Science on the Move Exhibit Themes, Descriptions and Curriculum Links

Questacon's travelling exhibition *Science on the Move* is mainly targeted at visitors aged 8 to 14 years, but can be enjoyed by people of all ages. This document lists *Science on the Move* exhibit names, descriptions, key themes and subject areas, as well as how *Science on the Move* links to the Australian National Science Curriculum.

Science on the Move's 35 exhibits explore principles of light, music, sound, human biology, force, motion, ecology, the environment, electricity and magnetism.

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 your fingers always meet at the same point on the stick and the broomstick? Where would your fingers meet if you were balancing a golf club or a billiard cue?
- Is it easier to balance the stick when the ball is in your hand, or up in the air? Try it with your eyes closed or on your fingertip.
- Do you see the same picture through each filter? If we used a yellow filter, what would we see in the picture?
- Which shape will win a rolling race—the ring, the disc or the ball?
- Count how many times the other gears turn for each time the gear you are spinning turns once. Do the other gears spin at the same speed as the one you are spinning?
- Hold up two polaroid filters, one behind the other. Look through both filters. What do you see? Rotate the filters. What do you notice now?
- If we keep repeating the reaction timer test, does your score improve or stay the same? Does everyone have the same reaction time?
- Which *Thongaphone* tube creates the highest pitch note? Which tube creates the lowest pitch note? How are these tubes different?

Science on the Move Exhibit Name	Exhibit Description	Key Themes	Subject Areas
Balancing Broom	Determine the balance point of different shaped rods and everyday items like a broom. The balance point of an object depends on how its mass is distributed around a certain point.	physics, balance, centre of mass, balance point, centre of gravity	Physics – forces & motion (inertia, gravity, push, pull, acceleration)
Balancing Nails	Try to balance six loose sticks in mid-air on top of a seventh, upright stick. Balance points and a low centre of mass allow odd-shaped structures to balance, including house roofs built without nails.	physics, balance, centre of mass, balance point, centre of gravity	Physics – forces & motion (inertia, gravity, push, pull, acceleration) Mathematics – puzzles & number tricks
Ball on a Stick	Balance the stick-and-ball, with the ball-end either in the palm of your hand, or in mid-air. Rotational inertia and hand-eye coordination make it easier to hold a stick-and-ball a certain way.	physics, balance, rotational inertia	Physics – forces & motion (inertia, gravity, push, pull, acceleration)
Chaotic Pendulum	A pendulum is set swinging in motion, but its movement is anything but regular and predictable Magnets change the motion of a swinging pendulum, creating chaotic motion.	physics, magnetism, pendulum, chaos, patterns	Physics – electricity & magnetism Physics – forces & motion (inertia, gravity, push, pull, acceleration)
Coloured Filters	View a picture through red, green or blue filters. Depending on the filter colour, different parts of a coloured picture can be seen due to absorption and transmission of colours and the composition of light.	physics, optics, colour, light, absorb, reflect	Physics – optics (visible light)
Downhill Race	Conduct a race down a slope between a flat disc, a thick ring and a ball. These shapes are all the same mass, but differences in the distribution of their mass causes one of the shapes to win the race each time.	physics, rotational inertia, gravity, race, rolling, speed	Physics – forces & motion (inertia, gravity, push, pull, acceleration)
Food Chain Puzzle	Complete the puzzle to model how food chains are structured. Simple food chains have more organisms at the bottom of the food chain, compared to the top of the food chain.	biology, ecology, food chain, animals, predator, omnivore, herbivore, carnivore	Biology – ecology (plant & animal populations, food webs)

