The Scientific Revolution

Renaissance pioneers: Innovations and borrowings from the 15th through 16th centuries:

Islamic borrowings: Algebra and the Astrolabe

Greek/Byzantine/Chinese borrowings: Greek Fire and Gunpowder

Venetian development: Glass-in mirrors (crucial in the telescope and microscope) and cut glass for the table and windows.

Basic spring and gears in the clock-first wrist-watches are worn by Elizabeth I.

New inventions that speed science along: **The telescope and the Microscope**-the same invention corrects vision with glasses.

On the use of Reason and Scientific Method: Francis Bacon

On analyzing the world through the use of the essay: Michel de Montaigne
Leaving trails to follow in anatomy, engineering and physics: Leonardo da Vinci

The Science: Basic discoveries and Revolutions 17th century
Physics:

Copernicus: In his **REVOLUTION of HEAVENLY BODIES:** Establishes the heliocentric Universe-but waits to publish until he is safely dead.

Newton: In his Principia: Establishes the laws of Gravity-basis of what became known as Newtonian physics.

Kepler's Laws of Plantetary Motion: Establishes the orbit of the planets-very accurately-theorizing that Newton's laws mean that the orbits should be elliptical, not strictly circular. They are.

Tycho Brahe: Establishes basic Mathematics underpinning the Newtonian theories for the stars-with the use of the telescope, in the Czech Republic.

Galileo: Establishes the real world applicability of Newtonian Physics, with rigorous experimental method. He is imprisoned by the Pope for his stubborn defense of scientific truth.

Biology/Anatomy:

Vesalius and Harvey: Establish the circulatory system-how it works at the capillary level, and are the producers of the first anatomical guides to the human body that are perfectly accurate.

Van Leewenhoek: Establishes biology of plant cycles and botany-basis for plant creation and bioengineering of plants in the Netherlands-leads to the creation of the tulip-produced for a huge profit in the Netherlands.

Math:

Descartes: Establishes the Cartesian Plane, and the Cartesian Plane Geometry

Fermat: Explores various experimental mathematical paradoxes-leaves an unsolved problem that mathematicians are still working on today.

Newton/Liebnitz: Establish Calculus

Pascal: Continues to develop higher mathematics

Philosophy:

Early Enlightenment Philosophers followed science and it influenced their writing:

Hobbes: The Leviathan: The will of the commonwealth should trump the will of the sovereign-his work helped justify the beheading of Charles II in the English Civil War.

Spinoza: The first public Atheist in the West: Argued that science is the only verifiable truth.

John Locke: Second Treatise on Government and Essay regarding Human Understanding: Human beings have the right to rebel against government which has contract with the ruled. All human beings have the right to life, liberty and the pursuit of property and are rational.

France:

Moliere: The French Shakespeare: Establishes humanism and the human perspective in his plays-Shakespeare of course does this in England

Bossuet: Uselessly defends the Divine Right of Kings Theory for Louis XIV.

18th century:

Navigation: The development of the sea clock and the establishment of longitude

Medicine: The discovery of bacteria as a cause of disease and the development of the smallpox vaccine.

Physics: Further refinement of Newtonian Physics

Engineering: 1790's Necowmen's Engine-development of the steam engine

Philosophy:

Voltaire: The absolute right to atheism, freedom of speech, and freedom of thought: "I may disagree with what you say, but will defend to the death your right to say it!!!

De Montesquieu: Separation of powers in Government-remember him?

Diderot: The Inventor of the Encyclopedia

Rousseau: The next step: The absolute right of everyone to a childhood, the beauty of nature, and the heroic nature of the individual-founder of the Romantic movement in Europe-also asserts that the majority in a democracy is always right.

The Enlightenment:

The Monarchs who face the growing power of the New Ideas on democracy, freedom, for the individual, secularism, and the right NOT TO BELIEVE IN GOD-and of course the power of science-deny the new ideas, and deny the new technology-countries that refuse the new philosophical ideas also DO NOT INDUSTRIALIZE first in Europe. The country that accepts science and a FREE PEASANTRY is the country that builds colonies in the 19th century.

