NAME DATE CLASS

Chapter 4

ENRICHMENT

# Uses of Titanium

## Silicon

*Read the following information and answer the questions.*

Like titanium, the element silicon has properties that make it valuable for industrial uses. Also like titanium, silicon is found in sand; in fact, silicon dioxide, in which silicon is combined with oxygen, is the main ingredient in sand (as well as in many minerals that make up rocks). Overall, silicon is the second most abundant element on Earth. In nature it is usually combined with oxygen as silicon dioxide. Lava that flows from some volcanoes is also mainly silicon dioxide.

Silicon is a semiconductor, a material that conducts electricity better than insulators like glass, but not as well as conductors like copper. Pure silicon would be an insulator, a material that cannot conduct electricity, because it has no free electrons. But silicon with just the right amount of certain impurities, such as arsenic or phosphorus, has a few free electrons. It is called p-type silicon. Silicon with impurities such as aluminum or boron can take on a few electrons. It is called n-type silicon. A flow of electrons passing from one atom to another results in an electric current.

Semiconductors are useful because the flow of electrons can be controlled. Semiconductors in solar cells can change light into electricity. Solar cells are made up of both p-type and n-type silicon. Light hitting the cell reaches the silicon and knocks free electrons from p-type silicon. Electrons from atoms in the n-type silicon move in to fill the holes. The movement of electrons causes an electric current to flow out of the cell. Semiconductors also are important in making transistors and integrated circuits or microchips. Silicon chips are used in computers and calculators. Transistors amplify electric signals.

*Answer the questions on the lines provided.*

1. How do you think solar cells could be useful? _____

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2. Silicon dioxide is a very stable compound. What evidence can you suggest to support this?

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3. How are the impurities in the silicon in solar cells important in the way the cells function?

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