

The Scientific Revolution

Vocabulary Builder

Section 1

DIRECTIONS Look up the vocabulary terms in the word bank in a dictionary. Write the dictionary definition of the word that is closest to the definition used in your textbook.

Ptolemy	alchemy	Scientific Revolution
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DIRECTIONS Read the **FALSE** statement below. Replace each underlined word with one from the word bank that makes each sentence **TRUE**.

science	rationalists	theories
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1. The explanations that scientists develop based on facts they have observed are called experiments.

2. The word alchemy comes from a Latin word meaning “knowledge” or “understanding.” It is a particular way of gaining knowledge about the world.

3. Aristotle, Ptolemy, and other Greek thinkers were naturalists, people who looked at the world in a rational, or reasonable and logical, way.

DIRECTIONS Read each sentence. Fill in the blank with the word in the word pair that best completes the sentence.

1. _____ was the first person to use a microscope as a scientific instrument. **(Tycho Brahe/Antoni van Leeuwenhoek)**
2. A force that attracts objects to each other is called _____ . **(barometer/gravity)**
3. _____ proposed several theories that have been proven so many times that they are now called laws, including the law of gravity and the laws of motion. **(Johannes Kepler/Sir Isaac Newton)**
4. Perhaps no astronomer during the Scientific Revolution influenced modern science more than _____ .
(Galileo Galilei/Johannes Kepler)
5. Danish astronomer _____ emphasized the importance of careful observation and keeping detailed, accurate records so that other scientists can use what has previously been learned.
(Tycho Brahe/Antoni van Leeuwenhoek)
6. German astronomer _____ proved that planets do not follow circular paths but move in elliptical, or oval, paths.
(Johannes Kepler/Sir Isaac Newton)
7. A _____ is a scientific instrument that measures air pressure. **(barometer/gravity)**
8. _____ wrote a book, called *On the Revolution of the Celestial Spheres*, which claimed that the earth actually circled the sun.
(Nicolaus Copernicus/Galileo Galilei)

DIRECTIONS Read the **FALSE** statement below. Replace each underlined word with one from the word bank that makes each sentence **TRUE**.

Francis Bacon	René Descartes	scientific method
hypothesis	Inquisition	

1. René Descartes was a philosopher who argued that science should be pursued in a systematic, logical fashion, and tried to get the king of England to provide money for scientific research.

2. The hypothesis is a step-by-step method for performing experiments and other scientific research.

3. Sir Isaac Newton was a philosopher who believed that nothing should be accepted as true if it wasn't proven to be true, and emphasized that people must use clear thinking and reason to establish proof.

4. A scientific method is a solution that a scientist proposes to solve a problem. It is different from a theory in that it has not yet been tested.

5. For publishing a book that supported the view that the earth and the planets orbit the sun, Galileo was put on trial by the rationalists, the arm of the Catholic Church devoted to punishing people who questioned church authority.

6. Johannes Kepler argued that religious leaders should not try to explain scientific matters and, in turn, scientific thinkers should not try to interpret religious matters.

Chapter 13 The Scientific Revolution

Section 1: A New View of the World

THE BIRTH OF MODERN SCIENCE

During the 1500s and 1600s, a handful of brilliant individuals built the foundations of science as we know it today. Some historians consider the development of science the single most important event in the intellectual history of humankind. The series of events that led to the birth of modern science is called the **Scientific Revolution**. It was a radical idea. It was a completely different way of looking at the world.

Before the Scientific Revolution, most educated people relied on the teachings of the ancient Greek and Catholic Church authorities. Afterward, people began to gain knowledge by observing the world around them and forming logical conclusions.

The word **science** is Latin for “knowledge.” Science is a particular way of gaining knowledge about the world. Scientists identify facts about the world by observation and then develop **theories**, which are explanations based on the facts. Theories must be tested to see if they are true. Before the Scientific Revolution, this way of learning about the world did not exist.

ROOTS OF THE REVOLUTION

The concept of science found its roots in ideas from the past. The Greek philosopher Aristotle, who wrote about geography and astronomy, made a great contribution to future science when he stressed that people should observe the world carefully and make careful, logical conclusions.

