

Physics

1. **Mechanics:** Advanced concepts of motion, forces, and Newton's laws of motion.

Phet Links:

[Projectile Motion](#)
[Energy Skate Park](#)
[Energy Skate Park: Basics](#)
[Forces and Motion: Basics](#)
[Friction](#)
[Vector Addition](#)

LabXchange Links:

[Forces and Vectors](#)
[Dynamics: Force and Newton's Laws of Motion](#)
[Linear Momentum and Collisions](#)
[Gravitation and Uniform Circular Motion](#)
[Kinematics](#)
[Rotational Motion](#)
[Rotational Motion and Angular Momentum](#)
[Simple Harmonic Motion](#)

2. **Energy and Work:** Understanding different forms of energy, work, and power.

Phet Links:

[Energy Forms and Changes](#)
[Energy Skate Park](#)
[Energy Skate Park: Basics](#)
[Hooke's Law](#)

LabXchange Links:

[Work, Energy and Simple Machines](#)
[Energy Storage in the 21st Century](#)
[Excellent Energy Engineering](#)

3. **Waves and Optics:** Properties of waves, interference, diffraction, and optical instruments.

Phet Links:

[Sound Waves](#)
[Wave Interference](#)
[Wave on a String](#)
[Geometric Optics](#)
[Geometric Optics: Basics](#)

LabXchange Links:

[Waves](#)
[Waves and Energy Transfer](#)
[Wave Optics](#)
[Sound](#)
[Light](#)

4. **Electromagnetism:** Understanding electric and magnetic fields, electromagnetic induction, and electromagnetic waves.

Phet Links:

[Charges and Fields](#)
[Coulomb's Law](#)
[Faraday's Law](#)

LabXchange Links:

[Electric Circuits](#)
[Electromagnetic Induction, AC Circuits, and Electrical Technologies](#)
[Magnetism](#)
[Magnetic Fields](#)

5. **Thermodynamics:** Laws of thermodynamics, heat transfer, and thermodynamic cycles.

Phet Links:

[Gas Properties](#)
[States of Matter](#)
[States of Matter: Basics](#)

LabXchange Links:

[Thermodynamics](#)
[Heat and Heat Transfer Methods](#)

6. **Modern Physics:** Introduction to quantum mechanics, atomic models, and particle physics.

Phet Links:

[Blackbody Spectrum](#)
[Build a Nucleus](#)
[Rutherford Scattering](#)

LabXchange Links:

[Introduction to Quantum Physics](#)
[Frontiers of Physics](#)
[Black Holes: The Meeting of Gravity and Quantum Physics](#)

7. **Relativity:** Special and general theory of relativity.

LabXchange Links:

[Special Relativity](#)

8. **Oscillations and Waves:** Understanding simple harmonic motion and wave phenomena.

Phet Links:

[Masses and Springs](#)
[Masses and Springs: Basics](#)
[Normal Modes](#)

LabXchange Links:

[Waves](#)
[Simple Harmonic Motion](#)

9. **Electric Circuits:** Advanced concepts in electric circuits, including AC circuits and impedance.

Phet Links:

[Circuit Construction Kit: AC](#)
[Circuit Construction Kit: AC - Virtual Lab](#)
[Circuit Construction Kit: DC](#)
[Circuit Construction Kit: DC - Virtual Lab](#)

LabXchange Links:

[Electric Circuits](#)
[Electric Current, Resistance, and Ohm's Law](#)

10. **Nuclear Physics:** Fundamentals of nuclear reactions, radioactivity, and nuclear energy.

Phet Links:

[Build a Nucleus](#)
[Rutherford Scattering](#)
[Isotopes and Atomic Mass](#)

LabXchange Links:

[Radioactivity and Nuclear Physics](#)

11. **Astrophysics:** Study of celestial bodies, cosmology, and the universe.

Phet Links:

[My Solar System](#)
[Gravity and Orbits](#)

LabXchange Links:

[The Origin of Stars and Planets](#)
[Galaxy Formation and Evolution](#)
[Many Planets, One Earth](#)

12. **Fluid Mechanics:** Understanding fluid properties, flow, and Bernoulli's principle.

Chemistry

1. **Atomic Structure and Periodic Properties:** In-depth study of atomic structure, quantum numbers, and periodic trends.

Phet Links:

[Build an Atom](#)
[Isotopes and Atomic Mass](#)

LabXchange Links:

[The Atom](#)
[Atomic Physics](#)
[Organizing Atoms and Electrons: The Periodic Table](#)

2. **Chemical Bonding:** Advanced concepts of chemical bonding, hybridization, and molecular orbital theory.