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Gear Table	Place gears of different size and with different numbers of teeth in a row and turn one wheel to watch how the gears turn. Gears transfer force and motion and are important devices in machines such as cars, tractors and bicycles.	physics, mechanics, gears, force, effort, speed	Technology Physics – forces & motion (inertia, gravity, push, pull, acceleration)
Get Unknotted	Biologists use knot theory to understand how DNA duplicates itself, while being so tangled and knotted. A spatial puzzle where a looped rope must be threaded over and around two metal pieces.	mathematics, topology, problem solving, visuo-spatial, puzzle	Mathematics – puzzles & number tricks Mathematics – geometry & topology
Hand Battery	Place your hands on different metal plates to complete an electrical circuit and generate an electric field, as indicated on a meter. Also observe the different conductive properties of aluminium and copper.	physics, electricity, battery, circuit,	Physics – electricity & magnetism
Handcuffs	Two people are connected by two interlocking sets of handcuffs. The challenge is to separate the link without taking the handcuffs off their wrist in this fun demonstration of the mathematics of topology.	mathematics, topology, problem solving, visuo-spatial, puzzle	Mathematics – puzzles & number tricks Mathematics – geometry & topology
Loop the Loop	In this spatial puzzle, a looped rope must be threaded over and around two metal pieces. Studying knots is a branch of mathematics which has many medical and industrial applications.	mathematics, topology, problem solving, visuo-spatial, puzzle	Mathematics – puzzles & number tricks Mathematics – geometry & topology
Musical Bottles	Vibrations in different volumes of air create the pitch of musical notes in musical instruments. A row of bottles filled with different volumes of water and air can be tapped to produce different pitched sounds.	physics, acoustics, music,	Physics – acoustics (sound)
Ocean Diver	Squeeze and release the water bottle containing a ‘diver’ and cause the diver to sink or float. Objects float or sink in water due to density and buoyancy. This relates to the way fish, whales and submarines control their depth in water.	physics, density, buoyancy, sink, float	Physics – air pressure & fluid mechanics (hydraulics & aerodynamics)

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Packing Parcels	Nine regular, but different sized boxes can all fit perfectly into one big box, but they must be packed carefully to do so. This puzzle demonstrates the efficient use of space and packing and also relates to the shape of solid matter.	mathematics, problem solving, visuo-spatial, puzzle, space, packing, arrangement, spheres	Mathematics – puzzles & number tricks Mathematics – geometry & topology
Pig Pen	Make four separate pig pens with one pig in each pen then use the same fence pieces to house three pigs in one pen and one pig in another pen. This spatial puzzle utilises mathematics and counting.	mathematics, problem solving, visuo-spatial, puzzle, space, arrangement	Mathematics – puzzles & number tricks
Thongaphone	Hit pipes of varying lengths with a rubber 'thong' and play a tune. Changes in sound pitch can be created by air vibrating in different lengths of pipe.	physics, acoustics, sound, vibrations	Physics – acoustics (sound)
Tornado	Two soft drink bottles filled with water are connected by a plastic tube. The challenge is to transfer water from one bottle to another in the most efficient way. A vortex (miniature tornado) is the most efficient method to transfer water between bottles.	physics, fluid, vortex, tornado	Physics – air pressure & fluid mechanics (hydraulics & aerodynamics)
Weight on Different Planets	Lift apparently identical blocks to gauge how light or heavy each block feels. This represents how heavy the blocks would feel on other planets in the solar system, due to gravitational force. The difference between mass and weight (a force) and how weight can change depending on gravitational force on different planets.	physics, mass, weight, force, Newtons, gravity, planets, physiology, muscles	Physics – forces & motion (inertia, gravity, push, pull, acceleration)

Frame 1 - Sound

Science on the Move Exhibit Name	Exhibit Description	Key Themes	Subject Areas
Catching Sounds	Hold different sized funnels up to the ear and listen for the difference in loudness of room noises. A funnel collects sound waves and concentrates them into the ear, so noise seem to grow louder.	physics, acoustics, hearing, sound, vibrations, waves, deaf, listen	Physics – acoustics (sound)
Separating Sounds	Hold different lengths of tubing to the ear and hear different sounds through each tube (similar to listening to the 'sea' in a sea shell). Different lengths of tubing separate some of the different sounds.	physics, acoustics, hearing, sound, vibrations, listen, pitch, frequency	Physics – acoustics (sound)
Stereo Sounds	Specially designed headphones are used to channel sound separately to each ear, while a second person taps somewhere on the headphones. Vibrations travel through air and solids and can be heard and located by the human ear and brain.	physics, acoustics, frequency, vibrations, physiology, hearing	Physics – acoustics (sound)
String Telephones	Two cans connected by string can be used as a low-tech telephone to pass messages between two people. Sound travels better in solids that in air, so the string telephone allows sound to travel further than in air.	physics, acoustics, sound, vibrations	Physics – acoustics (sound)

Frames 2 and 3 - Light

Science on the Move Exhibit Name	Exhibit Description	Key Themes	Subject Areas
Corner Reflectors	When looking into a corner reflector mirror, you can always see your reflection in the centre of the three mirrors. Corner reflectors (found in road reflectors), reflect light back to its source.	physics, optics, light, reflection, mirror	Physics – optics (visible light)

