

## Atomic Structure

1. All atoms are made of three smaller particles. What are they, what are their charges, and what are their relative masses?
2. How are these particles arranged in an atom?
3. A normal atom has no net charge. What is true about the numbers of electrons, protons and neutrons in an atom?
4. If you change the number of protons in an atom, what happens to the atom?
5. If you change the number of neutrons in an atom, what happens to the atom?
6. If you change the number of electrons in an atom, what happens to the atom?
7. It is relatively easy to change the number of only one of the particles that make up an atom – which one is it and why?
8. In this lab, you charged up a variety of objects, making them positive and negative. You were actually causing some of these small particles (electrons, protons and/or neutrons) to go back and forth between the objects.
  - a. To make something negative, what happened to the object in terms of electrons, protons and neutrons?
  - b. To make something positive, what happened to the object in terms of electrons, protons and neutrons?
9. Define and give examples of the following terms:  
*Insulator*  
  
*Conductor*  
  
Which of those has all its electrons tightly bound to each atom? Which has some "free electrons" that are not tightly bound to each atom?
10. What is meant by the phrase *Conservation of Charge*?

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11. We usually talk about charge being *quantized*. What does this mean?

12. What is the charge of each of the following:

electron = \_\_\_\_\_ proton = \_\_\_\_\_ neutron = \_\_\_\_\_

13. Because really small charges can have large electrical forces on them, we often use units of " $\mu\text{C}$ " for the charge of an object. The " $\mu$ " stands for \_\_\_\_\_, and can be read as a \_\_\_\_\_.

### *Problems*

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14. If an object has 5 extra electrons, what is its total charge in C?

15. What is the charge of an object that has  $20 \times 10^{11}$  extra electrons?

16. How many electrons would it take to make a total charge of  $-6.4 \times 10^{-19}$  C?

17. How many electrons would it take to make a total charge of  $-30 \mu\text{C}$ ?

18. How many electrons would it take to make a total charge of  $-2 \mu\text{C}$ ?

19. How many electrons would an object have to be *missing* to have a charge of  $+5 \mu\text{C}$ ?

20. Why didn't I ask for how many extra protons it would take to make a total charge of  $+5 \mu\text{C}$ ?

21. What is the total charge on an atom that has 12 electrons and 12 protons and 12 neutrons?

22. What is the total charge on an atom that has 14 electrons and 12 protons and 12 neutrons?

23. What is the total charge on an atom that has 12 electrons and 14 protons and 14 neutrons?

24. What is the total charge on an atom that has 13 electrons and 13 protons and 15 neutrons?

Answers: 14)  $-8 \times 10^{-19}$  C 15)  $-3.2 \times 10^{-7}$  C 16) 4 17)  $1.88 \times 10^{14}$  C 18)  $1.25 \times 10^{13}$  C 19)  $-3.13 \times 10^{13}$  C  
20) b/c  $p^+$  don't move! only  $e^-$  move 21) 0 C 22)  $-3.2 \times 10^{-19}$  C 23)  $3.2 \times 10^{-19}$  C 24) 0 C