Physical sciences

Sciences that seek to formulate laws about the world around us. They attempt to understand the essence of such basic concepts as matter, time, motion, forces, energy, heat, sound and light.

Physics

Acoustics

The study of phenomena related to sound propagation through air and other media.

Project ideas

How can the structure of a violin affect sound frequency?
Wave analysis
Studying the acoustic properties of different types of heat or acoustic insulation
Does pore size affect acoustic transmission?

Astronomy

The study of heavenly bodies or the structure of the universe by means of observations or measurements, using telescopes or space probes.

Project ideas

Determining the height of a lunar mountain using its shadow
Listening to Jupiter
Listening to the Sun
Io—one of Jupiter's moons
Einstein's cross
The northern lights
Comets
The Sun
Solar and lunar eclipses
The importance of the Gemini telescope in astronomy
Is Mars similar to our planet?
Mars—CO_2 explosions rather than water?
Mercury—the enigmatic planet

Astrophysics
The field of astronomy that deals with the constitution, physical properties and evolution of celestial bodies and their different constituent media.

Project ideas
The origins and the end of the universe
Is astrology a science?
The sun is more complex than it seems.
Determining the Sun's rotational speed
Determining the Sun's mass
What is the origin of the northern lights?
Comets
Galaxies
Quasars
Black holes
Solar energy
Using nebulae to understand the history of stars
The Big Bang Theory
Gravitational microlenses
Gamma bursts
Can humans survive on other planets?

Biophysics
The study of biological structures and mechanisms, using physics methods and techniques.

Project ideas
The biophysics of a walking cat
The biophysics of humans
What power does a cat generate to run 100 metres?
Where does sound pollution begin?
Can centrifugal force affect plant growth?
The effects of radiation on plants, seeds, etc.
3-D vision
Colour perception

Calorimetry
The series of techniques used to measure quantities of heat.

Cryophysics
The physics of low temperatures (e.g. superconductors).

Project ideas
The concept of cold

Electromagnetism
The study of the phenomena related to electrical and magnetic fields.

Project ideas
How do cordless telephones work?
Creating a form of transportation that operates by means of magnetic levitation
Detecting the passage of meteorites using radio wave reflection
Electricity
The Faraday cage
Magnets
Electrical circuits
Moving around by means of magnetohydrodynamics
Is there still room for new waves?

Mechanics
The study of the effects of forces on bodies.

Project ideas
Determining the thrust of a rocket engine, using simple machines
Experimenting with gravity
How does gravitational attraction affect our lives?
Wind energy
The biophysics of a walking cat
The biophysics of humans
Building sand castles
Calculating friction
The physics of baseballs
The physics of golf balls
The physics of footballs
The physics of soccer balls
The physics of curling
The physics of cycling
Perpetual motion
Are dice loaded?
The chaotic behaviour of the pendulum
What power does a cat generate to run 100 metres?
Testing the effectiveness of wax on skis

Optics
The study of light, its laws and how they relate to vision.

Project ideas
Wave analysis
Examining fluorescence in household products
Rayleigh instability
3-D effects in Imax movies
Solar energy
Sonoluminescence
Lasers—multiple or specific uses?
Lasers as sources of energy
The principle of photo development
Optical illusions
The dangers of wave bombardment
Why are oil slicks so colourful?
3-D projectors
Stroboscopes beyond the dance floor
Is there still room for new waves?

Solid state physics
The study of the physical properties of solids.

Project ideas
The creation and use of crystals
Growing large crystals
The Bose-Einstein phenomenon or the behaviour of atoms in the absence of heat

Fluid physics
The study of the behaviour of fluids (liquids and gases) in motion.

Project ideas
Divers and pressure
The Bernoulli theorem
A self-activated water pump?
The aerodynamics of baseballs
The aerodynamics of golf balls
Decreasing the effects of friction when skating and skiing
The aerodynamics of cycling

Nuclear physics
The study of the atomic nuclei, elementary particles and nuclear reactions.

Project ideas
Nuclear waste
Nuclear energy

Quantum physics
The branch of physics that uses and applies quantum theory.

Project ideas
Is teleportation possible?
Quantum teleportation
Quantum cryptography

Relativity physics
The series of relations that assume that the laws of nature are the same in all spatial/temporal reference frames.

Project ideas
What's the purpose of $E=mc^2$?
Man's obsession with time travel
What if Einstein was wrong?

Thermodynamics
The branch of physics that deals with the relations between heat and the transformation of matter.

Project ideas
Is it possible to cook carrots on Everest?

Chemistry
The study of the structure and properties of substances and how they affect one another.

Project ideas
The effects of UV-B rays on plants
Comparing different toothpastes
The use chemistry in the police force
Which fabric is easiest to clean?
Photography: a chemical phenomenon
The role of atoms
Is our water really safe for drinking?
Choosing between bottled and tap water
The role of CO_2 in the greenhouse effect

Analytical chemistry
The study of methods of isolating and characterizing compounds.

Project ideas
Isolating an essential oil
What is the best laundry detergent?
Testing the effectiveness of fruit and vegetable cleaning products
Testing the effectiveness of floor cleaners
Developing an organic cleaning product for fruits and vegetables

Inorganic chemistry
The chemistry of inert matter, without carbon atom chains.

Project ideas
Hydrogen—a clean energy source
Ozone—a water disinfectant
The secret side of ozone

Organic chemistry
The chemistry of carbon-based compounds, especially those that constitute living matter.

Project ideas
Developing a water-resistant varnish
Developing natural cosmetics
Isolating an essential oil
Is it possible to synthesize odours?

Creating perfume
The chemistry of wine
Does air help mold grow on food?
Soap throughout history
Carbon-14
Synthetic fabrics
New materials—carbon fibre

Pharmaceutical chemistry
The study of the biological activity of medicines.

Project ideas
The synthesis of biologically active compounds
Natural medicines
Combinatory chemistry
Can cancer treatments come from the forest?

Physical chemistry
Application of the concepts and laws of physics to chemical phenomena in order to describe in quantitative terms a vast amount of qualitative information.

Project ideas
Developing varnish using UV-block lotions
How can we measure the concentration of oxygen in the air?
How can we measure the concentration of nitrogen in the air?
Measuring the concentration of CO in the air
How ozone acts on UV-B radiation
Developing a solvent for chewing gum
Discovering and comparing the effectiveness of shampoos

Petrochemistry
The chemistry of petroleum derivatives.

Project ideas
Manufacturing polymers