

Name: _____

Age of Reason and Revolutions: Enlightenment and Revolution Part 1

The Scientific Revolution

Key Terms and People

Isaac Newton English scientist who discovered laws of motion and gravity

Galileo Galilei Italian scientist who invented the first working telescope; his discoveries put him into conflict with the Roman Catholic Church

deism Enlightenment belief that God created the universe and then allowed it to run on its own following natural laws

scientific method logical procedure for gathering information and testing ideas

geocentric theory in the Middle Ages, view which held that the earth was an immovable object located at the center of the universe

heliocentric theory idea that the earth and the other planets revolve around the sun

Scientific Revolution new way of thinking about the natural world based on careful observation and the questioning of accepted beliefs

Before You Read

In the last lesson, you read about how Parliament limited the English monarchy.

In this lesson, you will read about how the Scientific Revolution and the Enlightenment transformed Europe and helped lead to the American Revolution.

After You Read

Answer the questions that follow, in complete sentences, using the information from this guided reading.

THE ROOTS OF MODERN SCIENCE

How did modern science begin?

During the Middle Ages, few scholars questioned beliefs that had been long held. Europeans based their ideas on what ancient Greeks and Romans believed, or on the Bible. People still thought that the earth was the center of the universe. They believed that the sun, moon, other planets, and stars moved around it. This is known as the [1].

In the mid-1500s, attitudes began to change. Scholars started what is called [2]. It was a new way of thinking about the natural world. It was based on careful observation and the willingness to question old beliefs. European voyages of exploration helped to bring about the Scientific Revolution.

A REVOLUTIONARY MODEL OF THE UNIVERSE; THE SCIENTIFIC METHOD

How did new ideas change accepted thinking in astronomy?

The first challenge to accepted thinking in science came in astronomy. In the early 1500s, Nicolaus Copernicus, a Polish astronomer, studied the stars and planets. He developed a [3]. Heliocentric means sun-centered. It said that Earth, like all the other planets, revolved around the sun. This went against the geocentric theory that the earth was at the center of the universe. In the early 1600s, Johannes Kepler used mathematics to prove that Copernicus's basic idea was correct.

An Italian scientist, [4], made several discoveries that also undercut ancient ideas. He made an early telescope and used it to study the planets. He found that Jupiter had moons, the sun

had spots, and Earth's moon was rough. Catholic Church authorities forced Galileo to take back his statements. Still, his ideas spread.

Interest in science led to a new approach, the [5]. With this method, scientists ask a question, then form a hypothesis, or an attempt to answer the question. Then they test the hypothesis. Finally, they change the hypothesis if needed.

The English writer Francis Bacon helped create this new approach to knowledge. He said scientists should base their thinking on what they can observe and test. The French mathematician René Descartes also influenced the use of the scientific method. His thinking was based on logic and mathematics

NEWTON EXPLAINS THE LAW OF GRAVITY; THE SCIENTIFIC REVOLUTION SPREADS

What scientific discoveries were made?

In the mid-1600s, the English scientist [6] described the law of gravity. Using mathematics,

Newton showed that the same force ruled both the motion of planets and the action of bodies on the earth. He believed that God created the universe and then such natural forces took over. This belief is called [7].

Other scientists made new tools to study the world around them. One invented a microscope.

Doctors also made advances. One made drawings that showed the different parts of the human body. Another learned how the heart pumped blood through the body. In the late 1700s, Edward Jenner first used the process called vaccination to prevent smallpox disease.

Scientists made progress in chemistry as well. Robert Boyle questioned the old idea that things were made of only four elements—earth, air, fire, and water. He believed that the physical world was made up of smaller components that joined together.

8. What was the Scientific Revolution?

9. What old belief about the universe did the new discoveries destroy?

10. How did the science of medicine change?

Enlightenment Thinkers

Key Terms and People

John Locke English philosopher and founder of British empiricism; he developed political and economic theories during the Enlightenment. He declared that people have a right to rebel against governments that do not protect their rights.

Voltaire French philosopher and author who believed in tolerance, reason, freedom of religious belief, and freedom of speech

Rousseau Swiss-French political philosopher; he championed the freedom of the individual and the notion that all people were equal.

Montesquieu French political philosopher who explored democratic theories of government; he proposed a government divided into three branches and greatly influenced the United States Constitution.

Enlightenment 18th-century European movement in which thinkers attempted to apply the principles of reason and the scientific method to all aspects of society

social contract agreement by which people define and limit their individual rights, thus creating an organized society or government

philosopher one of a group of social thinkers in France during the Enlightenment

rationalism belief that truth could be found through reason or logical thinking

TWO VIEWS ON GOVERNMENT

What were the views of Hobbes and Locke?

The [11] was an intellectual movement. Enlightenment thinkers tried to apply reason and the scientific method to laws that shaped human actions. They hoped to build a society founded on ideas of the Scientific Revolution. Two English writers— Thomas Hobbes and John Locke—were important to this movement. They came to very different conclusions about government and human nature.

Hobbes wrote that there would be a war of “every man against every man” if there were no government. To avoid this war, Hobbes said, people formed a [12]. It was an agreement between people and their government. People gave up their rights to the government so they could live in a safe and orderly way. The best government, he said, is that of a strong king who can force all people to obey.

[13] believed that people have three natural rights. They are life, liberty, and property.

The purpose of government is to protect these rights. When it fails to do so, he said, people have a right to overthrow the government.

THE PHILOSOPHERS ADVOCATE REASON

Who were the philosophers?

French thinkers, called [14], had five main beliefs: (1) thinkers can find the truth by using reason—this is known as [15]; (2) what is natural is good and reasonable, and human actions are shaped by natural laws; (3) acting according to nature can bring happiness; (4) by taking a scientific view, people and society can make progress and advance to a better life; and (5) by using reason, people can gain freedom.

The most brilliant of the philosophes was the writer [16]. He fought for tolerance, reason, freedom of religious belief, and freedom of speech. Baron de [17] wrote about political freedom and separation of powers— dividing power among the separate branches of government. The third great philosophe was Jean Jacques Rousseau. He wrote in favor of human freedom. [18] believed that all

people were naturally free and good but that civilization chained them. He wanted a true democracy in which all people were equal, and government was guided by the “general will” of the

people. Cesare Beccaria was an Italian philosophe. He spoke out against abuses of justice and in favor of all people’s rights. He believed that laws should be based on fairness and reason.

19. How were Hobbes’s and Locke’s views different?

20. Name the types of freedoms that Enlightenment thinkers championed.
