

Science Bank: Chemistry

Programme 1: Raw materials

Activity 1 worksheet: Plastics all around

Crude oil provides the raw material for making plastics. One of the fractions we get by distilling crude oil is naphtha. This can be decomposed to give reactive substances, such as ethene, which are used for making plastics.

There are many uses of plastics but one of the most common is packaging. The plastics used to make packets and containers are coded. The code allows the consumer to identify the plastic used in the packaging of a product. This makes it easier to separate and recycle different types of plastic packaging.

Here is the code:

Code	Plastic	Chemical Name
1	PET	Polyethylene terephthalate
2	HDPE	High density polythene
3	PVC	Polyvinyl chloride
4	LDPE	Low density polythene
5	PP	Polypropene
6	PS	Polystyrene

Use this code to carry out a survey of the plastic packaging and containers in your home.

Locate the identification code on items of plastic packaging you find in each room at home (it will often be stamped on the bottom of a container).

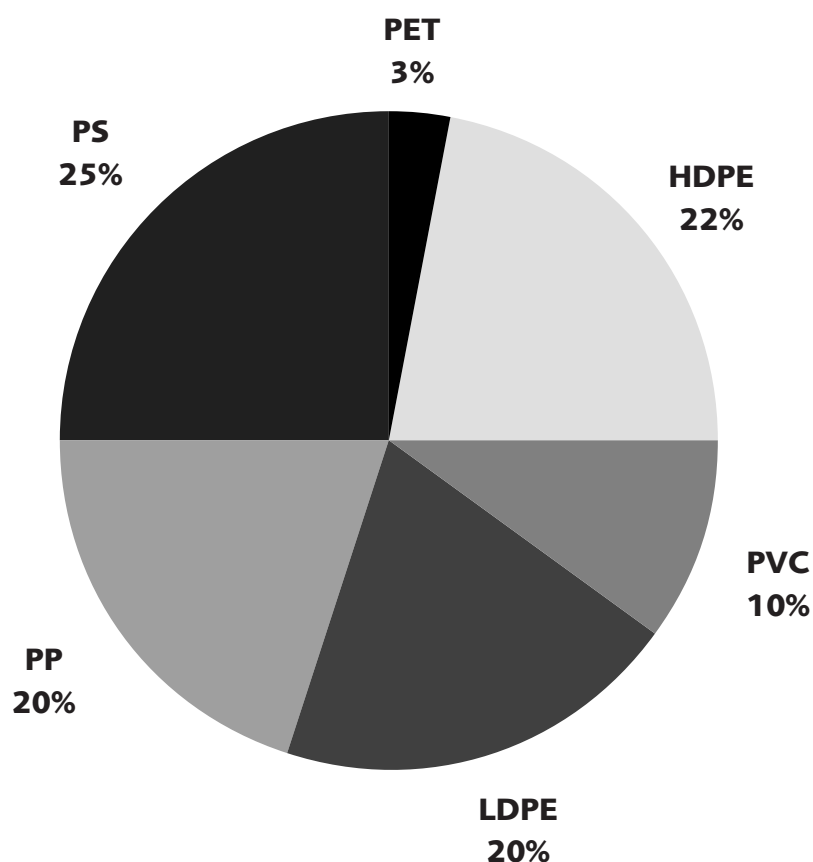
Keep a record of what you find. For each type of plastic, make a note of its name, how it is used and its frequency of use.

Draw a pie chart like the one below to show how often you found each of the six types of plastic in the table.

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Now try these questions:

1. Which of the plastics in your survey did you find (a) most often and (b) least often?
2. Plastics account for about one-fifth of domestic waste by volume. What happens to all this plastic waste after we dispose of it? How will this affect the environment?
3. Explain how this system of coding plastics might help to reduce the environmental problems caused by their disposal.

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Activity 2 worksheet: The oil industry and the environment

This is a role-play exercise in which you are going to discuss the economic importance of the oil industry and its possible impact on the environment.

Background

- Gareth and Ffion are school friends who live near Milford Haven, a port on the West Wales coast in the small county of Pembrokeshire. Each year this part of the coastline attracts many thousands of tourists because it is an area of outstanding natural beauty with a rich variety of habitats.
- Besides tourism, the only other major source of employment for the people of Pembrokeshire is the oil industry. Milford Haven is a deep-water port that provides anchorage for ocean-going supertankers. Oil is pumped from these tankers to a nearby oil refinery where it is distilled to obtain fuels and petrochemicals.
- Gareth's parents run a small hotel on the Pembrokeshire coast.
- Ffion's parents are both employed by the oil company in their refinery.
- The parents of Gareth and Ffion often meet and discuss concerns about their jobs.

Role-play exercise

Working in groups of about four, divide into pairs. One pair should take on the roles of Gareth's parents and the other pair the roles of Ffion's. Each set of parents should talk to the other about:

- The importance of their own jobs in the local economy;
- The effect the oil industry could have on jobs and the environment;
- How opportunities for employment in the local community can be protected.

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Activity 3 worksheet: Making metals

It takes more energy to make some metals than it does to make others. This is one of the reasons why some metals are so expensive. Energy costs money!

This table shows the energy costs of making some common metals.

Energy costs of producing metals

Metal	Symbol	Energy needed for extraction/GJ per tonne
Aluminium	AL	252
Chromium	Cr	133
Iron	Fe	35
Lead	Pb	28
Magnesium	Mg	370
Refined copper	Cu	116
Zinc	Zn	67

- Copy the data in the table onto a spreadsheet.
- Add another column to your spreadsheet to show the relative reactivities of the metals.

For example, copper is the least reactive of the metals so give this the number 1. (The most reactive metal will be numbered 7.) You can get the data you need for this from a chemistry textbook or from:

<http://spidergram.ccs.unr.edu/unr/sb204/geology/mas.html>

- Now sort the metals on the spreadsheet in order of their reactivities, starting with the least reactive of the metals.
- Produce a chart from the spreadsheet data to find out if the energy needed to make the metals is linked to their reactivities. (You will need to show the energy cost of making the metals on the y-axis and the metals in order of reactivity on the x-axis.)

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Use your chart to answer these questions:

1. Do the most reactive metals need most energy to make them? Use your chart to support your answer.
2. Do unreactive metals need less energy to make them from their ores? Name one metal that does not follow the general trend and try to explain why it is anomalous.
3. Why do metals such as aluminium and magnesium tend to be more expensive than iron?
4. The energy needed to make a metal will affect its cost. What else could affect the cost of a metal?
5. Estimate the energy needed to make a tonne of an alkali metal such as sodium. What factors should you consider when making your estimate?