large**

10. **According to the Coulomb's Law formula, if you double the distance between two ions, how will this affect the electrostatic force between the ions?**

    a) **The F_E will be four times large**
    b) **The F_E will be one forth as large**
    c) **The F_E will be twice as large**
    d) **The F_E will be one half as large**

11. **The force between two protons is 5.5 x 10^{-15} n. How far apart are the protons?**

    $5.5x10^{-15} = k(1.6x10^{-19})(16x10^{-19})/d^2$ d= $2.5x10^{-7}$-m

12. **A negative charge of - 2.0 C and a positive charge of 3.0 C are separated by 80 m. What is the force between the two charges?**

    $F = k(-2)(3)/80^2$ = -8428125N (attractive)

13. **A negative charge of - 0.0005 C exerts an attractive force of 9.0 N on a second charge that is 10 m away. What is the magnitude of the second charge?**

    $-9.0 = k(-0.005)(q2)/10^2$ q=0.0002C

14. **Two negative charges that are both - 3.0 C push each other apart with a force of 19.2 N. How far apart are the two charges?**

    $19.2N = k(-3)(-3)/d^2$ d=64915.8m

15. **A negative charge of - 4.0 x 10-5 C and a positive charge of 7.0 x 10-5 C are separated by 0.15 m. What is the force between the two charges?**

    $F = k(-4x10^{-5})(7x10^{-5})/(0.15)^2$ = -1118.76N

16. **A negative charge of - 8.0 x 10-6 C exerts an attractive force of 12 N on a second charge that is 0.050 m away. What is the magnitude of the second charge?**

$-12N = k(-8x10^{-6})(q)/(0.05^2)$ $q=+4.17x10^{-7}C$

17. **Two negative charges that are both - 5.0 x 10-5 C push each other apart with a force of 15 N. How far apart are the two charges?**

$15N=k(-5x10^{-5})(-5x10^{-5})/d^2$ d=1.22m

18. **Tripling the distance between two charges will cause the force to become:**

1/9F

19. **In order to increase the force between two charges by a factor of four, the distance must be:**

1/2d

20. **Doubling one of the charges will cause the force between the two charges to be:**

2F

21. **Decreasing the distance between two charges by a factor of three ($1/3d_0$) will cause the force to be:**

9F