

FIFTH AND SIXTH
PROPERTIES AND CHARACTERISTICS OF MATERIALS

Teacher Guidelines:

- Pp 123-128

Linkage:

- Living Things
- Environmental awareness and care
- Materials and change - p 123 – effects of heating and cooling
- Light – materials that allow light through
- Heat – materials that conduct heat
- Magnetism and electricity – materials that are magnetic; materials that conduct electricity

Integration:

- Geography: Natural Environments – Weather
- Oral Language Development – English and Gaeilge
- Visual Arts
- History
- Maths - sorting

Content Objective:

RECOGNISE THAT MATERIALS CAN BE IN SOLID, LIQUID OR GAS FORM

Some suggested activities:

- Brainstorm and then list the properties of solids, liquids and gases and give examples of each state (Refer to Exemplar 42 Teacher Guidelines.)
- Investigate ice cubes (solid), to water (liquid), to gas (by heating).
- Put drops of water, shampoo, syrup and washing up liquid on a clean tray.
- Tilt the tray and observe how the different liquids flow. Does temperature affect your result?
- Balance two inflated balloons on a beam balance/scales. Burst one and note how scales/balance tips. Experiment with pumps and inflated beach balls to feel the way air is easily squashed, yet quickly returns to its original shape.

Content Objective:

IDENTIFY AND INVESTIGATE A WIDENING RANGE OF COMMON MATERIALS IN THE IMMEDIATE ENVIRONMENT

Water, air, rock, fabric, paper, metal, wood, plastic, food

EXPLORE THE ORIGINS OF THESE MATERIALS

Identify natural and manufactured materials, and understand how some of these materials are processed or made.

Some suggested activities:

- Examine water: Where does it come from? What is it used for? What are the properties of water?
- Investigate the surface tension of water by floating a needle on the surface of water.
- Discuss the need for air to breath. Divide the class into pairs. Compare how many breaths each takes in 30 seconds before and after exercise. Record findings. Find the breathing averages in the class before and after exercise
- Examine a range of rocks e.g. granite, limestone, marble. Note the features. Make drawings of them. Important features to look for include: grain size, can you rub off grains, can you scratch it easily. Does the rock make a mark if you rub it on paving stone? Look for colours, patterns and does it contain fossils? Design a short trail around the school to find as many rock types as possible.
- Examine some natural fabrics and some synthetic/manufactured fabrics.
- What are fabrics used for? Name the fabrics in the garments you are wearing. Change the shape of stretchy fabrics e.g. tights, knitted pieces and lycra. Compare these with woven cloth (tweed) cotton silk etc. Using pieces of natural and synthetic fabric all the same size stretch the fabric along your desk. Measure and record using graphs. Which one stretched the most. Find out what it is made from.
- Examine a variety of paper e.g. tissue, greaseproof, paper-towel, shiny , writing paper, newspaper, discuss the properties of each. Are all easy to write on? Can you make a rubbing of a coin with all of them? Why/Why not?
- Examine some metals. Where are they to be found? What are they used for? Are all metals hard/soft? Are they conductors of electricity? Are all metals shiny? What about gold and silver? What is it necessary to do to make some metals strong? Find out which metals corrode and which can be recycled.
- Examine different types of plastic and their uses. What are the properties of plastic? What is plastic useful for?

- Examine four different types of wood and compare the properties of each. Which would make the best chopping board? The best floor? The best raft? The best table top? Now look at manufactured wood-based materials, plywood, and hardboard, MDF. Find out how these are made. Has each one its own distinctive set of properties etc. Investigate which trees are referred to as hardwoods.
- Food: See Exemplar 38 Teacher Guidelines

Some suggested investigations:

- Test different ways to filter water.
- Test what happens different substances when you add water
- Investigate the strength of three types of plastic bags that are the same size but made from different plastic.

Some suggested design and make:

- Make a filter using a combination of sand, gravel. Use a plastic lemonade bottle and layers of large pebbles, small pebbles, coarse sand and fine sand.

Content Objective:

GROUP MATERIALS ACCORDING TO THEIR PROPERTIES AND/OR COMPOSITION

Properties (e.g. flexibility, transparency, magnetism, conductivity, insulation, strength, shape, perishable, or non-perishable foods, solubility)

Composition (e.g. foods containing proteins, carbohydrates and /or fats; soil containing clay, silt, sand and/or gravel)

Some suggested activities:

- Examine a selection of materials. Which ones are flexible, transparent and magnetic? Using a Venn diagram place them in sets. Which ones are common 2 sets, 3 sets? Select six of the objects and test them to find out if they are conductors/insulators of electricity.
- Examine some raw and manufactured materials and test, which are the best insulators of heat.
- Choose materials of different shapes. Draw the shapes. Can you alter the shapes? How would you do this? Can you make tessellating shapes from these materials?
- Select different foods from the food pyramid, some proteins carbohydrates, and fats. Test a potato for starch by cutting in half, and adding iodine solution to the raw potato. If it turns blue/black starch is present in it. Test for fat. Using two pieces of brown paper put a tiny blob of butter on one and an equal amount of water on the other. Rub in the butter. Allow both to dry. Compare the pieces of paper by holding both up to the light. Record

your result. From the selection of foods chosen can you plan a healthy and balanced diet for one day taking breakfast, lunch and dinner into consideration? Examine diets from other cultures and compare these to yours.

