



Australian Government



***Excite@Q* Exhibit Themes, Descriptions and Curriculum Links**

Questacon's *Excite@Q* exhibition in Gallery 7 (based in Canberra), contains hands-on exhibits suitable for visitors aged 8 years through to adults. Each exhibit offers a highly sensory experience of spectacular physical phenomena. To ensure visitor safety, physical restrictions apply to some exhibits. These restrictions make some exhibits unsuitable for younger visitors, or visitors who have certain health issues. The Whoosh exhibit is suitable for younger visitors, but overall, *Excite@Q* is more appropriate for older visitors.

This document lists *Excite@Q* exhibit names, descriptions, key themes and subject areas as well as how *Excite@Q* links to the Australian Curriculum: Science.

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.

- Do you make a better vortex on the Jellyfish Vortex by yourself or by working with other people? Have you seen a vortex back home?
- Check your heart rate (on *the* Heart Rate exhibit) before and after you *use* Free Fall.
- Does an adult have quicker reflexes than a child? When do fast reflexes or reaction times come in handy?
- Can you design a four-person air hockey game? What rules will you play by?
- Can you play Jingle Bells on OptiMusic?
- How does the robot's computer 'know' where the puck is located on the air hockey table?
- Which materials let you hide from human view, but not from the thermal camera? How would fire fighters or an industrial factory use this camera?

Excite@Q Exhibit Name	Exhibit Description	Key Themes	Subject Areas
Art Machine	<p>Draw, splatter and spin digital paint around a touch screen to create your own virtual artwork.</p> <p>This touch screen demonstrates how digital technology can be used creatively to generate works of art.</p>	science-art, digital, multimedia, colour addition, colour mixing, technology	Culture – visual arts Technology
Batak	<p>Tap lights as soon as you see them glow and check your score at the end of the session.</p> <p>As well as testing your reaction time (how long it takes your nervous system to register seeing each light, then reaching and tapping a light with your hand), this exhibit shows how peripheral vision compares to direct vision in detecting movement.</p>	reaction time, response rate, nervous system, vision, peripheral vision, movement, homeostasis	Biology – human psychology & behaviour Biology – human body (physiology) Technology
Cross Hockey	<p>One to four players can create their own air hockey game on this exhibit. A spinning shape in the centre challenges you to bounce the puck off the spinning shape, or time your moves so the puck whizzes past the shape.</p> <p>You need to consider the shape's rotating speed and angles of reflection when the puck strikes the shape.</p>	collision, reflection, momentum, rebound, friction, judgement, timing, team work,	Physics – air pressure & fluid mechanics (hydraulics & aerodynamics) Physics – forces & motion (inertia, gravity, push, pull, acceleration) Mathematics – geometry and topology Biology – human psychology & behaviour
Disgustoscope	<p>Look into the tunnel of mirrors to see a strange image of your hair and face magnified against a backdrop of earthworms!</p> <p>LEDs (Light Emitting Diodes) that line the mirrored tunnel seem to reflect into infinity, becoming duller as the reflections continue. The appearance of your flesh within the infinite reflections can create an odd image of a 'new' living mass!</p>	light, reflection, angles, infinity, absorption, kaleidoscope, psychology	Physics – optics (visible light) Biology – human psychology & behaviour Biology – human body (physiology)

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Free Fall	<p>Hang from the top of a 6 metre high slide, then let go to slip down the slide.</p> <p>Free Fall gives you a small taste of zero gravity (weightlessness) and the fear response.</p>	gravity, zero gravity, weightlessness, acceleration, falling, fear response, slide, heart rate, adrenalin	<p>Biology – human psychology & behaviour</p> <p>Biology – human body (physiology)</p> <p>Physics – forces & motion (inertia, gravity, push, pull, acceleration)</p>
Heart Rate	<p>Hold the bar to see and hear your heart beat played on a bass drum.</p> <p>Sensors in the bar detect tiny electrical signals from arterial nerves in your hands. When your heart beats faster, the nerves respond and the bar's sensors filter and amplify your nerve signals as electrical signals within an electronic circuit to beat the drum.</p>	heart rate, pulse, nerves, fear electrophysiology, response, adrenalin, homeostasis	<p>Biology – human body (physiology)</p> <p>Technology</p>
Jellyfish Vortex	<p>Make ribbons on the ceiling curl and sway like jellyfish tentacles, using the simple power of mist and air pressure.</p> <p>Pushing down on the vortex generator's collar creates a large, toroidal air-mist vortex, which floats towards the ceiling due to changing air pressure and friction. The toroidal vortex has enough force to bend the ribbons hanging from the ceiling.</p>	air pressure, vortex, toroid, doughnut vortex, floatation, fluid, force	Physics – air pressure & fluid mechanics (hydraulics & aerodynamics)
OptiMusic	<p>Compose a musical masterpiece using lights, sensors and your waving hands and feet.</p> <p>This <i>OptiMusic</i> exhibit uses beams of light, sensors and a computer to generate sounds. Light beams shine down from the ceiling and hit reflector discs on the floor, so the light is reflected back up to sensors on the ceiling. When a light beam is blocked by your hand, light cannot be reflected back up to the</p>	light, sound, music, sensors, programming, reflectors, software, technology	<p>Physics – optics (visible light)</p> <p>Physics – acoustics (sound)</p> <p>Culture – music</p>