Great Britain: Anne I, George I, and III: Engaging in rebellion in the New World (the US) and the evolution of the independent tenure farmer, the free peasants, and a new agricultural revolution that will prepare the way for the Industrial Revolution-with Great Britain leading the pack.

Prussia: Frederick the Great: Presiding over a conservative Protestant empire in Eastern Germany and Western Poland that misses out on the Industrial Revolution because the Prussian peasants are serfs-Prussia does not emerge with industrial power until 1870-and that is only because Prussia unites with the economically much more advanced free cities of Western Germany.

Austria: Maria Theresa and Franz Joseph I: Presiding over a conservative Catholic country with pockets of liberalism-missing out on the Industrial Revolution because Austrian peasants are serfs-Austria will catch up only in the 20th century.

Russia: Peter the Great, Catherine I, Anne I, Elizabeth I, Catherine the Great, Alexander I: Presiding over an expanding Russian Empire, with a conservative elite and an oppressed peasantry-missing out on the Industrial Revolution as a result-Russia does not begin to catch up technologically until after 1870.

France: Louis XIV, Louis XV, and Louis XVI: Presiding over an increasingly bankrupt society that is seething, getting ready to explode into the French Revolution-through the political turmoil from 1789-1870 will slowly have an Agricultural Revolution and an Industrial Revolution.

The Netherlands just goes with the new flow and leads Europe in technology: It is already a democracy-its peasants are free, and this country is the birthplace of the Agricultural Revolution, the art of growing more and more food on less and less land. Set to lead the pack in the Industrial Revolution.
Scandinavia becomes more and more liberal on the model of Great Britain-they quickly become constitutional monarchies-and benefit from both the Agricultural and Industrial Revolutions.

The free states of Germany and Belgium (The Austrian Netherlands in this time) want more democracy than they can have-when possible participate in the Agricultural and Industrial Revolutions on a limited basis-after 1830 Belgium receives independence and will follow the Netherlands into the industrial future.

Spain: Locked in an authoritarian prison: Increasingly weak and out of touch, Bourbon rulers preside over a weakening empire, convinced that the old conservative Catholic world (which denies the existence of the Scientific Revolution) will somehow stay relevant. It doesn't-misses out completely on the Agricultural Revolution .

Italy: Also locked in the past-but with pockets of liberal thinking that will later explode in the early 19th century-does not have any Agricultural or Industrial Revolution until the 20th century.

The Czech Republic, Poland, Hungary: These countries have an intellectual elite that follow all the new ideas, but these countries are trapped in conservative empires: Poland is split three ways, and Hungary and the Czech Republic are stuck in the Austrian Habsburg Empire.

The Women:

Intellectual women follow all this revolution too. The mistresses of the intellectual salon where all these new ideas were discussed were:

Mme de Stael: German/French noblewoman who hosted the best salons in Europe.

Mme de Pompadour: French mistress of Louis XV who hosted the best French salons.

Catherine the Great: Hosted the best salons in Russia-but kept the new ideas strictly under control.

Maria Theresa: Hosted limited intellectual salons in Austria, but kept the new ideas strictly under control.

Olympe de Gouges: Emerges in France at the time of the French Revolution-and wants full rights for women-the first to declare this publicly in the West.

Abigail Adams: Wife of the second famous American President: Also publicly wants equal rights for women.

Marie Shelley: The Creator of Frankenstein, also wants equal rights for women (emerges after the French Revolution)

Mary Wollstonecraft: She also wants equal rights for women-a famous writer in England. Women follow all the new ideas, practice or help establish the new science, but are anonymous because they are not kept track of in formal records.

Military and Naval Applications of the New Knowledge:

The Guns get better and better after the invention of the flintlock rifle.
The fast clipper ships are developed after 1780.

World navigation is more and more accurate.

The health of sailors at sea is improved through the new medicine.

The power of artillery and cannon are becoming decisive in all battles.

Early scientists find a haven developing weapons in all navies and armies.

Practical effects on Society 18th century:
First air balloons fly 1780-so a view from the air is possible
L**ens of all kinds are developed for glasses, telescopes and microscopes.**