The Scientific Revolution

Questions to be answered:

1) Why did scientists begin to challenge the Ptolemaic view of the Universe? (i.e. everything revolved around the Earth)

2) Which of their discoveries gradually replaced the Ptolemaic view? Describe each step in the scientific journey from Copernicus to Newton.

To Do:
With a partner, diagram the Universe as we know it today... Be as accurate as possible!

The Scientific Revolution

Question:
How does your diagram Differ from this one?
The Scientific Revolution
1500 - 1687

WHY?
1) The Scientific Revolution starts around the lifetime of Copernicus
2) 1687 – Isaac Newton publishes “Principia Mathematica”…
   Laws of Motion

The process of change takes time for science (from 1500 to 1800)
At the start of the 1000s AD, the Europeans are vastly behind the rest of the world in science and technology… They must catch up to China!

1295 – Marco Polo, a European explorer visits Asia and sees their advancements… He comments on the inferiority of the Europeans

The Scientific Revolution

A new way of thinking emerges:

1) Secular – “of this world”
   - This is the focus of things on this world, not so much about religion.
   - Around the 1500s there’s a shift from theology to philosophy; taught in universities.
     (politics, natural sciences, etc…) we still have Ph.D.s
   - They believed that while God did create the Universe, he did so in a way that we humans could understand, reconstruct, and know.

2) Rational – use reason and logic to define natural world.

3) Reason – Humans CAN figure out the way the world works (Laws of nature) by studying physics, biology, chemistry, and politics (i.e. what makes society work).

4) Progress – You get to knowledge through progress. To do this humans need to re-engineer the world.
The Scientific Revolution
Nicholas Copernicus (1473 - 1543)
A Polish Priest who wrote in Latin

- Up to the time of Copernicus, people thought that there was a sort of crystal sphere the kept the planets, moon, and stars in orbit around the Earth.

- It was Copernicus that proposed the idea that the Earth revolved around the sun, and not vice versa... **The sun was the center of the Universe, not the Earth.**

- In 1543 Copernicus published *De Revolutionibus Orbium Coelestium*. He waited until he was about to die before publishing it because he knew what he was proposing would be contradicting the church... *He sends a letter before its publication... "I don't mean to..."*

He provides a Possible Alternative Explanation...
The Scientific Revolution
Johannes Kepler (1571 - 1630)
A German who also publishes in Latin

- Kepler proved Copernicus was right through mathematics

- To do this he needed to gather a lot of information. He uses night observations (over the span of years) from a Danish Nobleman named Tycho Brahe.

- Kepler uses his information to make accurate models of the heavens.

- Kepler demonstrates that planets move in an elliptical orbit… not a circular orbit that Copernicus had previously said.

The Scientific Revolution
Galileo Galilei (1564 - 1642)

- He was one of the first Europeans to build and use a telescope (he didn’t invent it!)

- Galileo used a telescope to observe the moon, and saw craters. This proved that the moon was not a perfect Sphere.

- He saw moons on Jupiter (thus we have the Galilean Moons of Jupiter)

- Galileo early form of scientific method to come to his conclusions;
The Scientific Revolution

Isaac Newton (1643 - 1727)

-Wrote “Principia Mathematica” which contained mathematical Descriptions of how the world works (up to the speed of light, as Einstein later proves...)

Law 1:
Every object continues in its state of rest or of uniform motion in a straight line, unless compelled to change that state by forces impressed upon it.

Law 2:
The acceleration of an object is directly proportional to the net force acting on the object, in the direction of the net force, and is inversely proportional to the mass of the object.

Law 3:
Whenever one object exerts a force on a second object, the second object exerts an equal and opposite force on the first.

The Enlightenment

Intellectual Developments of Europe; 1685–1780s
Effect of the Scientific Revolution

- Religious Authority Questioned
  - Copernicus, Galileo, Descartes

- Scientific Method
  - Bacon, Descartes, Newton

Principles of the Enlightenment

- Natural Science should govern understanding of the world.
- Reason over faith
- Skepticism
- Scientific Method can also be applied to discovery of “laws” of human society.

- Birth of social sciences
- Enlightenment thinkers looked to use philosophy and reason to create better society.
- “General Will” - J. Rousseau.
Enlightenment and Society

Government
- Most French writers wrote under cover of satire.

Intellectual Class
- Educated few Vs. General public
- Slow transition to acceptance of enlightenment ideals by 1750s
- Book trade in Europe

Enlightened Absolutism
- Catherine the Great
  - Russia
- Fredrick II,(the Great)
  - Prussia

France
- Louis XIV dies in 1715
- Louis XV restores French parliament
- Revolution ahead for Louis XVI

Voltaire, *Candide*

Chapter 1:
Master Pangloss taught the metaphysico-theologo-cosmolonigology. He could prove to admiration that there is no effect without a cause; and, that in this best of all possible worlds, the Baron’s castle was the most magnificent of all castles, and My Lady the best of all possible baronesses.

"It is demonstrable," said he, "that things cannot be otherwise than as they are; for as all things have been created for some end, they must necessarily be created for the best end. Observe, for instance, the nose is formed for spectacles, therefore we wear spectacles. The legs are visibly designed for stockings, accordingly we wear stockings. Stones were made to be hewn and to construct castles, therefore My Lord has a magnificent castle; for the greatest baron in the province ought to be the best lodged. Swine were intended to be eaten, therefore we eat pork all the year round: and they, who assert that everything is right, do not express themselves correctly; they should say that everything is best."