

Explore an Issue

Each unit includes an *Explore an Issue*, which encourages students to examine various points of view on a “real-world” issue before making a personal decision.

Student Record of Learning>
corresponding pages.

2.4 Explore an Issue

- DECISION MAKING SKILLS**
- Define the Issue
 - Identify Alternatives
 - Research
 - Analyze the Issue
 - Defend a Decision
 - Evaluate

Is Natural Better than Synthetic?

There was a time when our ancestors used only natural products in their everyday lives. Wool fibres from sheep were woven together to make clothing. The fibres of silk, cotton, and linen were used similarly.

Strong dwelling were built using wood from the trunks of trees. If this material could hold a tree erect in all kinds of wind and weather, it ought to be able to do the same in a manufactured structure.

Today, people buy and use manufactured products. Most of the products contain chemicals. These include

- fabrics used to make clothes
- soaps and detergents used for cleaning
- plastics used to wrap or store food
- paints used to protect and decorate various surfaces

In each case, chemicals have been synthesized to create materials with the same properties as the natural products they replace.

Natural products are obtained from natural sources – animals, plants, or minerals (Figure 1). For example, wool comes from sheep, wood from trees. Minerals provide metals and fuels.

Synthetic products are composed of materials that have been manufactured in the chemical industry, or, simply, chemicals (Figure 2). Most are manufactured from petrochemicals. They include polyethylene plastic bottles, aspirin, videotapes, and computer chips.

Which is better – natural or synthetic? The following arguments have been collected by people who favour the use of natural products.

- Natural drugs, such as those which come from various herbs, are safer and more effective than synthetic drugs.
- Cardboard containers, such as those used in fast-food restaurants, are made from trees.



Figure 1
What natural substances are in these products?

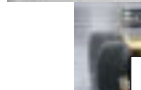


Figure 2
The vulcanized rubber used in the example of a synthetic substance rubber to make the tires less dependent on temperature. Today, tires are made from synthetic rubber.

- Losing weight by cutting back on better than using synthetic diet often cause long term health problems.
- Cotton diapers are better than synthetic diapers because they are re-usable and take up space in landfills. Similar arguments have been collected by people who use synthetic materials.
- Synthetic medicines are more effective than natural medicines because they can be produced more quickly.
- Styrofoam cups use up fewer resources than cardboard cups. When compared to cardboard cups, they are more environmentally friendly because, even though disposal is a problem, they are biodegradable.

Work the Web

Synthetic materials are extremely durable and last a long time. This is an advantage when using them, but a disadvantage when it comes to getting rid of them. What is being done to solve the disposal problem? Visit www.science.nelson.com and follow the links from Science 10, Section 5.14, to find out about “biodegradable” plastic.

Debate Natural Products are Better than Synthetic

Proposition

Natural products are made from renewable resources and are therefore better than synthetic products

- Your teacher will place you in a group of four students. One pair of students will be assigned the “pronatural” position, and the other will be assigned the “prosynthetic” position. You will be given 5 minutes to prepare your arguments. Form your arguments with your partner and present them to the class. The two presenting first.
- After all four students have spoken for 2 min each, reverse your positions: the “prosynthetic” students now take the “pronatural” position, and vice versa. Argue your new viewpoint for 2 min each.
- Finally, in your group of four, discuss the issue and arrive at a position. Produce a 20- to 50-word statement that summarizes your group’s feelings on the issue. The group must all show your agreement by signing this consensus statement.

Case Study 2.7

Air Pollution and Acid Rain

Refer to Figure 1 on p. 900 of Nelson Applied Science 10.

1. Name the 5 kinds of air pollutants illustrated in Figure 2.

2. The pie chart for each pollutant illustrates the various sources. Looking at all 5 pie charts, name the three most significant sources of all types of air pollution.

