

NAME: \_\_\_\_\_

PERIOD: \_\_\_\_

DATE: \_\_\_\_\_

## **CHEMISTRY WORKSHOP 4.1**

### **ATOMIC AND ELECTRON CONFIGURATION**

#### **Seeing Atoms: the STM**

*Read the following paragraphs, and complete the exercises below.*

The idea that everything is made up of small particles called atoms was first proposed by Greeks in the fifth century B.C. At that time, there was no experimental evidence to support this theory, and it did not gain much acceptance.

Much later, in the early 1800s, British scientist John Dalton made a convincing argument based on experimental evidence for the existence of atoms. Atoms are much too small to see, but Dalton found evidence for them in things he could observe, such as reactions between compounds. Because of the work of Dalton and others, the atomic theory soon became widely accepted by scientists.

#### **How the STM sees atoms**

Until recently, all evidence for atomic theory was indirect. But an exciting development in 1981 made it possible to “see” atoms for the first time. This new technology, the scanning tunneling microscope (STM), uses an electric current to probe the surface of a material. The STM measures how electrons are distributed on the material’s surface. The results are used to create a computer-generated image of the atoms on the surface.

The first image created by a STM showed a layer of gold atoms. Since then, the atoms of many different substances have been observed with STMs, including silver, nickel, platinum, and silicon. At this time, imaging atoms is the primary use of STMs. STMs have also been used to move single atoms from one location to another, and other potential applications are being researched.

#### **Exercises**

1. What was one important difference between the Greek theory of atoms and Dalton’s atomic theory?

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2. What is the significance of the invention of the STM?

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3. Explain how an STM creates an image of the atoms on the surface of a material.

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