History of the Atom Worksheet Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Periodic Trends and History Worksheet**

1) Rank the following elements by increasing atomic radius: carbon, aluminum, oxygen, potassium.

2) Rank the following elements by increasing electronegativity: sulfur, oxygen, neon, aluminum.

3) What is the difference between electron affinity and ionization energy?

4) Why does fluorine have a higher ionization energy than iodine?

5) Why do elements in the same family generally have similar properties?

Write the name of the scientist who is credited with the following experiments or discoveries.

1. \_\_\_\_\_\_\_\_\_\_\_Discovered the electron

2. \_\_\_\_\_\_\_\_\_\_\_Discovered the nucleus

3. \_\_\_\_\_\_\_\_\_\_\_ Named particles atoms

4. \_\_\_\_\_\_\_\_\_\_\_Used a cathode ray tube

5. \_\_\_\_\_\_\_\_\_\_\_ Discovered neutrons

6. \_\_\_\_\_\_\_\_\_\_\_ Did the Gold Foil Exp.

7. \_\_\_\_\_\_\_\_\_\_\_ Said all atoms are same for one element

8. \_\_\_\_\_\_\_\_\_\_\_ Plum pudding model

State the subatomic particle that is described in each of the following statements.

9. \_\_\_\_\_\_\_\_+1 charge

10. \_\_\_\_\_\_\_ No Charge

11. \_\_\_\_\_\_\_-1 charge

12. \_\_\_\_\_\_\_found outside nucleus

13. \_\_\_\_\_\_\_found inside nucleus

14. \_\_\_\_\_\_\_least massive

Answer each of the following questions completely.

15. Describe how scientists discovered that atoms were made of electrons (Hint: cathode ray tube)

16. How did scientists discover that atoms contained a nucleus?

17. How did scientist discover neutrons?

18. Draw a model of how we expect atoms to look. Be sure to include the location of subatomic particles.

19. How does the mass of an electron compare to a proton and neutron?

20. Put the subatomic particles in order from the most massive to the least massive.

21. What is meant by atomic theory?

22. Why has our idea of what the atom looks like changed so many times?

23. Do you think our view of the atom will every change again? Why or why not?

1. What is John Dalton’s theory?

**John Dalton (1766 – 1844):**

John Dalton was an English chemist. His ideas form the atomic theory of matter. Here are his ideas.

* All elements are composed (made up) of atoms. It is impossible to divide or destroy an atom.
* All atoms of the same elements are alike. (One atom of oxygen is like another atom of oxygen.)
* Atoms of different elements are different. (An atom of oxygen is different from an atom of hydrogen.)
* Atoms of different elements combine to form a compound. These atoms have to be in definite whole number ratios. For example, water is a compound made up of 2 atoms of hydrogen and 1 atom of oxygen (a ratio of 2:1). Three atoms of hydrogen and 2 atoms of oxygen cannot combine to make water.

1. What is the name of John Dalton’s theory?

26. What are elements made of?

27. An atom of hydrogen and an atom of carbon are

28. What are compounds made of?

29. The ratio of atoms in HCl is: a) 1:3 b) 2:1 c) 1:1

**J. J. Thompson (Late 1800s):**

J. J. Thompson was an English scientist. He discovered the electron when he was experimenting with gas discharge tubes. He noticed a movement in a tube. He called the movement cathode rays. The rays moved from the negative end of the tube to the positive end. He realized that the rays were made of negatively charged particles – electrons.

30. What did J.J. Thompson discover?

31. What is the charge of an electron?

32. What are cathode rays made of?

33. Why do electrons move from the negative end of the tube to the positive end?

34. What was Thompson working with when he discovered the cathode rays?

**Lord Ernest Rutherford (1871 – 1937):**

Ernest Rutherford conducted a famous experiment called the gold foil experiment. He used a thin sheet of gold foil. He also used special equipment to shoot alpha particles (positively charged particles) at the gold foil. Most particles passed straight through the foil like the foil was not there. Some particles went straight back or were deflected (went in another direction) as if they had hit something. The experiment shows:

* Atoms are made of a small positive nucleus; positive nucleus repels (pushes away) positive alpha particles
* Atoms are mostly empty space

1. What is the charge of an alpha particle?

2. Why is Rutherford’s experiment called the gold foil experiment?

3. How did he know that an atom was mostly empty space?

4. What happened to the alpha particles as they hit the gold foil?

5. How did he know that the nucleus was positively charged?

**Niels Bohr (Early 1900s):**

Niels Bohr was a Danish physicist. He proposed a model of the atom that is similar to the model of the solar system. The electrons go around the nucleus like planets orbit around the sun. All electrons have their energy levels – a certain distance from the nucleus. Each energy level can hold a certain number of electrons. Level 1 can hold 2 electrons, Level 2 - 8 electrons, Level 3 - 18 electrons, and level 4 – 32 electrons. The energy of electrons goes up from level 1 to other levels. When electrons release (lose) energy they go down a level. When electrons absorb (gain) energy, they go to a higher level.

1. Why could Bohr’s model be called a planetary model of the atom?
2. How do electrons in the same atom differ?
3. How many electrons can the fourth energy level hold?

4. Would an electron have to absorb or release energy to jump from the second energy level to the third energy level?

5. For an electron to fall from the third energy level to the second energy level, it must \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_energy.