

SYNOPSIS:

Everything on earth and in space is made up of elements, the basic building blocks of matter. As the fundamental chemical units of which all matter, at or above the atomic level, is composed, elements are substances that cannot be separated into simpler substances by chemical means.

This program looks at atoms, elements, and compounds. It shows how elements are smelted from ore and how they can be combined through chemical processes into different compounds. It also demonstrates how our knowledge of elements can be used in forensic science to provide evidence against criminals.

CURRICULUM UNITS:

Chemistry
Earth Science
Physical Science

CAREER OPPORTUNITIES:

Chemist
Forensic Scientist
Geologist
Materials Engineer
Pharmacist

PROGRAM OVERVIEW:

As the fundamental chemical units of which all matter, at or above the atomic level, are composed, elements can be divided until there is only one atom left, but no further. Elements are substances that cannot be separated into simpler substances by chemical means.

This report looks at atoms, elements, and compounds, showing a Periodic Table and discussing how elements are arranged in groups. Most elements and students can see how metals like gold, can be panned from rivers, while other more reactive metals are found in compounds.

Malachite ore and the copper we get from it are shown. In a smelting process that has been used since the Bronze Age, the malachite is crushed, placed in a crucible and then into a clay furnace. Charcoal, placed on top of the crucible reacts with other elements in the malachite and leaves the pure copper behind. It can then be poured into a stone mold.

Just as we can separate elements from compounds, we can also get elements to react with each other and form new compounds. To demonstrate this process, iron wool is heated and grows heavier as it reacts with the air. In addition, a diamond is heated and placed in liquid oxygen thus producing carbon dioxide. This process is repeated using more plentiful graphite so that students can see the dry ice produced by the reaction.

Today, our technology allows us to see what elements are in a compound without having to take it apart. To illustrate, we see a burglar breaking into a house and being apprehended by a British policeman. The glass on the burglar's clothing is analyzed in a forensics laboratory and shown to be identical in composition to the glass from the broken window. Through their knowledge of atoms and elements, scientists can use chemistry to make the world a better place.

ISSUES AND CRITICAL THINKING:

Prior to viewing this DVD, students should have some understanding of the following.

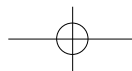
THE STRUCTURE OF MATTER

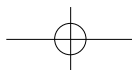
Heating and cooling causes changes in the properties of materials. Many kinds of changes occur faster under hotter conditions.

When a new material is made by combining two or more materials, it has properties that are different from the original materials. For that reason, a lot of different materials can be made from a small number of basic kinds of materials.

The atoms of any element are alike but are different from atoms of other elements. Atoms may stick together in well-defined molecules or may be packed together in large arrays. Different arrangements of atoms into groups compose all substances.

Atoms and molecules are perpetually in motion. Increased temperature means greater average energy. In solids, the atoms are closely locked in position and can only vibrate. In liquids, the atoms or molecules have higher energy, are more loosely connected, and can slide past one another. In gases, the atoms or molecules have still more energy and are free of one another except during occasional collisions.





CRITICAL THINKING EXERCISES:

After showing the DVD, ask your student the following:

What is an atom?

What is an element?

What is a compound?

How are metals extracted from ore?

Is smelting the same as melting? What is the difference?

Discuss the elements and what makes them different from one another.

Discuss the difference between physical and chemical change.

Discuss the Periodic Table and atomic numbers.

Talk about taking apart compounds and making new compounds.

Have each student look up a different element and make a complete study of it, from its placement on the Periodic Table to its use in the industry.

GLOSSARY:

ATOM- The smallest unit of an element that still retains the properties of that element.

COMPOUND- Substances made of at least two different elements.

CRUCIBLE- A container used to melt metals and alloys.

DRY ICE- Carbon Dioxide, CO₂ that has been condensed to a snow like solid.

ELEMENT- Substances that cannot be reduced to a simpler substance by chemical means.

EXTRACT- To pull out by a physical or chemical process.

FORENSIC ANALYSIS- Chemical analysis whose findings may be used in court.

HALOGEN- Group VII on Periodic Table; combines with most metals to form salts.

MAGNIFY- To cause to appear larger by the use of lenses or mirrors.

MATTER- Material particles that have inertia and occupy space.

NOBLE GAS- A gas that is non-reactive; Group VII on the Periodic Table.

ORE- Any naturally occurring material that contains minerals or economic value.

PERIODIC TABLE- Arrangement of elements in a pattern that represents periodic law.

PHILOSOPHER- A thinker.

SEDIMENT- Solid material that is deposited from suspension in a liquid .

SMELT- Various methods by which ores are processed to yield a metal.

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ATOMS & ELEMENTS



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