

**SCIENCE AND INVENTION**  
**1660 TO 1914**  
**ISAAC NEWTON TO GREAT WAR**

**CHARACTERS – SCIENCE AND INVENTION**

**SCIENCE - ASTRONOMY**

- Tycho Brahe** 1546–1601 Made accurate astronomical observations, used by Kepler to calculate motion of planets.
- Johannes Kepler** 1571–1630 Proposed Heliocentric theory after studying measurements of Tycho Brahe.
- Galileo Galilei** 1564–1642 Promoted Heliocentric theory against pressure from the Pope. Invented the telescope.
- Isaac Newton** 1642–1727 Outstanding scientist. Made important breakthroughs in physics, optics, and mathematics.
- William Herschel** 1738–1822 Astronomer who discovered the planet Uranus, improved telescopes, and made many other discoveries.

**SCIENCE - PHYSICS/CHEMISTRY**

- Antoine Lavoisier** 1743–1794 French scientist, known as the "Father of Chemistry". Discovered oxygen and established the principle of conservation of mass.
- John Dalton** 1766–1844 Chemist who proposed the atomic theory, and designed experiments to prove it.
- Lord Kelvin** 1824–1907 Made important discoveries in thermodynamics and electricity.
- J. J. Thomson** 1856–1940 Discovered the electron, and also the isotope.
- Madame Curie** 1867–1934 A pioneer in the field of radioactivity, and first female winner of the Nobel prize in physics.
- Ernest Rutherford** 1871–1937 Father of nuclear physics. Advocated the orbital theory of the atom.

**SCIENCE - BIOLOGY/GEOLOGY**

- Carolus Linnaeus** 1707–1778 Great Taxonomist, who initiated naming conventions and classification of plants and animals.
- Charles Lyell** 1797–1875 Influential 19th century Geologist who promoted the idea of doctrine of uniformitarianism (as opposed to catastrophism.)
- Charles Darwin** 1809–1882 Proposed the theory of evolution of species. Wrote *The Descent of Man*.

**ELECTROMAGNETISM/COMMUNICATION**

- Alexander Volta** 1745–1827 Invented the first usable electrical storage battery.
- Samuel Morse** 1791–1872 Inventor of Morse code, a system telegraph transmission widely used before the telephone.
- Michael Faraday** 1791–1867 Physicist who was important in the development of electricity and magnetism.
- James Clerk Maxwell** 1831–1879 Developed laws defining the behavior of electricity and magnetism.
- Alexander Graham Bell** 1847–1922 Inventor of the telephone, and also a founder of a school for the deaf.
- Thomas Edison** 1847–1931 Prolific inventor, responsible for improvements in the light bulb, movies, phonograph, and many others.
- Guglielmo Marconi** 1874–1937 Inventor of a wireless telegraphy system, first used on ships.

## MEDICINE

- William Harvey** 1578–1657 Medical doctor who described the process of circulation and the role of the heart and blood.
- Edward Jenner** 1749–1823 English doctor who developed a vaccine for smallpox.
- Louis Pasteur** 1822–1895 Renowned scientist in bacteriology. Helped develop germ theory of disease and pasteurization process.
- Joseph Lister** 1827–1912 Promoted the idea of sterilization using antiseptics to kill germs on wounds and medical instruments.
- Alexander Fleming** 1881–1895 Scottish biologist who studied bacteria and discovered the antibiotic properties of penicillin.

## TEXTILES

- James Hargreaves** 1720–1778 Inventor of an automated Spinning wheel. Founder of the Industrial Revolution.
- Richard Arkwright** 1732–1792 Inventor of the spinning frame, which allowed water or steam power to spin cloth.
- Samuel Crompton** 1753–1827 Inventor of the Spinning Mule, which could be used to make fine cloth such as Muslin.
- Eli Whitney** 1765–1825 Inventor of the Cotton Gin, and also interchangeable parts for rifles.
- Elias Howe** 1819–1867 American inventor of the sewing machine. His great innovation was the "lock stitch".

## INDUSTRY

- James Watt** 1736–1819 Inventor of the Steam Engine, and founder of the Industrial Revolution.
- Robert Fulton** 1765–1815 Inventor of Steamboats. Operated the steamboat Clermont on the Hudson River.
- George Stephenson** 1781–1848 Inventor of the steam locomotive, and the modern railroad.
- Goodyear** 1800–1860 Discovered the process for 'vulcanizing' rubber, and making it far more usable.
- Cyrus McCormick** 1809–1884 Invented the mechanical reaper, which revolutionized agriculture, especially in Midwest.
- Henry Bessemer** 1813–1898 Invented a process for the manufacture of steel that was of superior quality for a low cost.
- Rudolf Diesel** 1858–1913 German engineer and inventor who developed a practical internal combustion 'diesel' engine.
- Wilber and Orville** 1871–1948 Inventors of the first practical airplane. The Wright brothers were self-educated bicycle shop owners.