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	sensors and a switch is activated by a software program to broadcast different sounds.		
Robot Hockey	<p>Pit your human reaction times and hand-eye co-ordination skills in a game of air hockey against the robotic arm.</p> <p>An industrial robotic arm uses a high speed digital camera and software algorithms to calculate the position and speed of the moving puck to plan its movements. Game statistics and the robot's 'vision' and programming can be viewed on three separate screens.</p>	robot, technology, reflector, sensor, response, programming, logic, algorithms, statistics, friction, artificial vision, reaction time	<p>Physics – optics (visible light)</p> <p>Biology – human psychology & behaviour</p> <p>Biology – human body (physiology)</p> <p>Technology</p>
Rototron	Walk through the tunnel of moving LEDs and try to keep to a straight line. You may lose your balance or feel dizzy inside the Rototron tunnel, because of conflicting sensory messages. Your visual system (eyes and visual cortex) see the LEDs moving, but receptors inside your joints and inner ears feel that the ground is stable and level.	light, reflection, infinity, balance, vision, sensory, dizzy, proprioceptors, visual system,	<p>Physics – optics (visible light)</p> <p>Biology – human psychology & behaviour</p> <p>Biology – human body (physiology)</p> <p>Technology</p>
Superplexus	<p>Challenge yourself to complete this 3d puzzle labyrinth. Superplexus has colour coded levels of difficulty for various skill levels.</p> <p>Superplexus builds problem solving and spatial intelligence skills as users negotiate a ball through the maze by moving the sphere in three dimensions.</p>	Inertia and momentum, push and pull, forces, gravity, kinetic energy	Physics/ Physical sciences – push and pull, forces, gravity, kinetic energy
Thermal Camera	<p>Stand behind different panels to discover which material allows you to hide from human view, but still be seen by the thermal camera.</p> <p>The thermal camera detects IR (infrared) radiation that your eyes cannot see. IR is emitted by all</p>	thermal, infrared, heat, radiation, materials, properties, spectrum	<p>Physics – EM radiation (radio, infrared, UV, X-rays)</p> <p>Physics – thermodynamics (heat)</p> <p>Biology – human body (physiology)</p>

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	objects, more so at higher temperatures. The panels are either transparent to light, or transparent to IR.		
Whoosh	<p>Push a scarf into an inlet and watch the scarf fly through a network of connected tubes. This exhibit is attractive to pre-school aged children as well as older visitors.</p> <p>A fan pumps air through the tubes, so the scarf is carried by the force of air pressure. When the scarf is ejected into mid-air, it floats down gracefully like a parachute, due to its surface area creating drag.</p>	air pressure, acceleration, weight, Bernoulli, gravity, floatation, drag, aerodynamics	Physics – air pressure & fluid mechanics (hydraulics & aerodynamics)
Wobbly Wheel	<p>Turn a wheel on the mezzanine to roll a wheel along a tight rope suspended above the gallery.</p> <p>The centre of mass of an object wants to be as low as possible. Wobbly Wheel's weighted arms hang from the sides and bring the centre of mass below the wire so it won't fall off. It acts more like a hook on a wire than a wheel sitting on top.</p>	Centre of mass, mass vs weight, rotational inertia	Physics – mass, weight & forces (gravity)

Australian Curriculum Links

Excite@Q exhibits link to the Australian National Science Curriculum. Core links indicate content that is directly covered within the exhibition, while optional links indicate content that is dependent on how people use and facilitate various exhibits.

