Name:

Investigating Ions

Go to the website http://phet.colorado.edu/en/simulation/build-an-atom. (There is a link on libbyteach.net in the activities section for "Chemistry in Action: Part 1")

Click the "play" button on the image to open the simulation. Choose the "Atom" version.

- 1. Add one proton to the nucleus of the atom (the X).
 - (a) What element did you create?
 - (b) Add another proton. What element do you now have?
 - (c) What is the charge on this atom?
 - (d) Atoms cannot have a charge. Fix it so that the charge is neutral. What did you do?
 - (e) Don't forget the neutrons. Add those. How many did you add?
- 2. Click on the reset button () in the bottom right corner. Add one proton to the nucleus.
 - (a) Add one electron.

 Describe what happens when you add it (remove it and add it again if you missed it).
 - (b) Add another electron.
 - (i) Describe what changes.
 - (ii) Is this possible in real life? Explain.

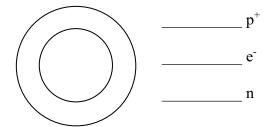
SC20F/PB Page 1 of 4

3. Click on the reset button.

Expand the 'Net Charge' menu by clicking the green + on the right side of the boxes. Add 10 protons to the nucleus.

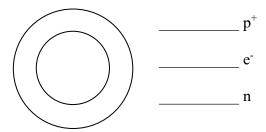
- (a) What element are you representing?
- (b) Using your periodic table, how many neutrons should you add?
- (c) Fix the atom so it's a neutral atom. What did you do to achieve this?

(d) Draw what you see on your screen and fill in the number of protons, electrons, and neutrons (subatomic particles).



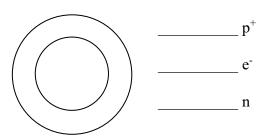
(e) Remove enough subatomic particles to make O²⁻.

Draw what you have on the screen and fill in the number of subatomic particles.



(f) Remove enough subatomic particles to make N³⁻.

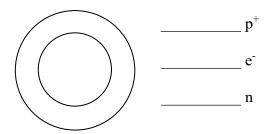
Draw what you have on the screen and fill in the number of subatomic particles.



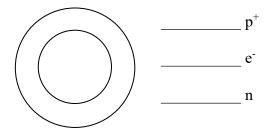
SC20F/PB Page 2 of 4

(g) Remove enough subatomic particles to make F⁻.

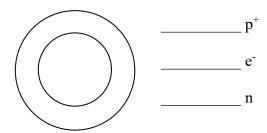
Draw what you have on the screen and fill in the number of subatomic particles.



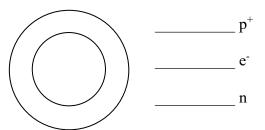
- 4. The following ions cannot be drawn with the simulation.
 - (a) Draw the diagram for Al³⁺ and fill in the number of subatomic particles.



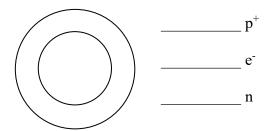
(b) Draw the diagram for Mg²⁺ and fill in the number of subatomic particles.



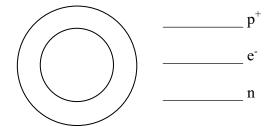
(c) Draw the diagram for Na⁺ and fill in the number of subatomic particles.



(d) Draw the diagram for S²⁻ would look like. Fill in the number of subatomic particles.



(e) Draw the diagram for Ca²⁺? Fill in the number of subatomic particles.



5. From this exercise, make a conclusion about why elements make the ions they do.