

OXFORD INSIGHT SCIENCE FOR NSW STAGE 4

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2ND EDITION

SKILLS AND ACTIVITY BOOK

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SAMPLE CHAPTER

UNCORRECTED PAGE PROOFS

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CONTENTS

Oxford Insight Science for NSW
Stage 4 2E Skills and activity book

Chapter 1 Working Scientifically

PHYSICAL WORLD

Chapter 2 Forces (PW1)

Chapter 3 Fields (PW2)

Chapter 4 Energy (PW3)

Chapter 5 Energy efficiency (PW4)

EARTH AND SPACE

Chapter 6 The changing Earth (ES1)

Chapter 7 Earth, Sun and Moon (ES2)

Chapter 8 The Earth's resources (ES3)

Chapter 9 Water (ES4)

LIVING WORLD

Chapter 10 Classification (LW1)

Chapter 11 Cells (LW2)

Chapter 12 Functioning organisms (LW3)

Chapter 13 Health science (LW4)

Chapter 14 Sustainable ecosystems (LW5)

CHEMICAL WORLD

Chapter 15 The nature of matter (CW1)

Chapter 16 Elements and compounds (CW2)

Chapter 17 Mixtures (CW3)

Chapter 18 Chemical change (CW4)

Literacy builder

Read the following article to answer the questions below.

Return and earn

Over 160 million drink containers end up as litter in New South Wales every year. This litter doesn't just look bad on our streets and beaches, it can also seriously harm the environment.

In 2017, the state government introduced an initiative to reduce the amount of litter in the state. The Return and Earn program encourages people to bring their empty drink containers to a return point, where they can earn a refund. So how does it work?

The first step is to collect your bottles, cartons and cans. But not every drink container is eligible for a refund. For example, milk containers and cordial bottles will not be accepted. If you are unsure about your containers, you can check on the Return and Earn website to make sure they meet the criteria.

The next step is to take your containers to a collection point. There are over 600 places in NSW where they can be dropped off. Every eligible container you return can earn 10 cents. Some collection points are like reverse vending machines, where you can place your containers and they will give you a refund in return. You can also return your containers over the counter at participating retail stores.

- 1 Identify** any words in the article you do not recognise. Find out what they mean and write a definition for them below.

- 2 Describe** how you can earn money from plastic bottles.

- 3** Why did the NSW government introduce the Return and Earn program?



Making predictions

Wind energy can be captured by wind turbines. They use the wind to spin an electric generator that creates useable energy in the form electricity. Wind power is a renewable energy. Wind turbines are often placed in windy areas, such as along a coast line (Figure 1) or on the top of hills. These long lines of wind turbines are called a wind farm.

1 Predict what would happen to energy production from the wind turbines in the following scenarios:

IF	THEN
the wind speed increases	
the wind speed decreases	
two of the wind turbines are removed	
the sun disappears behind a cloud	

2 Explain what you know about wind energy that helped you to make your predictions in Question 1.



Figure 1 A wind farm in Albany, Western Australia

Identifying the purpose of an investigation

The *aim* of an investigation is a short statement that identifies its purpose. In other words, what is the reason for doing the investigation? What question or problem is the investigation trying to answer? This is answered in the aim.

1 Consider the two investigations outlined below. Can you identify an aim for each of these?

Draw a line between each investigation and its correct aim.

Five types of solar panels are placed outside. Each panel charges its own battery for the same length of time. Scientists then test which battery last the longest.

A banana peel, a chip packet, an old newspaper and some grass cuttings are placed in a container with soil and covered with another layer of soil and water. The rubbish is turned over every 3 days and water is added to keep the soil moist. After 6 weeks, the rubbish is inspected to see which items have biodegraded or decomposed the most.

To investigate how wind can affect a solar panel

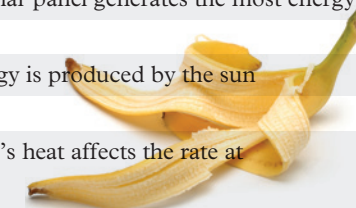
To investigate what type of household waste decomposes the quickest

To investigate how different waste materials can be thrown out

To investigate what type of solar panel generates the most energy

To investigate how much energy is produced by the sun

To investigate whether the sun's heat affects the rate at which waste decomposes



2 Justify your choices in Question 1. Why did you choose these two aims and not the others?

[illegible]

Identifying improvements to the method

The solar cell investigation

A group of students wanted to know how much energy solar cells could generate under different conditions. They connected three different types of solar cells to voltmeters. The voltmeters would help them to measure the amount of energy each cell produced.

The students then placed the solar cells around their school: one in the middle of the school field, one on a table in a classroom and one under a tree.



Figure 2 The solar cell locations: **a** on the school field, **b** on a table in the classroom and **c** under a tree

The solar cells were all put out and collected at different times of day.

The results

The students observed the voltmeter and recorded the amount of energy (volts) generated by each solar cell.

The solar cell in the classroom produced the highest energy reading on its voltmeter, then the solar cell under the tree. The solar cell on the field generated the least energy in this investigation.

The students were surprised. They had predicted that the solar cell on the field would generate the most energy because it received the most sun in that location.

What went wrong?

- 1 Put a tick next to the variables that could influence the results of this experiment.
- ☐ The time of day the solar cells are put out
 - ☐ The accuracy of the voltmeter reading
 - ☐ The number of voltmeters attached to each solar cell
 - ☐ The number of solar panels tested
 - ☐ The brand of the solar cells
 - ☐ The amount of light available at each location
 - ☐ The amount of wind at each location
 - ☐ The number of solar panels tested

2 Choose two of these variables and **outline** in the table how you could control them to make the investigation more reliable

Variable to control	How will you control this variable?	How could the variable influence the results if it is not controlled?

8D

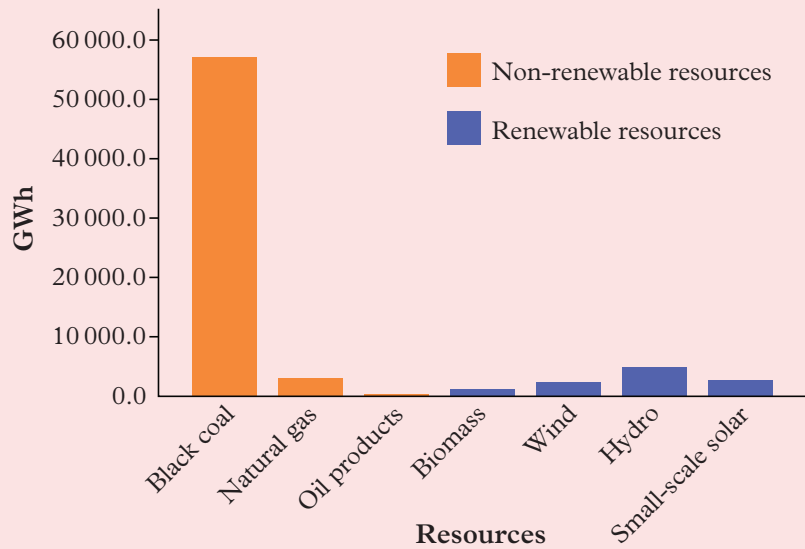
Processing and analysing data and information

Extracting information from graphs

The amount of energy produced by different resources can be charted on a graph. Examine Figure 3. This graph has all the information you need to answer the following questions.

Figure 3 Electricity generation in NSW by resource [2018]

*Energy is commonly measured in watts (W). Gigawatt hours (written as GWh) is a unit that power companies use to measure the amount of energy generated.



- 1 **a** Figure 3 shows the amount of energy generated in what state of Australia?
- b** Circle where you can find this information on the graph.
- 2 **a** What type of resource produces the second-most amount of energy?
- b** Circle where you can find this information on the graph.
- 3 **a** Is natural gas a renewable or non-renewable resource?
- b** Circle where you can find this information on the graph.

Using identified strategies to suggest possible solutions

Imagine a coastal city that generates all the energy it needs by burning coal. The coal it uses comes from a local mine, but the coal is starting to run out.

The city council has asked for help to solve this problem. It needs energy to keep everything running, including schools and hospitals.

1 Using your scientific knowledge, consider the following solutions and **identify** the pros and cons of each.

	PROS	CONS
The city reduces its use of electricity.		
The city sets up wind and hydro power to replace coal.		
The city finds a new source of coal nearby.		

2 Based on your above evaluation, propose a possible solution for the city.

Using scientific language to present ideas

Scientists report their findings using scientific language. This means they do not use personal words like ‘I’, ‘me’, ‘my’ or ‘us’, ‘we’, ‘our’. When a scientist records their observations, they write what they see, not how they feel about it. They also write in the past tense. For example:

‘We saw the mixture turning a beautiful shade of red.’

This sentence would be written scientifically as:

‘The mixture turned red.’

1 Read the following statements and rewrite them using scientific language.

a

I saw the water bubbling in the test tube while it was boiling.

b

We divide the flower's stem into five pieces using scissors.

c

I am wearing an ugly lab coat, safety glasses and my hair is tied back so that I'm safe during the experiment.

CAUTION: Risks should be managed by use of personal protective equipment and/or specified control measures. Always consult your teacher before conducting an experiment.

Read through the following practical activity. Use the skills you've practised in this chapter to help you fill in the blanks.

Fish are a resource, which we can farm or take from the ocean for food. But many species of fish are threatened with extinction from overfishing. Humans are catching fish from populations faster than the fish can reproduce. This could one day leave us with no fish at all.

Sustainable fishing means that we only take the fish we need, and leave enough so that the populations of fish can continue to survive.



Figure 1 Fish can be farmed or caught from the ocean for food.

1 Read through this activity to identify the aim:

1 Read through the method and predict what will happen in this experiment.

IF a straw is used to fish, THEN

IF a spoon is used to fish, THEN

IF hands are used with a straw to fish, THEN

- M&Ms and jelly beans
- Straws
- Trays
- Stopwatch
- Spoons

1 You are not allowed to use M&Ms and jelly beans, because you cannot have food in the lab. What would you replace these items with so that you can still conduct this activity?

2 Explain why you chose these replacement materials.

Update the method to include your replacement materials.

- 1 Place plates of 20 M&Ms and 10 jelly beans (representing fish) around the room.

2 Each student should use a straw (without using their hands) to collect as many 'fish' as they can for 1 minute.

3 After 1 minute, the remaining fish are available for breeding. Add one new M&M 'fish' for every M&M left on a plate and one jelly bean 'fish' for every jelly bean left on a plate.

4 Repeat steps 2 and 3 several times.

5 How long can you keep fishing? Is the fishing sustainable?

6 Repeat steps 2–5, but this time using your hands to help move your straws. (This represents using technology to help find fish.)

7 Repeat steps 2–5 using a spoon instead of a straw. (This represents fishing with a net.)

Conduct the investigation using your updated method. Record what happens at each round.

Discussion

1 Which method was the most effective at catching the most fish in a minute?

2 Which method was the most sustainable?

3 Compare your results to your prediction.

Conclusion

1 What do you know about sustainable fishing after completing this activity?



A scuba diver observing a rusted and overgrown shipwreck in the Red Sea. The average water temperature of the Red Sea is 22°C; wearing a wetsuit helps the scuba diver's internal systems continue to function while exploring the ocean. Over time, shipwrecks corrode. This corrosion, combined with the structure of the ship itself, can provide habitats for a variety of marine life including fish, crabs, sea anemones and coral. Shipwrecks are common throughout the Red Sea, particularly on coral shelves.