Foundation core links

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

Nature and development of science (ACSHE013) Science involves exploring and observing the world using the senses

Planning and conducting (ACSIS011) Explore and make observations by using the senses

Foundation optional link

Chemical sciences (ACSSU003) Objects are made of materials that have observable properties

Year 1 core link

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

Year 1 optional links

Nature and development of science (ACSHE021) Science involves asking questions about, and describing changes in, objects and events

Planning and conducting (ACSIS025) 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 (ACSIS026) Use informal measurements in the collection and recording of observations, with the assistance of digital technologies as appropriate

Year 2 core link

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

Year 2 optional links

Questioning and predicting (ACSIS037) Respond to and pose questions, and make predictions about familiar objects and events

Planning and conducting (ACSIS039) Use informal measurements in the collection and recording of observations, with the assistance of digital technologies as appropriate

Year 3 core link

Physical sciences (ACSSU049) Heat can be produced in many ways and can move from one object to another

Year 3 optional link

Questioning and predicting (ACSIS053) With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge

Year 4 core link

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

Year 4 optional links

Nature and development of science (ACSHE061) Science involves making predictions and describing patterns and relationships

Questioning and predicting (ACSIS064) With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge

Year 5 core link

Physical science (ACSSU080) Light from a source forms shadows and can be absorbed, reflected and refracted

Year 5 optional link

Nature and development of science (ACSHE081) Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena

Year 6 optional link

Nature and development of science (ACSHE098) Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena

Year 7 core link links

Physical sciences (ACSSU117) Change to an object's motion is caused by unbalanced forces acting on the object

Physical sciences (ACSSU118) Earth's gravity pulls objects towards the centre of the Earth

Year 7 optional links

Use and influence of science (ACSIS124) People use understanding and skills from across the disciplines of science in their occupations

Year 8 core links

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

Year 8 optional links

Biological sciences (ACSSU150) Multi-cellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce

Chemical sciences (ACSSU151) The properties of the different states of matter can be explained in terms of the motion and arrangement of particles

Questioning and predicting (AC SIS139) Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge

Year 9 core links

Biological sciences (ACSSU175) Multi-cellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment

Physical sciences (ACSSU182) Energy transfer through different mediums can be explained using wave and particle models

Year 10 core link

Physical sciences (ACSSU190) Energy conservation in a system can be explained by describing energy transfers and transformations

Physical sciences (ACSSU229) The motion of objects can be described and predicted using the laws of physics

Senior Secondary Years: Physics

Unit 1: Thermal, nuclear and electrical physics

Science Understanding

- Heat transfer occurs between and within systems by conduction, convection and/or radiation

Unit 2: Linear Motion and Waves

Science Understanding

- Uniformly accelerated motion is described in terms of relationships between measurable scalar and vector quantities, including displacement, speed, velocity and acceleration
- Vertical motion is analysed by assuming the acceleration due to gravity is constant near the Earth's surface
- Newton's Three laws of motion describe the relationship between the force or forces acting on an object, modelled as a point mass, and the motion of the object due to the application of the force or forces
- Momentum is a property of moving objects, it is conserved in a closed system and may be transferred from one object to another when a force acts over a time interval
- Collisions may be elastic and inelastic kinetic energy is conserved in elastic collisions
- A ray model of light may be used to describe reflection, refraction and image formation from lenses and mirrors

Unit 3: Gravity and Electromagnetism

Science Understanding

- The movement of free-falling bodies in Earth's gravitational field is predictable
- When an object experiences a net force of constant magnitude perpendicular to its velocity, it will undergo uniform circulation motion, including circular motion on a horizontal plane and around a banked track

Senior Secondary Years: Biology

Unit 4: Maintaining the internal environment

Science Understanding: Homeostasis

- Homeostasis involves a stimulus-response model in which change in external or internal environmental conditions is detected and appropriate response occur via negative feedback in vertebrates, receptors and effectors are linked via a control centre by nervous and/or hormonal pathways
- Hormones alter the metabolism of target cells, tissues or organs by increasing or decreasing their activity, in animals, most hormones are produced in endocrine glands as result of nervous or chemical stimulation, and travel via the circulatory or lump system to the target cells, tissues or organs