# TIMELINE – SCIENCE AND INVENTION

## **INVENTION AND INDUSTRY**

- 1764 [James Hargreaves](#) invents the Spinning Jenny, allowing multiple threads of yarn.
- 1769 [Richard Arkwright](#) designs a water frame that made it possible to spin strong threads.
- 1781 [James Watt](#) invents the Steam Engine—ushers in the industrial revolution.
- 1793 [Eli Whitney](#) invents the cotton gin, greatly lowering the price of cotton.
- 1807 [Robert Fulton](#) runs the first steam propelled boat on the Hudson river.
- 1821 [George Stephenson](#) creates the first practical railroad locomotive; ushers in age of railways.
- 1844 [Goodyear](#) receives a patent for vulcanized rubber.
- 1847 [Cyrus McCormick](#) establishes a mechanical reaper business in Chicago, revolutionizes agriculture.
- 1851 [Elias Howe](#) invents sewing machine, but Isaac Singer succeeds in selling his version.
- 1858 [Cyrus Field](#) lays the first trans-Atlantic cable from Ireland to Newfoundland.
- 1865 [Henry Bessemer](#) invents a process that greatly improves production of steel.
- 1893 [Rudolf Diesel](#) invents an internal combustion engine.

## **ELECTROMAGNETISM AND COMMUNICATION**

- 1800 [Alexander Volta](#) invents the first electric battery.
- 1831 [Michael Faraday](#) invents a dynamo which uses electromagnetic induction to create a current.
- 1836 [Samuel Morse](#) invents the telegraph. First Washington to Baltimore telegraph in 1844.
- 1873 [James Clerk Maxwell](#) proposes a theory of electromagnetism.
- 1876 [Alexander Graham Bell](#) receives a patent for the telephone.
- 1879 [Thomas Edison](#) produces the first practical light bulb.
- 1897 [Guglielmo Marconi](#) perfects wireless telegraphy.

## **ADVANCES IN MEDICINE**

- 1628 [William Harvey](#) publishes 'De Motu Cordis' detailing operation of heart and circulatory system.
- 1796 [Edward Jenner](#) develops the first small pox vaccine.
- 1861 [Louis Pasteur](#) establishes Germ theory, and develops methods for sterilization.
- 1928 [Alexander Fleming](#) discovers penicillin, an antibiotic substance that kills bacteria.

## ASTRONOMY AND HELIOCENTRIC THEORY

- 1543 [Nicholas Copernicus](#) publishes his theory of a heliocentric universe.
- 1609 [Johannes Kepler](#) publishes 'Astronomia Nova', a book detailing his theory of elliptical planetary orbits.
- 1633 [Galileo Galilei](#) is subjected to the Inquisition for promoting heliocentric theory.
- 1687 [Isaac Newton](#) publishes *Principia* his universal laws of motion.
- 1781 [William Herschel](#) discovers Uranus, improves telescope.

## SCIENCE AND DISCOVERY

- 1789 [Antoine Lavoisier](#) discovers the element oxygen and law of conservation of mass.
- 1805 [John Dalton](#) develops the Atomic Theory of chemistry.
- 1827 Amedeo Avogadro defines the Gas Law relating volume to number of gas molecules.
- 1848 [Lord Kelvin](#) establishes the value of absolute zero.
- 1859 [Charles Darwin](#) publishes *The Origin of Species*.
- 1865 [Gregor Mendel](#) develops laws of inheritance, establishes basis for genetics.
- 1898 [J. J. Thomson](#) discovers electrons, proposes the Plum pudding model of an atom.
- 1898 [Madame Curie](#) discovers polonium, radium, and coins the term "radioactivity".
- 1900 Max Planck develops law of black body radiation, basis for quantum theory.
- 1909 Robert Millikan conducts an oil drop experiment, determines charge of electrons.
- 1913 Niels Bohr establishes the Bohr Model of the atom, proposing electronic orbitals.
- 1915 Albert Einstein proposes a general theory of relativity.

# RECOMMENDED READING – SCIENCE AND INVENTION

## CORE READING ASSIGNMENTS

Haaren - <a href="#"><u>Famous Men of Modern Times</u></a>	<a href="#"><u>Galileo</u></a> to <a href="#"><u>Sir Isaac Newton</u></a> (2)
Harding - <a href="#"><u>The Story of England</u></a>	<a href="#"><u>Industrial and Social Changes</u></a> (1)
Bachman - <a href="#"><u>Great Inventors</u></a>	<a href="#"><u>Watt and the Steam Engine</u></a> to <a href="#"><u>Invention of Spinning Machines</u></a> (5)
Wright - <a href="#"><u>Stories of the Great Scientists</u></a>	<i>entire book</i>

## SUPPLEMENTAL RECOMMENDATIONS

Gibson - <a href="#"><u>War Inventions</u></a>	<i>entire book</i>
Gibson - <a href="#"><u>Stories of Great Scientists</u></a>	<i>entire book</i>

## ALSO RECOMMENDED

Marshall - <a href="#"><u>Our Island Story</u></a>	<a href="#"><u>A Story of a Spinning Wheel</u></a> (1)
Synge - <a href="#"><u>Great Englishmen</u></a>	<a href="#"><u>George Stephenson</u></a> (1)
Synge - <a href="#"><u>Great Englishwomen</u></a>	<a href="#"><u>Mary Somerville</u></a> (1)
Synge - <a href="#"><u>Reign of Queen Victoria</u></a>	<a href="#"><u>An Age of Science</u></a> (1)
Rowbotham - <a href="#"><u>Lives of Great Scientists</u></a>	<i>entire book</i>
Gibson - <a href="#"><u>Scientific Discoveries</u></a>	<i>entire book</i>
Gibson - <a href="#"><u>Twentieth Century Inventions</u></a>	<i>entire book</i>

\* *Level I and II Study Questions are based on **Core** Reading Assignments.*