Phet Links:

[Build a Molecule](#)
[Molecule Shapes](#)
[Molecule Shapes: Basics](#)

LabXchange Links:

[Chemical Bonding](#)
[Molecular Shapes](#)

3. **Chemical Equilibrium:** Understanding reversible reactions, Le Chatelier's principle, and equilibrium constants.

Phet Links:

[Balancing Chemical Equations](#)

4. **Thermodynamics:** Enthalpy, entropy, and Gibbs free energy in chemical reactions.

Phet Links:

[Energy Forms and Changes](#)
[States of Matter](#)
[States of Matter: Basics](#)

LabXchange Links:

[Thermodynamics](#)
[Energy and Phase Changes](#)

5. **Acids and Bases:** Properties of acids and bases, pH scale, and acid-base titrations.

Phet Links:

[Acid-Base Solutions](#)
[pH Scale](#)
[pH Scale: Basics](#)

LabXchange Links:

[Acids and Bases](#)
[How Can We Measure pH?](#)
[What Is pH Again?](#)

6. **Redox Reactions:** Balancing redox equations and electrochemical cells.

LabXchange Links:

[Electrochemistry](#)

7. **Organic Chemistry:** In-depth study of organic compounds, functional groups, and reaction mechanisms.

Phet Links:

[Build a Molecule](#)
[Molecule Polarity](#)

LabXchange Links:

[Organic Chemistry](#)

8. **Environmental Chemistry:** Analyzing chemical processes affecting the environment.

Phet Links:

[Greenhouse Effect](#)

Biology

1. **Cell Biology:** Advanced understanding of cell structure, organelles, and cellular processes.

LabXchange Links:

[Cells](#)
[Cell Structure I](#)
[Cell Structure II](#)
[Cellular Structure and Function](#)
[The Cellular Basis of Inheritance](#)
[Cell Division](#)
[Cell Membranes](#)

2. **Genetics and Biotechnology:** Advanced concepts in genetics, DNA technology, and genetic engineering.

Phet Links:

[Gene Expression Essentials](#)
[Natural Selection](#)
[Neuron](#)

LabXchange Links:

[DNA Structure and Function I](#)
[DNA Structure and Function II](#)
[Genes and Proteins I](#)
[Genes and Proteins II](#)
[Genetic Disorders](#)
[Patterns of Inheritance](#)
[Modern Understandings of Inheritance](#)
[Biotechnology I](#)
[Biotechnology II](#)
[Introduction to Genetic Engineering: The Role of Cells](#)

3. **Physiology:** In-depth study of human physiology and regulatory mechanisms in the body.

LabXchange Links:

[Biotechnology I](#)
[Biotechnology II](#)
[The Cardiovascular System: Blood](#)
[The Cardiovascular System: Blood Vessels and Circulation](#)
[The Cardiovascular System: The Heart](#)
[The Circulatory System](#)
[The Immune System and Disease](#)
[The Immune System I](#)
[The Immune System II](#)
[The Musculoskeletal System](#)
[The Nervous System I](#)
[The Nervous System II](#)
[The Nervous System III](#)
[The Nervous System IV](#)
[The Reproductive System](#)
[The Respiratory System](#)
[The Respiratory System I](#)
[The Respiratory System II](#)
[The Respiratory System III](#)
[Animal Nutrition and the Digestive System](#)

4. **Evolution and Ecology:** Mechanisms of evolution, evidence for evolution, and ecological interactions.

Phet Links:

[Natural Selection](#)

LabXchange Links:

[Evolution](#)
[Ecology](#)
[Population and Community Ecology](#)
[Ecosystems](#)
[Ecosystems and the Biosphere](#)
[Conservation and Biodiversity](#)
[Conservation Biology and Biodiversity](#)

5. **Animal Biology:** The physiology, anatomy, and behavior of animals, exploring how they survive, reproduce, and adapt to their environments.

LabXchange Links:

[Animal Reproduction and Development](#)
[Diversity of Animals](#)
[The Body's Systems](#)

6. **Plant Biology:** The processes of photosynthesis, plant anatomy, growth, and reproduction, highlighting the ecological roles of plants.

LabXchange Links:

[Diversity of Plants](#)
[Photosynthesis](#)
[Healthy Eating, Plant Foods and Vitamins](#)

7. **Molecular Biology:** The structure and function of DNA, gene expression, protein synthesis, and the applications of genetic engineering.

LabXchange Links:

[Molecular Biology](#)
[The Basics of DNA](#)
[The Cellular Basis of Inheritance](#)

8. **Microbiology:** The structure, genetics, and functions of microorganisms, along with their roles in disease and biotechnology applications.

LabXchange Links:

[Diversity of Microbes, Fungi, and Protists](#)
[The Immune System and Disease](#)
[Diffusion Through a Membrane](#)