Science on the Move Exhibit Name	Exhibit Description	Key Themes	Subject Areas
Moiré Patterns	Look through sets of circular lines printed on clear plastic and see a new and unexpected range of Moiré patterns. Moiré patterns are formed when two patterns partly overlap, causing new patterns to emerge.	physics, optics, light, refraction, illusion, vision, interference	Physics – optics (visible light)
Polarised Light	Rotate one Polaroid filter in front of another to filter light at different angles and create the effect of Polaroid sunglasses. Light has a wave form and polarising filters can be used to block or pass light at different angles.	physics, optics, light, polaroid, polarise, vision	Physics – optics (visible light)
Seeing Around Corners	Look into special periscopes and see the top of your own head, or perhaps into your own ear! The way mirrors reflect light can be useful in optical instruments such as periscopes.	physics, optics, light, reflection, mirror	Physics – optics (visible light)
Kaleidoscope	Look down a Kaleidoscope tube to see a range of patterns and colours. Different sized and angled mirrors in a tube reflect light to produce a variety of images and patterns.	physics, optics, light, reflection, mirror, kaleidoscope	Physics – optics (visible light)
Lighthouse Lens	Look through a Fresnel lens, which is used in lighthouses, traffic lights and brake lights. Lenses are curved transparent objects which bend or refract light to make things look larger or smaller.	physics, optics, light, refraction, Fresnel, lens,	Physics – optics (visible light)
Seeing to Infinity	Look into a hole to see multiple reflections between two facing mirrors and notice how the reflections gradually become duller..	physics, optics, light, reflection, mirror	Physics – optics (visible light) Biology – human psychology & behaviour
Stereo Vision	Look into the peep hole, which contains two copies of an image from slightly different angles. The human brain combines these images to “see” a three dimensional image. Stereovision in humans allows us to see in three dimensions.	psychology, vision, stereovision, 3D, stereo	Physics – optics (visible light)

Frame 4 – Human Biology

Science on the Move Exhibit Name	Exhibit Description	Key Themes	Subject Areas
Coloured Words	Read out the words (‘colour word’), then the ink colour used to print each word. The human brain receives and processes information differently, which can create confusion!	psychology, perception, language	Biology – human psychology & behaviour
Fitness Test	Complete the fitness step test in a certain time to measure your pulse rate and work out your aerobic fitness.	biology, physiology, fitness, human, heart, exercise	
Illusions	Various visual illusions are printed on a banner along with things to notice about the illusion. The way the brain interprets optical illusions can give scientists insight into how the brain works.	psychology, perception, vision, illusion	Biology – human psychology & behaviour
Reaction Timer	One person holds a reaction timer stick and drops it without warning, while a second person catches the stick and notes their reaction time printed on the side of the stick. Reaction time is how long it takes the brain to receive and process visual signals before co-ordinating muscle movements.	biology, physiology, fitness, human, reaction, nerves, nervous	Biology – human psychology & behaviour

Australian Curriculum Links

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

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

Year 1 core links

Chemical sciences (ACSSU018) Everyday materials can be physically changed in a variety of ways

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

Year 1 optional link

Evaluating (ACSIS213) Compare observations with those of others

Year 2 core link

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

Year 2 optional links

Nature and development of science (ACSHE034) Science involves asking questions about, and describing changes in, objects and events

Use and influence of science (ACSHE035) People use science in their daily lives, including when caring for their environment and living things

Year 3 optional link

Nature and development of science (ACSHE050) Science involves making predictions and describing patterns and relationships

Year 4 core links

Biological sciences (ACSSU073) Living things, including plants and animals, depend on each other and the environment to survive

Chemical sciences (ACSSU074) Natural and processed materials have a range of physical properties; These properties can influence their use

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

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

Year 4 optional link

Measurement and Geometry (ACMMG142) Investigate combinations of translations, reflections and rotations, with and without the use of digital technologies

Year 5 core links

Chemical sciences (ACSSU077) Solids, liquids and gases have different observable properties and behave in different ways

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

Year 7 core links

Biological sciences (ACSSU112) Interactions between organisms can be described in terms of food chains and food webs; human activity can affect these interactions

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 9 core link

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