What you may have noticed when you walked out your door is smog, a yellow-brown haze that hangs over many cities on a calm, hot summer day. Smog consists mainly of ground-level ozone, which forms when two main pollutants, nitrogen oxides and hydrocarbons, react with sunlight. Ground-level ozone should not be confused with the ozone layer high up in the atmosphere which protects us from the sun’s harmful rays. The ground-level variety is a serious pollutant.

How does air pollution become acid rain?

3. Four of the air pollutants illustrated in Figure 2 on page 900 are able to dissolve in water to form acids. Name the acid in each case.

- (a) carbon dioxide: _____
- (b) carbon monoxide: _____

4. This 2

2.7 Case Study

Air Pollution and Acid Rain

Have you ever stepped outside your home and noticed the air you breathe? What was it about the air that got your attention? Was it the colour? Perhaps the odour?

- Name the 5 air pollutants illustrated in Figure 2.
- The pie chart for each pollutant illustrates the various sources. Looking at all 5 pie charts, name the three most significant sources of all types of air pollution.

Acid rain occurs when oxide air pollutants combine with water in the atmosphere to form droplets of acid. The most common acidic oxide is carbon dioxide.

Carbon dioxide (CO₂) is naturally produced by all living creatures, including plants.

3. It is a fact that normal rainfall is slightly acidic. Can you explain why?

- Predict what might happen if
 - the amount of carbon dioxide produced was to increase.
 - the amount of the other oxides were to increase.

How are air pollutants produced?

- naturally:
 - forest fires
 - volcanoes
 - the decay of vegetation
- by people:
 - burning forests to clear land for growing crops
 - burning waste
 - burning fuel (for transportation; for electricity)

Try This Activity Acid Rain

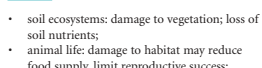
- Put a piece of chalk into a clear container of vinegar. Observe what happens to the chalk.
- Put a piece of limestone (where available) into a second clear container of vinegar.

If rain is already a matter of air pollution, Nature depends on rain reacts with natural bases can no longer be destroyed.

What does excess aquatic ecosystems animals in the completely;

- soil ecosystems: damage to vegetation; loss of soil nutrients;
- animal life: damage to habitat may reduce food supply, limit reproductive success;

Figure 1



Explore an Issue 2.4

Is Natural Better than Synthetic?
What determines whether a product is natural?

Or synthetic?

Give 2 examples of a “natural” product:

- _____
- _____

Give 2 examples of a “synthetic” product:

- _____
- _____

In the space below, describe in your own words the argument that has been assigned to you. The argument:

What is the “natural” position on this argument?

What is the “synthetic” position on this argument?

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establish the validity of each position.

Understanding the Issue

- What is the source of most natural products?
- Write three arguments supporting the use of disposable diapers, and three arguments supporting the use of cloth diapers.

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Identifying Alternatives

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Role Play or Debate

Role play or debate situations provide students with an opportunity to analyse and evaluate issues. Both formats encourage the presentation (communication) and defence of personal decisions.

Questions

Questions attached to the narrative help students focus on and develop key ideas and information.

Case Study

Case Studies introduce students to concepts that, for reasons such as time, safety, or expense, they would not be able to investigate themselves. Each concept is presented in a familiar context.

Inquiry Investigations

Each unit presents several investigations to engage students in observing and experimenting. During these investigations, students will have the opportunity to develop inquiry skills: **Questioning, Hypothesizing, Planning, Conducting, Recording, Analysing, Concluding,** and **Communicating.**

While most investigations will be “directed”, each unit provides at least one opportunity for an “open-ended” investigation, which requires students to choose their own questions and to plan and conduct an inquiry to answer those questions.

Inquiry Skills Menu

Indicates which inquiry skills students will develop in investigations.

Questions

Questions relating to the expectations are provided, where applicable, and categorized as *Understanding Concepts, Making Connections,* and for investigations, *Applying Skills.*

a Understanding Concepts: Questions focusing on understanding the basic concepts introduced or developed in the section.

b Making Connections: Questions inviting students to relate their knowledge and skills to other problems and situations.

c Applying Skills: Questions focusing on the inquiry skills, and their related applications.

