

SCIENCE FAIRS	01	02	03	04	05	06	07
---------------	----	----	----	----	----	----	----

Applied science and technology

Knowledge and techniques related to the design, development and application of processes, devices and machines in a given field.

Aerodynamics

The study of gaseous fluids (usually air) in motion and their effects on bodies when they move through such fluids or when such fluids move against or around the bodies.

Project ideas

The obstacle effect of tracers in air or in water

How does the shape and texture of feathers affect airflow around a bird's wings?

Aeronautics

The science that deals with flight through the air, and the design, manufacture and operation of aircraft.

Project ideas

Inventing a process that would improve an airplane wing's lift

Building a glider

Ergonomics

The study of working conditions (psychophysiological and socioeconomic) and the relationships between humans and machines.

Project ideas

An ergonomic chair

An ergonomic house

Existing ergonomic standards

Creating an ergonomic school environment

Aeronautical engineering

The design, construction, testing and maintenance of aircraft and aircraft components.

Project ideas

Gliders

SCIENCE FAIRS	01	02	03	04	05	06	07
----------------------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

Aerospace engineering

The discipline that deals with the design, developing and manufacture of or aeronautical and space-based systems.

Project ideas

What problems would we have to overcome to live on the moon?
 The conquest of Mars
 A reusable space shuttle

Agricultural engineering

The art of rural constructions (buildings, water supply systems, etc.).

Project ideas

High-energy manure: "ecological" energy thanks to a power plant?
 A wood-burning stove? No, a grain-burning stove!
 How is field irrigation done?
 How can water be used optimally in agriculture?

Food engineering

The application of engineering principles to the handling, manufacture, processing, transformation and distribution of food.

Project ideas

How are small industrial cakes produced?
 How do preservatives work?
 How are frozen foods processed?
 Freezing foods without desiccation
 Improving the cleaning of production lines to facilitate the transition from one series of foods to another

Architectural engineering

Designing buildings from an engineering standpoint.

Project ideas

Making skyscrapers more resistant to earthquakes
 The resistance of skyscrapers to airplane crashes

SCIENCE FAIRS	01	02	03	04	05	06	07
---------------	----	----	----	----	----	----	----

Biochemical engineering

The use of the processes and physical properties of living organisms to manufacture chemical products and medicines.

Project ideas

Yeast and the production of carbon dioxide

Biomedical engineering

People working in this field are responsible for applying engineering concepts and methods to the design and construction of instruments, artificial organs and systems used in patient care, and for the provision of a consulting, maintenance and repair service for complex medical electronic instruments and equipment.

Project ideas

Creating a functioning model of an artificial kidney

Lighter and less costly artificial limbs

An assisted braking system for wheelchairs

An arm with an articulated hand

A bionic arm

A cybernetic arm

An ultrasonic white cane

A robotic spoon that enables disabled people to feed themselves

A lens that adapts to visual variations (e.g. for diabetics)

The effect of the physics of elementary particles in cancer treatment

Cancer-causing cell phones? How can we make these devices less harmful to the brain?

Chemical engineering (sometimes called process engineering)

The design, testing and operation of chemical processes on a commercial scale in safe chemical plants.

Project ideas

Creating new products to facilitate relaxation

Eliminating toxic fumes from tire combustion by means of a new reactor

Is hydrogen an efficient and ecological fuel?

Pyrotechnics

How does a silica sand purification plant work?

Is "Super" gas really superior?

Hydrogels as a delivery system for medication

Are polymers better than wood or metals?

SCIENCE FAIRS	01	02	03	04	05	06	07
----------------------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

Complex systems (e.g. creating a plant for manufacturing checker pieces)
 What is the best wood for heating?
 Creating a reverse osmosis device
 Replacing non-organic products contained in toothpastes with organic products
 Developing a game on the evolution of the atomic model
 A non-polluting car thanks to dual combustion purification
 A photoelectric cell for calculating the concentration of sugar in an aqueous solution
 An electrochemical battery

Civil engineering

Field that includes the planning, design, construction and use of buildings, transportation systems and sewage systems, etc.

