

Greenhouse gas from the General?

Mission title:	Greenhouse gas from the General?
QCA scheme of work:	Unit 3B Helping plants grow well
Resources:	Investigation sheet, small plants (minimum of two per pupil/group), two-litre clean, plastic soft-drink bottles (minimum of one per pupil/group), scissors, ruler, graph paper, unhealthy plant (or picture of one)
Class organisation:	Individual/group/class.

Knowledge review

Plants need water, light, warmth and nutrients to grow well. Greenhouses help plants grow faster because they protect plants from cooler temperatures. Plants need watering more frequently because the warmer temperature evaporates water faster. In warm weather it is necessary to have ventilation in the greenhouse, and many greenhouses use fans to help the air circulate.

Plants cultivated under 24-hour light grow faster.

Introducing the mission

Show the children a plant not growing well (or a picture of one). Brainstorm ways to help plants grow better. Explain that they will be finding ways to improve plant growth.

Teacher's notes

- This test will take a few days while plant growth is recorded.
- Care should be taken when cutting the bottles.
- Consider the security implications of leaving a light on for 24 hours.
- Children may, rarely, be allergic to some plants. Check with 'Be Safe!' from the ASE (ISBN 0 86357 324 X) for common plant allergies.

Further extension for children

- Can a plant grow without soil?
- How can we test which type of plant grows best?

Useful websites

http://www.bbc.co.uk/schools/scienceclips/ages/7_8/plants_grow.shtml

Towel trouble for Bazza

Mission title:	Towel trouble for Bazza
QCA scheme of work:	Unit 3C Characteristics of materials
Resources:	Paper towels, investigation sheets, water, containers, a variety of coloured pens, calculators
Class organisation:	Individual/group/class.

Knowledge review

Chromatography is a method of separating mixtures of chemicals. The mixtures are positioned to allow a solvent to soak them. The molecules in the mixture are different sizes and have different solubility. This means that the chemicals travel at different speeds when they are pulled along the paper by the solvent.

Chromatography can be used to identify different inks. Inks are made of different pigments (colours). In chromatography, the ink is soaked in a solvent (water, in this case) and the different pigments separate and the colours that make up the ink are shown. Many common inks are water-soluble. Permanent inks may need a different solvent to separate the pigments.

Introducing the mission

List all the things used to dry wet areas. Discuss why we use these things. Explain that the children are going to investigate which paper towels are best.

Teacher's notes

- This test is easier if the containers are wider than the paper towels.
- A variety of makes and quality of paper towels are needed.
- This test needs to be in a wet area or outside.
- Place a tray on each table for wet paper towels.
- In the chromatography test, the pen mark should be above the water.

Further extension for children

- Test whether all black pens have the same colour in their inks.
- Investigate the uses of chromatography.
- Produce a leaflet advising people which paper towels to buy and why, using your scientific findings from the investigation.

Useful websites

http://www.exploratorium.edu/science_explorer/black_magic.html
<http://www.itsjustabox.com/Sciencefair.htm>

Shape up and get strong!

Mission title:	Shape up and get strong!
QCA scheme of work:	Unit 3C Characteristics of materials
Resources:	Lunchbox, bike (or picture of one), thin plastic cups, scissors, scrap paper, thin elastic bands, books (any), paper
Class organisation:	Individual/group/class.

Knowledge review

Flat surfaces generally cannot bear as much weight (or stress) as faceted surfaces. High-stability folds support extra weight. A series of parallel folds will make a series of triangles. The strongest shape is a triangle. Triangles are used frequently in construction. Making different shapes out of rods gives a clear demonstration of how rigid a triangle is compared with other shapes. This is because a triangle keeps its shape under stress while other shapes tend to move. Corrugated iron and cardboard are so strong because they have a series of triangles built in to them.

Paper is flexible. Folding and creasing paper makes it more rigid. Folded paper is strong along the direction of the fold. Folds create polygonal facets, which reduce flexibility and create stability but if folds intersect then a weak point is created. When paper is folded its slenderness ratio is reduced. The larger the slenderness ratio, the weaker the paper will be. The slenderness ratio is basically the length of the paper divided by its minimum width. Creases and folds increase the width of a material.

Introducing the mission

Discuss what is strong and why it is strong. Explain that the children are going to find out how to make materials stronger.

Teacher's notes

- Allow at least three sheets of scrap paper per pupil.
- Allow one plastic cup per child.
- Care needs to be taken cutting the plastic cups.

Further extension for children

- Investigate car-body design
- Find buildings that use triangles in their construction.

Useful websites

http://www.teachersdomain.org/K-2/sci/engin/materials/subtopic_materials.html

Rock for ever!

Mission title:	Rock for ever!
QCA scheme of work:	Unit 3D Rocks and soils
Resources:	Pebbles (optional), small pieces of chalk, marble and limestone, water, vinegar, plastic bottle, access to freezer
Class organisation:	Individual/group/class.

Knowledge review

Chemical weathering

All rain is slightly acidic because carbon dioxide that is naturally in the air dissolves in the rainwater and produces a weak acid, giving rainfall a pH of about 5.5 – neutral pH (no acidity) is 7. Acid rain occurs when there are pollutants, such as those from fossil fuels in the air (e.g. sulphur dioxide). These pollutants produce a stronger acid, with a pH of about 4.

Limestone reacts with acid, so limestone buildings and statues can be badly damaged by acid rain.

Physical weathering

Physical weathering can be caused by ice forming in any gaps and cracks in the rock. When water freezes it expands. Water seeps into gaps and cracks in the rock. When it turns to ice the expansion exerts a physical stress on the rock. This weakens the rock and causes it to crack.

Introducing the mission

Examine the pebbles and discuss where they came from and how they got to be the shape they are. Explain that the children are going to find out more about how rocks are broken up.

Teacher's notes

- If freezer space is too small to stand the bottle up, fill the bottle with water, put the top on and lay the bottle in the freezer compartment. The bottle will crack (showing the strength of the ice).

Further extension for children

- Freeze liquids other than water and investigate what happens.
- Investigate how kitchen acid (vinegar) affects different materials.
- What would be a good material for a statue that will last? Design a statue for the school playground – think of the subject, design and material.

Useful websites

http://www.bbc.co.uk/schools/scienceclips/ages/7_8/rocks_soils.shtml
<http://www.sofweb.vic.edu.au/scitrek/laboratory/programs/rock/date.htm>