

## Review for Exam 2

### *The Scientific Revolution: Galileo*

Biographical background. Astronomical discoveries using the telescope: Milky Way, Moon features, Jupiter's satellites, Venus' phases, sunspots, Saturn's rings. Galileo's support for the heliocentric theory. Galileo's physics: relative motion, inertia, projectile motion. Falling objects' speed independent of their mass. Father of experimental science. Galileo's trial: what he did, and why it got him into trouble.

### *Newton*

Biographical background. His work in math, especially the development of calculus. Calculus used to study motion. Law of Gravity. The apple story. Moon and gravity. Force and “action at a distance”. His work in optics, especially colors. The particle theory of light. Invention of the reflecting telescope. Newton and the Royal Society. His secrecy. His work in alchemy and theology.

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### *Newton (continued):*

Hooke, Halley, and the writing of the *Principia Mathematica*. Newton's Laws of Motion and their significance. Relationship between laws of motion and law of gravity. Newton's public life, his career at the Mint and as president of the Royal Society.

### *The Rise of Classical Physics (Part I):*

Influence of Newton's discoveries on society at large. The Enlightenment. Theoretical versus Experimental sciences. Ancient knowledge of electricity and magnetism. Static electricity, Leyden jars. Franklin's contributions. Two fluid versus one fluid model. Oersted and the link between electricity and magnetism. Biographical background on Faraday. The geometry of the magnetic field caused by a current. Electromagnetic induction – the creation of electricity using a magnet. Electromagnets, dynamos. Faraday's lines of force. Faraday as an outstanding experimenter.

## *The Rise of Classical Physics (Part II)*

Biographical Background on Maxwell. Major contributions outside of electricity and magnetism (theory of colors; nature Saturn's rings; kinetic theory of gasses). Attempts to come up with a single theory that can accurately describe all known properties of electricity and magnetism combined. Uses Faraday's lines of force idea, and invents the concept of a force field. Uses an imaginary mechanical analogy to help derive four equations to explain all off electro-magnetism. Predicts the existence of electromagnetic waves (light). Explains the behavior of tails of comets using his theory. After his death, his work inspires Hertz to discover radio waves, and Einstein to create the theory of relativity.