



Australian Government



***Imagination Factory* Exhibit Themes, Descriptions and Curriculum Links**

Questacon's *Imagination Factory – Invent and Play* is a **touring** hands-on exhibition which is mainly targeted at visitors aged 8 to 14 years but can be enjoyed by people of all ages. This document lists *Imagination Factory* exhibit names, descriptions, key themes and subject areas as well as how *Imagination Factory* links to the Australian National Curriculum.

Imagination Factory's 21 exhibits focus on how technology makes life easier and challenges the idea that technology is only defined as high-tech electronics. Visitors will play with simple machines such as cams, pulleys, levers, gears, pistons (or pneumatics), wheels and electricity. Nine accompanying information banners also describe where you can find simple machines at home, school, work or play, as well as some Australian inventors and some peculiar patents.

The following suggestions and questions are useful for strengthening the educational experience for students and encouraging them to connect exhibit concepts to what they encounter in their everyday lives.

- Can you crack the code and open the safe door? What's special about the cam-shaped discs in the oversized lock?
- What parts can you see moving inside the engine? When each piston moves, what else moves in response?
- If you want the toy camel to win the race, what's the best combination of gears to use? What do you notice when you connect a mixture of the smallest and the largest gears?
- Do all levers look and work the same? Where is the 'best' place to pull down on the lever arm and lift your friend? When you pull at the 'easiest' point, do you need to pull down further?
- Will each piston move the same distance and with the same force? Which piston moves higher? Is one piston more difficult to push down than the other?
- Do you need to use the same length of rope and amount of effort to lift yourself up with each seat? How much rope passes through your hands? Does it take much effort to pull the rope and lift up one seat more than another?

Imagination Factory Exhibit Name	Exhibit Description	Key Themes	Subject Areas
Amazing Air	A team of people use pneumatic pistons and problem solving skills to roll a ball through the tilting maze. Pneumatic pistons use air to lift and lower heavy things.	physics, mechanics, machines, pneumatics, pistons, air, pressure, force, area	Physics – air pressure & fluid mechanics (hydraulics & aerodynamics) Technology
Crack the Cam Lock	Turn the dial to line up notches in three cams and open the safe door. This models how cams are used in certain kinds of locks.	physics, mechanics, machines, cams, locks, camshaft	Technology
Crank the Engine	Turn the handle and watch as pistons move up and down inside cylinders to turn the engine's crankshaft below. Pistons and crankshafts interact within car engines to create movement in a car.	physics, mechanics, machines, cams, crankshaft, camshaft, force, speed, pistons, engine, car	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology
Diff with a Difference	Turn a handle and observe how separate gears and axles turn car wheels at different speeds. Try holding one wheel still and keep turning the handle to observe how the second wheel responds. This shows how simple machines work together to steer a car.	physics, mechanics, machines, cams, crankshaft, camshaft, force, speed, wheels, car, steering	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology
Dynamo	Spin a magnet past an iron bar wrapped in copper wire to generate an electric field and illuminate lights on a meter. This model dynamo shows one way of generating an electrical field.	physics, mechanics, electricity, magnets, electromagnet, dynamo, generate, generator, power, energy	Physics – electricity & magnetism Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology
Electric Face	Use different generators (batteries, power pack, solar cell or hand crank) to animate a cartoon face.	physics, mechanics, electricity, circuit, field, battery, energy	Physics – electricity & magnetism Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology

Imagination Factory Exhibit Name	Exhibit Description	Key Themes	Subject Areas
Gear Race	Combine small, medium and large gears and turn a handle to race a toy camel and a toy horse along a track. Different sized gears can be used to magnify force or distance (speed) as mechanical advantage.	physics, mechanics, machines, gears, force, speed, ratio	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology
Go Go Gears	Interlock rows of different sized gears and make an illusion disc spin. Different sized gears can be used to magnify force or distance (speed) as mechanical advantage.	physics, mechanics, machines, gears, force, speed, ratio	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology
Levels of Levers	Push or lift each lever to assess whether you need to use more or less effort, or you need to shift the lever more to lift the load. Different 'orders' or classes of levers have their fulcrum and load located in different positions relative to where effort is being used to work the lever.	physics, mechanics, machines, levers, force, distance, class, order, effort, fulcrum, load, first-class, second-class, third-class, first order, second order, third order	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology
Lifting with Levers	Lift a friend off the ground using a giant lever and compare how much effort is needed at each point along the lever arm.	physics, mechanics, machines, levers, force, distance, effort, fulcrum, giant	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology
Manipulator	Move the joysticks to move the mechanical hand and arm. Factory machinery use simple machines such as pistons to move mechanical arms and perform work.	physics, mechanics, machines, pneumatics, hydraulics, pistons, air, pressure, force, area	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Physics – air pressure & fluid mechanics (hydraulics & aerodynamics) Technology

Imagination Factory Exhibit Name	Exhibit Description	Key Themes	Subject Areas
Pascal's See Saw	Push down the narrow piston and watch how the attached, wider piston moves, due to transferred pressure and force over an area. Changing the area or the pressure increases or decreases the force and the amount of work that can be done.	physics, mechanics, machines, pneumatics, hydraulics, pistons, air, pressure, force, area	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Physics – air pressure & fluid mechanics (hydraulics & aerodynamics) Technology
Play with Pulleys	Connect cassettes containing different sized pulleys to broadcast a song, or make a cartoon pelican fly. The size and combination of pulleys determines how fast they (and things that are attached) will spin.	pulleys, size ratio, effort, speed,	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology
Pulley Power	Seats with 5 or 7 pulleys allow people to sit in the seats and lift themselves off the ground and compare how much effort and rope was required. Pulleys may be arranged in block and tackle formats to lift heavy objects with less effort.	pulleys, size ratio, block and tackle, distance, effort, height	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology
Pump it Up	One narrow and one wide piston are pumped up to lift masses to a certain height. These show how pressure applied over an area generates a force that can do work. Changing the area or the pressure increases or decreases the force.	physics, air, pressure, force, area, pneumatic, pistons, maze, team work,	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Physics – air pressure & fluid mechanics (hydraulics & aerodynamics) Technology
Rock, Paper, Switches	Two people press switches to complete an electric circuit and illuminate a rock, paper or scissors icon as part of this traditional game. The game can only be played when an electric field is generated within a closed circuit.	physics, electricity, circuit, game, field, closed circuit	Physics – electricity & magnetism Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology

Imagination Factory Exhibit Name	Exhibit Description	Key Themes	Subject Areas
Topple Table	Children under 6 years build with wooden blocks on a fixed or unstable tabletop and experiment with centre of mass.	early childhood, centre of mass, problem solving, open ended, early childhood, tot spot, building, wooden blocks	Physics – forces & motion (inertia, gravity, push, pull, acceleration)
Toying with Cams	A toy caterpillar and toy dog have rods attached to parts of their body, so different camshafts make them 'jump' or 'wiggle' in different ways. This demonstrates how different shaped cam discs can influence the pattern and timing of how other things move.	physics, mechanics, machines, cams, crankshaft, camshaft, force, speed	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology
Wall Maze	Attached tubes along a wall and roll a ball through the tubes. This exhibit encourages problem solving and open ended play, using processes similar to scientific enquiry.	problem solving, open ended, early childhood, tot spot, building, ball run, maze	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology
Weights and Wheels	Wheels spin differently depending on whether their mass is distributed around the rim, the centre, or evenly across the whole wheel. A wheel's rotational inertia changes when its mass is mostly located near the centre or near the rim.	physics, mechanics, machines, wheels, mass, rotational inertia, flywheels	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology
Wheel Racer	Roll sets of tapered wheels along a track to demonstrate how train wheels roll along train tracks. The shape of wheels determines how well they follow different shaped tracks.	physics, mechanics, machines, wheels, track, rolling, circumference, rim	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Technology

Australian Curriculum Links

Imagination Factory exhibits link to the Australian National Science Curriculum (particularly Science Inquiry Skills across all school years).

Foundation

Physical sciences (ACSSU005) The way objects move depends on a variety of factors, including their size and shape

Year 1

Physical sciences (ACSSU020) Light and sound are produced by a range of sources and can be sensed

Questioning and predicting (AC SIS024) Respond to and pose questions, and make predictions about familiar objects and events

Questioning and predicting (AC SIS025) Participate in different types of guided investigations to explore and answer questions, such as manipulating materials, testing ideas and accessing information sources

Questioning and predicting (AC SIS026) Use informal measurements in the collection and recording of observations, with the assistance of digital technologies as appropriate

Year 2

Physical sciences (ACSSU033) A push or pull affects how an object moves or changes shape

Questioning and predicting (AC SIS037) Respond to and pose questions, and make predictions about familiar objects and events

Planning and conducting (AC SIS038) Participate in different types of guided investigations to explore and answer questions, such as manipulating materials, testing ideas and accessing information sources

Planning and conducting (AC SIS039) Use informal measurements in the collection and recording of observations, with the assistance of digital technologies as appropriate

Nature and development of science (AC SHE034) Science involves asking questions about, and describing changes in, objects and events

Year 3

Questioning and predicting (AC SIS053) With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge

Planning and conducting (AC SIS054) Suggest ways to plan and conduct investigations to find answers to questions

Planning and conducting (AC SIS055) Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate

Year 4

Physical sciences (ACSSU076) Forces can be exerted by one object on another through direct contact or from a distance

Questioning and predicting (AC SIS064) With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge

Planning and conducting (AC SIS065) Suggest ways to plan and conduct investigations to find answers to questions

Planning and conducting (AC SIS066) Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate

Year 6

Physical sciences (AC SSU097) Electrical circuits provide a means of transferring and transforming electricity

Physical sciences (AC SSU219) Energy from a variety of sources can be used to generate electricity

Nature and development of science (AC SHE099) Important contributions to the advancement of science have been made by people from a range of cultures

Use and influence of science (AC SHE100) Scientific understandings, discoveries and inventions are used to solve problems that directly affect peoples' lives

Planning and conducting (AC SIS103) With guidance, select appropriate investigation methods to answer questions or solve problems

Questioning and predicting (AC SIS232) With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be

Year 7

Physical sciences (AC SSU117) Change to an object's motion is caused by unbalanced forces acting on the object

Physical sciences (AC SSU118) Earth's gravity pulls objects towards the centre of the Earth

Planning and conducting (AC SIS125) Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed

Use and influence of science (AC SHE120) Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations

Year 8

Planning and conducting (AC SIS140) Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed

Use and influence of science (ACSHE135) Science and technology contribute to finding solutions to a range of contemporary issues these solutions may impact on other areas of society and involve ethical considerations

Physical sciences (ACSSU155) Energy appears in different forms including movement (kinetic energy), heat and potential energy and causes change within systems

Year 9

Use and influence of science (ACSHE161) Advances in science and emerging sciences and technologies can significantly affect people's lives, including generating new career opportunities

Use and influence of science (ACSHE228) The values and needs of contemporary society can influence the focus of scientific research

Year 10

Use and influence of science (ACSHE195) Advances in science and emerging sciences and technologies can significantly affect people's lives, including generating new career opportunities

Use and influence of science (ACSHE230) The values and needs of contemporary society can influence the focus of scientific research