Project ideas

Is it possible to measure distances without using a map or moving around?
 What to do with excess snow in cities
 Ecological housing—housing of the future
 Expansion joints on bridges
 Bridge construction and reliability
 Sewage and water supply systems
 Problems related to the resonance frequency of a structure (e.g. collapse of the Tacoma Narrows Bridge)
 Building a cement canoe
 What are the challenges involved in building a leaning tower?

Environmental engineering

Field that focuses on minimizing the impact of engineering projects on the environment.

Project ideas

Water filtration using sand or peat
 Producing whiter paper without polluting
 Fishways to help save endangered species
 What happens to a product after it goes into the recycling bin?

SCIENCE FAIRS	01	02	03	04	05	06	07
----------------------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

Automated production engineering

The area of robotics that focuses on production lines.

Project ideas

Improving the cleaning of production lines to facilitate the transition from one series of foods to another

Ceramic engineering

The use of ceramics in industry.

Project ideas

The space shuttle's resistance to heat

Communications engineering

The study of the technological, networking and commercial aspects of global communications.

Project ideas

What are the challenges resulting from an ever-increasing use of cell phones?

How are geostationary satellite networks developed for telecommunications purposes?

The use and management of telephone lines

Fibre optics

Will video surpass film in terms of visual quality?

A confidential radio transmitter

Materials engineering

Science applied to the development, manufacturing and use of materials.

Project ideas

Developing boot soles adapted to our climate

Condom resistance

Ecological housing—housing of the future

Are polymers better than wood or metals?

A scarf better adapted to our winters

Verifying the efficiency of insulation materials

Can asphalt be improved?

The high-temperature heat resistance of ceramics

Using X-ray diffraction to analyze the quality of steel and aluminum

SCIENCE FAIRS	01	02	03	04	05	06	07
----------------------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

How does heat treatment increase the properties of metals?
 Manufacturing fire retardant textiles
 Designing composite materials (e.g. fibreglass)
 Making carbonated beverage cans lighter, while increasing their resistance to shock and corrosion
 Diminishing the spread of cracks in construction materials
 Are straw houses only for the three little pigs?

Pulp and paper engineering

Research on the transformation of cellulose fibre into a wide variety of pulp, paper and cardboard.

Project ideas

Making paper using industrial methods
 A reactor capable of eliminating the odours produced by pulp and paper plants
 Making paper using ecological methods

Water resources engineering

The science of irrigation, drainage, flood control, port development and planning, and water resources improvement.

Project ideas

Could the flooding of the Saguenay have been avoided?

Transportation engineering

The planning, design and construction of transportation infrastructure (e.g. roads, railroads, airports, ports, train stations, parking areas).

Project ideas

Testing the durability of concrete
 Creating asphalt that is resistant to our winters

Electrical engineering

The production, transportation, distribution and use of electricity in various sectors.

Project ideas

Designing a spectroscope controlled by an electronic terminal
 Developing a calorimeter
 Superconductors
 Creating a functioning model of an artificial kidney

SCIENCE FAIRS	01	02	03	04	05	06	07
----------------------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

Is it possible to create an ecological battery?
 How does a breathalyzer test work?
 How does the subway work?
 Developing a spectrophotometer
 How do solar winds affect power lines?
 How can energy losses on power lines be diminished?
 Hydroelectric dams

Electronic engineering

The study and use of variations in electrical magnitude to capture, transmit and use information.

