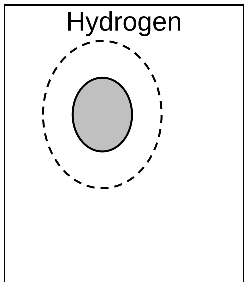
WODSS SCIENCE
SCH 4CI

Name: ____________________

Date: ____________________

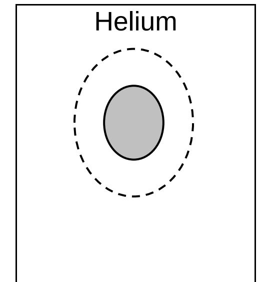
BOHR-RUTHERFORD DIAGRAMS FOR THE FIRST 18 ELEMENTS

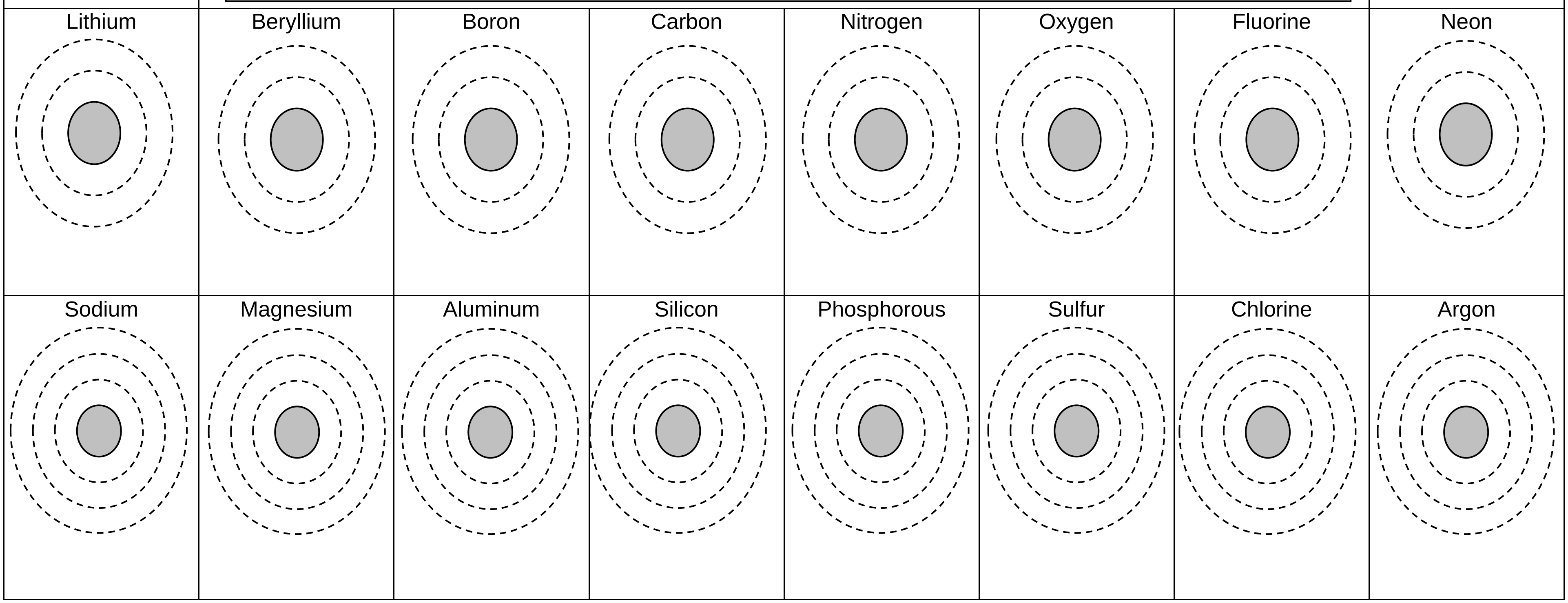
1. Write the number of protons and neutrons in the shaded nucleus. For example: 3 protons = 3p: 3 neutrons =3n
2. Draw the electrons in the correct energy level using dots.
3. Write the standard atomic notation of each element below the diagram.
4. Valence electrons are the electrons in the outer orbit. Count the number of valence electrons in each atom. Write the number of valence electrons in the bottom right corner of each box.



Answer the following questions on a separate piece of paper:

1. What do you notice about the number of valence electrons as you move down a column?
2. What do you notice about the number of valence electrons as you move across a row?
3. How does the number of orbits change as you move across a row?
4. How does the number of orbits change as you move down a column?
5. Hydrogen is in the first column, along with some metals, instead of being grouped with the other gasses. Based on the number of valence electrons, why does it make sense for hydrogen to be in the first column?
6. Why do you think Helium is in the last column instead of in the second column?





Bohr’s Model of the Atom

Bohr’s model of the atom can be described in the following 6 points:

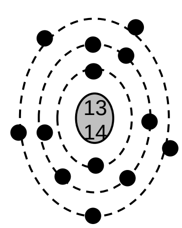
1. Electrons move around the nucleus in circular paths called ______________ or __________ _______________.
2. The energy of each electron is ____________________, which means that electrons have specific amounts of energy in each orbit.
3. The farther away the electron is from the nucleus, the _____________ its energy is.
4. Electrons can move from one orbit to another, but they cannot stay in the spaces between orbits.
5. The first orbit can hold a maximum of ______ electrons. The second and third orbit can hold a maximum of _____ electrons
6. Electrons are more stable at lower energy, when they are _____________ to the nucleus.

Bohr's model explained that electrons can jump from one orbit or ___________________ to another. When electrons are energized by heat, electricity, or light, they use this extra energy to jump out to a _______________ orbit. We say they are in an ______________ state. These excited electrons are very __________________ and tend to fall back into their normal, more stable orbits. This low-energy state is called the _____________ state. When electrons drop back to their normal orbits, their extra energy is given off in the form of ________. The amount of energy given off corresponds to a very specific _______.

Bohr’s theory helps us to understand the line spectra of elements. Each element has a ___________ line spectrum, which is like its fingerprint (see p. 489 for the line spectra of different elements). The line spectrum of each element can be seen using a ______________________, which is an instrument that separates light into its component colours using a prism. The coloured lines are emitted as the excited electrons fall back down to their ground state, giving off very specific coloured bands of light. __________________________________ is a qualitative analysis technique, where substances are identified by their line spectra, since line spectra are unique to each type of substance.

Questions: Read pages 21 and 22 from textbook and answer the following questions on a separate piece of paper.

1. Describe the Bohr model of the atom.
2. In developing his atomic model, Bohr used evidence from the line spectrum of hydrogen. Suggest a reason why Bohr chose to work with hydrogen and not any other element?
3. What is a spectroscope? What does it do? Why is it a useful tool for qualitative analysis?
4. What is the difference between a continuous and line spectrum?
5. How does an electron become excited?
6. An electron does not stay in an excited state for long. What happens to it? How is its energy released?
7. When all electrons are in the lowest possible energy levels, what state are they in?
8. ”Energy levels are quantized”. What does this mean?
9. Look at the following Bohr Rutherford diagram:
   a. Which atom is represented?
   b. Which electron in an excited state?
   c. Which electrons are in the ground state?
   d. Circle the electron(s) with the greatest energy. Put a triangle around the electrons with the least energy.



10. You look at the line spectrum of an unknown substance, and all you see is two yellow bands. Compare this observation to the line spectra shown on p. 489 and determine what the unknown substance is.