

Scientific Revolution DBQs

Directions: Analyze the documents and answer the short-answer questions that follow each document in the space provided.

Document 1

. . . Gradually scientists came to challenge more and more what the ancients [past civilizations] taught. They came to develop new, better methods of finding out how things worked. Mathematical knowledge increased and helped them to reason. They began to think up experiments to check on their ideas in a methodical way. The scientific revolution had begun.

Many men were needed to bring this about. These men came from every part of Europe. They wrote books to explain their ideas. The printing press made it possible to produce thousands of copies which found their way all over Europe. Scientists were able to learn from one another and give one another new ideas. So the Scientific Revolution was not the work of Englishmen, or Frenchmen, or Italians alone. It was the work of Europeans. And, as we have seen, even they did not do it all by themselves. The Chinese, the Indians, the Persians, and the Arabs all gave something before it came about. Today this is not hard to understand, because men and women from all over the world add to scientific knowledge and so help one another. . .

Source: Peter Amey, *Scientific Revolution*, Greenhaven Press

1. Based on this document, state *two* changes resulting from the Scientific Revolution.

(1) _____

(2) _____

Document 2

. . . As in Mathematicks, so in natural philosophy, the investigation of difficult things by the method of analysis [scientific method], ought ever to precede the method of composition. This analysis consists in making experiments and observations, and in drawing general conclusions from them by induction [reason], and admitting of no objections against the conclusions, but such as are taken from experiments, or other certain truths. For hypotheses [theories] are not to be regarded in experimental philosophy. And although the arguing from experiments and observations by induction be no demonstration of general conclusions; yet it is the best way of arguing which the nature of things admits of, and may be looked upon as so much the stronger, by how much the induction is more general. And if no exception occur from phenomena [facts], the conclusion may be pronounced generally. But if at any time afterwards any exception shall occur from experiments, it may then begin to be pronounced with such exceptions as occur. By this way of analysis we may proceed from compounds to ingredients, and from motions to the forces producing them; and in general, from effects to their causes, and from particular causes to more general ones, till the argument end in the most general. This is the method of analysis [scientific method]: and the synthesis [combination of parts] consists in assuming the causes discovered, and established as principles, and by them explaining the phenomena proceeding from them, and proving the explanations. . . .

Source: Sir Isaac Newton, *Opticks*, 1718

2. According to this document, why is the scientific method important?

Document 3

This is an excerpt from a letter written by Galileo Galilei in 1615 to the Grand Duchess Christina defending his approach to science.

Some years ago, as Your Serene Highness well knows, I discovered in the heavens many things that had not been seen before our own age. The novelty of these things, as well as some consequences which followed from them in contradiction to the physical notions commonly held among academic philosophers, stirred up against me no small number of professors — as if I had placed these things in the sky with my own hands in order to upset nature and overturn the sciences. They seemed to forget that the increase of known truths stimulates the investigation, establishment, and growth of the arts; not their diminution [lessening] or destruction.

Showing a greater fondness for their own opinions than for truth, they sought to deny and disprove the new things which, if they had cared to look for themselves, their own senses would have demonstrated to them. To this end they hurled various charges and published numerous writings filled with vain arguments, and they made the grave mistake of sprinkling these with passages taken from places in the Bible which they had failed to understand properly, and which were ill suited to their purposes. . . .

Source: Galileo Galilei, "Letter to the Grand Duchess Christina" (1615)

3a. According to Galileo, why is the search for truth important?

3b. Which document did Galileo's opponents use to support their opinions?

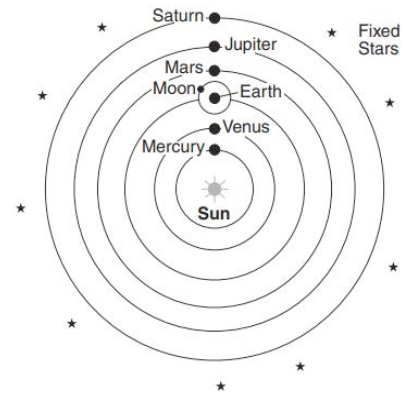
Document 4

The Copernican Model: A Sun-Centered Solar System

The Earth-centered Universe of Aristotle and Ptolemy held sway on [governed] Western thinking for almost 2000 years. Then, in the 16th century a new idea was proposed by the Polish astronomer Nicolai Copernicus (1473–1543).

The Heliocentric System

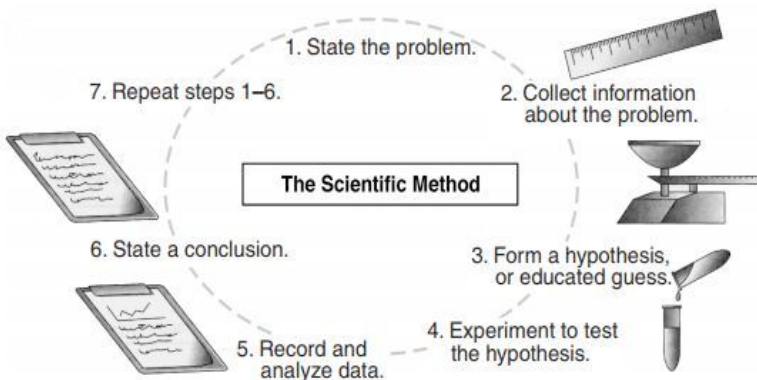
In a book called *On the Revolutions of the Heavenly Bodies* (that was published as Copernicus lay on his deathbed), Copernicus proposed that the Sun, not the Earth, was the center of the Solar System. Such a model is called a heliocentric system. The ordering of the planets known to Copernicus in this new system is illustrated in the following figure, which we recognize as the modern ordering of those planets. . . .



Source: The Copernican Model: A Sun-Centered Solar System, Department of Physics & Astronomy, University of Tennessee

4. Based on this document, how was Copernicus's theory of heliocentrism different from Ptolemy's ideas about the universe?

Document 5



. . . At first, the discoveries of Copernicus and Galileo upset many Europeans. Over time, however, a new way of thinking about science emerged. Scientists began to observe the world around them and to develop ideas about why things happened. They did experiments to test these ideas. This new way of thinking was called the scientific method. . . .

Source: *Guide to the Essentials of World History*, Prentice Hall, 1999 (adapted)

5. Based on this excerpt and diagram, what is one way Copernicus, Galileo, and others influenced how scientists work?