Project ideas

Developing an automated control system
 Creating an alarm system
 Designing a calculator
 An automated system capable of controlling the temperature inside a greenhouse
 Creating a flight simulator
 Voice recognition for the disabled
 Magnetic resonance imaging
 Electronics associated with light phenomena
 Is an iris imprint more reliable than a fingerprint
 A photoelectric house
 High-definition television
 Digital cameras
 The transition from CD-ROM to DVD-ROM
 What would we do without fibre optics?
 Artificial satellites
 A system that turns lights on and off when a person enters and leaves a room
 A device that uses ultrasound to detect presence, motion and distance
 An arm with an articulated hand
 A bionic arm
 A cybernetic arm
 A tool to help search for people lost in the forest
 A robot guided by light
 A robot design inspired by insects
 A robot that can go anywhere to save lives
 A robot that makes right-angle turns (robotized platform)
 An underwater robot to help underwater archeologists
 An all-terrain robot capable of detecting anti-personnel mines
 A wire-guided robot made of recycled parts

SCIENCE FAIRS	01	02	03	04	05	06	07
----------------------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

A thermometer that measures to the thousandth degree Celsius
 An ultrasonic white cane
 A photoelectric cell for calculating the concentration of sugar in an aqueous solution
 A robotic spoon that enables disabled people to feed themselves
 A lens that adapts to visual variations (e.g. for diabetics)
 A computer mouse with variable shape
 Will robots one day be more intelligent than us?
 Designing electronic circuits that are more resistant to the environment (corrosion, humidity, extreme temperature, severe shock)
 A vaporizer connected to the toilet flushing mechanism that eliminates foul odours
 Various techniques for eliminating disruptive noises

Electromechanical engineering

Design, development and analysis of various industrial projects involving both electricity and mechanics.

Project ideas

A pager turner for musical scores
 A sensor that opens doors

Industrial engineering

The management of labour, machines and materials in industrial production; quality operations.

Project ideas

How to maximize bicycle production in a plant

Computer engineering

A discipline that deals with the design, development and manufacture of computer systems.

Project ideas

Developing a data acquisition system
 Recycling computer components

SCIENCE FAIRS	01	02	03	04	05	06	07
---------------	----	----	----	----	----	----	----

Maritime engineering

The design of ships, from the study of the influence of the sea to the design of piping and electrical circuits.

Project ideas

A wire-guided submarine built from recycled parts

Is it possible to build an unsinkable ship?

What are the challenges involved in building huge passenger liners (e.g. the Titanic)?

How do oil tanker wrecks occur (e.g. Exxon-Valdez, Erika) and how can they be prevented?

Optimizing space in a submarine

Mechanical engineering

The design, manufacture and development of machines and devices used in various sectors.

Project ideas

Developing a spectrophotometer

Developing a colorimeter

A device that heats liquid through the force of friction

A chair made of recycled cardboard

Improving cup holders adapted for wheelchairs

Designing a system that would indicate the volume of liquid contained in underground storage tanks at a gas station

Developing a bimetal thermometer

Creating a less costly and more efficient anemometer

Creating a functioning model of an artificial kidney

Creating a compressed air engine

Creating a system activated from inside a truck cab that would enable a trucker to cover his cargo

Creating a non-polluting vehicle

Lighter and less costly artificial limbs

Developing boot soles adapted to our climate

How does a breathalyzer test work?

Hovercrafts

A tidal power station: using the force of the waves and tides to create currents

Is the "watt" appropriate?

The frictionless tachometer for calculating speed and distance

Is the thermocouple a new source of energy?

Are thermal power plants the way of the future?

Expansion joints on bridges

How does the subway work?

SCIENCE FAIRS	01	02	03	04	05	06	07
---------------	----	----	----	----	----	----	----

Artificial satellites
 What is the best wood for heating?
 Moving around by means of a turbo sail (revolving cylinder)
 An assisted braking system for wheelchairs
 An arm with an articulated hand
 A bionic arm
 A cybernetic arm
 An anti-pollution engine thanks to compressed air
 A heat energy saver (e.g. from the dryer to the hot water)
 A more effective system of wheels for in-line skates
 A thermometer that measures to the thousandth degree Celsius
 A pager turner for musical scores
 A train that operates by means of superconductors
 A pneumatic train
 A dog sled for the summer
 A customized downhill bicycle
 A bicycle made for winter
 A robotic spoon that enables disabled people to feed themselves
 A lens that adapts to visual variations (e.g. for diabetics)
 A toilet with no tank
 Verifying the efficiency of insulation materials
 Designing cutting tools (e.g. blades, lasers, saws)
 Building a telescope
 A self-sorting recycling bin
 Designing an automatic fish food distributor
 Designing a snow cannon
 Is it possible to have a fully reliable car?
 Various techniques for eliminating disruptive noises
 A hockey helmet that provides better neck protection

Metallurgical engineering

The study of the transformation of metals and alloys to make them usable.