2.1 Investigation

INQUIRY SKILLS MENU

- Questioning
- Hypothesizing
- Predicting
- Planning
- Conducting
- Recording
- Analysing
- Evaluating
- Communicating

Recognizing Acids and Bases

What makes a substance an acid or a base?
Acids have properties that are very different from the properties of bases.

The simplest property is based on how an acid and a base react with a chemical indicator. Chemical indicators appear as one colour when mixed with an acid. They become a different colour when mixed with a base.

Litmus is a common indicator. You may have used either red or blue litmus paper to test for an acid or base (Figure 1).

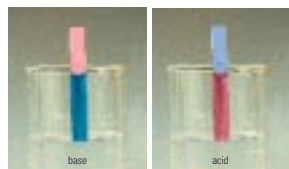


Figure 1
The litmus paper turns red when dipped into an acid. The paper turns blue when dipped into a base.

In this investigation, you will make a natural indicator. This indicator will then be used to identify substances as acidic or basic (Figure 2).



Figure 2

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Question

Can indicators be used to identify substances as either acidic or basic?

Prediction

Do you think a natural indicator will work as well as a chemical indicator to identify acids and bases?

Materials

- apron
- safety goggles
- red and blue litmus paper
- red cabbage
- knife or shredder
- a large pot
- hot water kettle
- wire sieve
- distilled water test solution
- acid test solution (vinegar)
- base test solution (clear ammonia)
- unknown solutions

Procedure

- 1 The juice from red cabbage leaves can be used as a natural indicator. If the leaves are chopped and placed into a pot of water, the natural pigment in the leaves will be extracted, and colour the water (Figure 3).

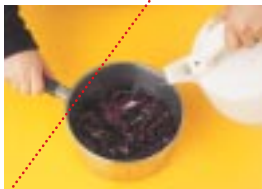


Figure 3

Place a drop each of the known acid, base, and distilled water onto a piece of red litmus, and again on a piece of blue litmus (Figure 4).



Figure 4

- 3 Use microdroppers to add a few drops of the cabbage indicator to each of the known acid, base, and water samples in a microtray. Record the colours in your workbook (Figure 5).



Figure 5

- 4 Test the unknown samples by placing a drop of each onto pieces of red and blue litmus paper.
- 5 Test the unknown samples in the microtray with the red cabbage indicator.
- 6 Observe and record the colour change of the indicator with each sample.
- 7 Record the observations in your workbook. Identify, where possible, each sample as acidic, basic, or neutral.

SKILLS HANDBOOK: Creating a table

Analysis and Conclusion

1. Which colour changes were easier to recognize when both indicators were added to the known acid, base and distilled water?
 - (a) the same?
 - (b) different?
2. Was either indicator able to tell you whether all the acid samples were
 - (a) the same?
 - (b) different?
3. How about the bases?
 - (a) the same?
 - (b) different?
4. How would you compare the natural indicator (red cabbage juice) to the chemical indicator (litmus)? Give reasons.
 - (a) Why was water tested as well as samples of acids and bases?
 - (b) Why do you think the distilled water did not change the colour of the indicator?

Understanding Concepts

1. How is a chemical indicator used to identify an acid or a base?
2. How is litmus paper used to identify a solution as being an acid or a base?

Applying Skills

3. What is the role of distilled water in this investigation?

Procedural Photographs

Where appropriate, written procedural steps are supported visually by a photograph.

Student Record of Learning

corresponding pages.

2.1 Investigation

Recognizing Acids and Bases

What do you know about the colour of litmus paper in the presence of an acid or a base?
Refer to your textbook, p. 100, and complete the chart below.

| Type of Substance | Litmus Colour |
|-------------------|---------------|
| Acid | |
| Base | |
| Neutral | |

In the space below, write a question that might drive this investigation.

Do you think natural juices, such as red cabbage juice, can be used to identify acids and bases in the same way that litmus does?
Write your prediction.

1. _____

2. _____

3. _____

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