- Examine samples of clay, silt sand and gravel individually. What properties do each one have? Describe the texture of each. Find out the composition of soil. Test a sample of soil to find the type of soil particles it (sedimentation) Fill a screw top jar quarter full with fresh soil and water. Put on the lid and shake vigorously. Leave overnight. Next day draw a diagram of the jar and its contents. The gravel will settle on the bottom of the jar, next the sand, silt, clay particles suspended in water and on the top humus.

Some suggested investigations:

- Which materials is the best insulator of heat.
- Which material is the best insulator of sound

Content Objective:

IDENTIFY HOW MATERIALS ARE USED

Relate the properties of the material to its use

Examine how shape affects the strength of structures

Design and make a bridge that takes account of flexibility, form, stability and strength

Some suggested activities:

- Look at pictures of structures/different types of houses. List the materials used in each. Say why these materials were chosen.
- Look at the shape of the structure. Why is it this shape? Where is the strongest part of the structure?
- Find out what factors architects/engineers take into account when designing and building buildings.
- Look at pictures of bridges. What materials were used to make them?
- What makes it stable and strong?

Some suggested design and make:

- A bridge that is stable and can hold five toy cars.

Content Objective:

RECOGNISE THAT A GAS, SUCH AS AIR, OCCUPIES SPACE, HAS MASS AND EXERTS PRESSURE

Investigate evidence for atmospheric pressure

Explore the effect of air resistance

Design and make a glider

Some suggested activities:

- Use drink cartons - when drink is finished the straw can be used to suck the air out and the carton collapses. Can you find other ways to remove air from a container?
- Fill a tumbler to the brim with water, place card on top and then turn the tumbler over carefully. Take away your hand.
- Pierce a plastic bottle with a golf tee. Fill the bottle with water and screw the lid tightly. Remove the tee. What happens?
- Observe a barometer and record the air pressure reading over a number of days. Make a bar/linear graph of your findings (Note the weather changes as atmospheric pressure rises and falls) Predict the weather for the following day on reading the Atmospheric Pressure on the barometer.
- Examine weather maps in the newspaper. All areas of equal pressure are joined to make a curving line called an isobar.

Some suggested design and make:

- A glider /parachute. Test for air resistance. Make another and change one variable. Compare the two.

Content Objective:**RECOGNISE THAT SOME MATERIALS DECAY NATURALLY WHILE OTHERS SURVIVE A LONG TIME IN THE ENVIRONMENT**

Biodegradable and non-biodegradable waste

Environmental problems caused by non-biodegradable waste Materials that may be recycled

Some suggested activities:

- Brainstorm the meaning of biodegradable and non-biodegradable waste.
- Take 12 items and divide them into biodegradable/non-biodegradable products.
- Find out the average amounts of rubbish in a family household or classroom bin. Examine the contents and separate into recyclable/non- recyclable products.
- Make a list of the materials which you think, can cause pollution if placed in landfill. Investigate how these items can pollute the soil or the atmosphere. Collect cuttings from newspapers re oil spillages at sea and the effects of these disasters on fish stocks and wildlife. The effects of fertilizers on rivers and streams, the effect on plants and the atmosphere from burning fossil fuels. Investigate industrial pollution, smog, acid rain. Make a wall chart of reports such as these.
- Make a poster about the dangers of pollution in the atmosphere.

- Investigate how glass, paper, plastic, cardboard, aluminium can be recycled. How much energy is saved in doing so and how the recycled materials are used.

Some suggested design and make:

- Make a composter from plastic bottles. Put biodegradable material into it and one item, which is non-biodegradable. Over a few weeks observe what happens

Content Objective:

BECOME AWARE THAT AIR IS COMPOSED OF DIFFERENT GASES

Including oxygen and carbon dioxide

Some suggested activities:

- Oxygen is an invisible and odourless gas and without it we would all die. Why is it so important to us? We breathe it in all the time in air where it is mixed with other gases. Is it found anywhere else? In oceans it is dissolved in and forms part of the water. It is found in rocks/most minerals. What are its properties? It is colourless, odourless and tasteless. It supports combustion – substances, which burn in air, burn more vigorously in oxygen. It is slightly soluble in water, is slightly heavier than air, reacts with most elements to form oxides, and has no effect on litmus. Is it used for breathing, in the manufacture of steel, and for burning and welding? Investigate the uses of oxygen in hospitals.
- Carbon dioxide occurs in rocks such as chalk, fossil fuels such as coal and in the air. When fuels burn the carbon in them reacts with the oxygen in the air to form carbon dioxide. Too much carbon Dioxide in the air traps heat like the glass in a greenhouse. This is called the greenhouse effect.
- Investigate why charcoal is used to filter water. Why is it used in gas masks? spacecraft ventilation? Cooker hoods? Why is it used in fish tanks?
- Place a few layers of charcoal in a container e.g. colander. Pour some muddy/dirty water over it and stand for a few minutes. What happens? Is the clear water drinkable?

Content Objective:

BECOME AWARE OF SOME OF THE PRACTICAL APPLICATIONS OF THESE GASES IN EVERYDAY LIFE

Use of carbon dioxide in fizzy drinks and in fire extinguishers.

Some suggested activities:

- The fizz in drinks is carbon dioxide. The gas dissolves in the liquid under pressure, bubbles come out when the pressure is released. Lightly shake a bottle of 7Up. Release the cap. What happens? Put an Alka Seltzer tablet in a film container with a small amount of water. Put the lid on quickly and leave for a few seconds. What happens? Replace the lid and feel the forces at work in the “fizz”.
- Examine the school fire extinguisher. What does it contain?
- Get some bicarbonate of soda. Mix with vinegar. Watch the reaction.