Project ideas

Choosing the right material, identifying its basic properties (e.g. density, conductivity, corrosion) and determining its uses
 Recycling waste from an aluminum smelter
 The use of plasma
 Duralcan—material of the future?

SCIENCE FAIRS	01	02	03	04	05	06	07
---------------	----	----	----	----	----	----	----

Mining engineering

The study of excavation techniques in rock and the handling of excavated materials.

Project ideas

How to maximize the use of a mine roadway
How to prevent gas outbreaks

Municipal engineering

The design, development and analysis of various projects related to infrastructure operation in a big city.

Project ideas

What to do with excess snow in cities

Nuclear engineering

The practical applications of nuclear physics in medicine, nuclear energy production in power plants and the manufacturing of weaponry.

Project ideas

Nuclear power plants—solution of the future?
Is it possible to have a nuclear battery?
What is the future of nuclear power plants?
Is it possible to build safe small-scale nuclear power plants near each town to satisfy the town's needs
Radioactive waste treatment

Petroleum engineering

The identification of the nature and quantity of natural fluids (e.g. petroleum, oil, gas) found underground.

Project ideas

Prospecting for new underground petroleum pools

Physics engineering

The application of physics discoveries to industrial problems.

Project ideas

Creating ones own Van de Graaf
Estimating the intensity of radiation received at the MIR space station during a given period

SCIENCE FAIRS	01	02	03	04	05	06	07
---------------	----	----	----	----	----	----	----

Manufacturing a Foucault device
 The electronics associated with light phenomena
 The conquest of Mars
 Is the thermocouple a new source of energy?
 The transition from CDs to DVDs
 The applications of lasers
 What would we do without fibre optics?
 Nanotechnologies
 Artificial satellites
 The principles of holography
 Moving around by means of a turbo sail (revolving cylinder)
 A cyclotron capable of accelerating electrons up to a kinetic energy of 1000 eV
 A thermometer that measures to the thousandth degree Celsius
 A train that operates by means of superconductors
 A faster space shuttle that uses antimatter
 The first transistor (in the 1950s) was as small as a pinkie and, today, we can fit 50 million on a fingernail. Up to what point can we miniaturize and what laws of physics limit this miniaturization?
 Manufacturing fibre optics
 Techniques for depositing ultra-thin layers (e.g. anti-glare treatment for eyeglasses, plastic wrap on chip bags)
 How do laser diodes work (e.g. CD players, laser pointers)?
 Use of quantum confinement for electronics of the future
 Manufacturing and optimization solar cells
 How do electron microscopes work?
 Conducting particle physics experiments in your basement
 Designing a wind generator
 Superconductors

Siderurgical engineering

The study of metal extraction and alloys, metal forming, and the working of sheet metal and other materials.

Textile engineering

Research on the transformation of natural and synthetic fibres for use in industrial manufacturing.

Project ideas

How to make bullet-proof best vests more effective

SCIENCE FAIRS	01	02	03	04	05	06	07
---------------	----	----	----	----	----	----	----

Geodetics

The science concerned with the determination of the size and shape of the Earth and the precise location of points on its surface.

Project ideas

Land surveying

Robotics

Science aimed at developing robots to perform certain tasks.

Project ideas

Creating a robot to help children learn to tie their shoes

A robot guided by light

A robot that can get through anything to save lives

A robot design inspired by insects

A robot that makes right-angle turns (robotized platform)

An underwater robot to help underwater archeologists

An all-terrain robot capable of detecting anti-personnel mines

Robotic windows

Robots made of recycled parts