The ancient Greek astronomer **Ptolemy** put these ideas into practice. He studied the skies and offered theories to explain what he saw. As a geographer, he made the most accurate maps of his time based on real world observations. Thinkers like these are called **rationalists**, people who look at the world in a rational, reasonable, or **logical** way.

European scholars were able to study the ancient Greek writings because Muslim scholars had already translated the writings and added their own ideas. Early religious scholars also wrote about the classics. The Jewish scholar Maimonides (my-MAHN-uh-deez) and the Christian scholar Thomas Aquinas tried to apply Greek philosophy and theories to their religions. The humanists spent much time observing the natural world. There was also a growing interest in **alchemy** (AL-kuh-mee), an early forerunner of chemistry. All this information was borrowed by science later.

Summary:

Section 2: Discoveries and Inventions

DISCOVERY LEADS TO DOUBT

During the Renaissance, scholars studied the ancient Greek and Roman authorities. No one thought to question their information until 1492, when Christopher Columbus, a sailor and explorer, came upon something the ancients never imagined existed-another continent. Scholars began to question the ancient authorities for the first time.

ADVANCES IN ASTRONOMY

In 1543 Polish astronomer **Nicolaus Copernicus** published *On the Revolution of the Celestial Spheres*, the first book to contradict the respected Greek astronomer Ptolemy. According to Ptolemy, the earth was the center of the universe. But Copernicus studied the planets and saw that this was unlikely. He asked himself whether the planets might orbit around the sun. This theory fit his observations.

Astronomer **Tycho Brahe** made detailed notes of the positions of the stars. **Johannes Kepler** both supported and corrected the work of Copernicus. His studies proved that the planets did orbit the sun. But Kepler also learned that the planets move in elliptical, not circular, orbits.

Galileo Galilei was one of the most important scientists of the Scientific Revolution. He was the first person to study the planets with a telescope. He also rigorously tested his theories with experiments.

SIR ISAAC NEWTON

With his book *Principia Mathematica*, published in 1687, **Sir Isaac Newton** distinguished himself as perhaps the most important scientist of all time. He reviewed and evaluated all previous scientific work, coupled it with his own observations, and developed four theories about how the natural world worked. These theories have been proven so many times, they have become laws, like the law of gravity. He also developed mathematical calculus.

NEW INVENTIONS

New inventions aided in the observations of scientists. The microscope, the telescope, and the **barometer** helped scientists observe their surroundings more accurately.

Summary:

Section 3: Science and Society

BACON, DESCARTES AND THE SCIENTIFIC METHOD

Science has become the most established and reliable way of learning about the natural world. The acceptance of this fact of modern life is due to the work of **Francis Bacon** and **René Descartes**.

Bacon was an English philosopher and politician who recognized how much new knowledge could be gained from the systematic use of science. He tried to persuade the king of England to fund scientific research. Descartes, a French philosopher, argued that nothing should be accepted if it were not proven true. Observation and theory are not enough, he said, because people could be tricked by their senses. People must use clear thinking and reason to establish proof.

Scientists today employ the **scientific method**, a clear, step-by-step **procedure** for performing experiments and scientific research. This involves gathering information then forming and testing a **hypothesis** before coming to a conclusion.

SCIENCE AND GOVERNMENT

Science had a profound impact on many nonscientific subjects. Philosophers recognized that human reason, or logic, was a powerful tool that could be applied to solve human problems. One way of solving these problems was by changing government. This marked the beginning of democratic thought. If laws govern the natural world, people surmised, maybe laws also govern human behavior. Determining those laws could help solve problems like war and poverty. What more equalizing **principle** exists than the idea that all humans were subject to the same laws?

SCIENCE AND RELIGION

The powerful Catholic Church regarded some of the advances of science with suspicion. Many of the new ideas contradicted the church's teachings and undermined and weakened its authority. The best-known church-science conflict was the case of Galileo, who was tried and threatened with torture unless he agreed with the church that the earth was the center of the universe and did not move. Ironically, Galileo and other scientists did not think science went against religion. They believed it helped people understand God's creation.

Summary: