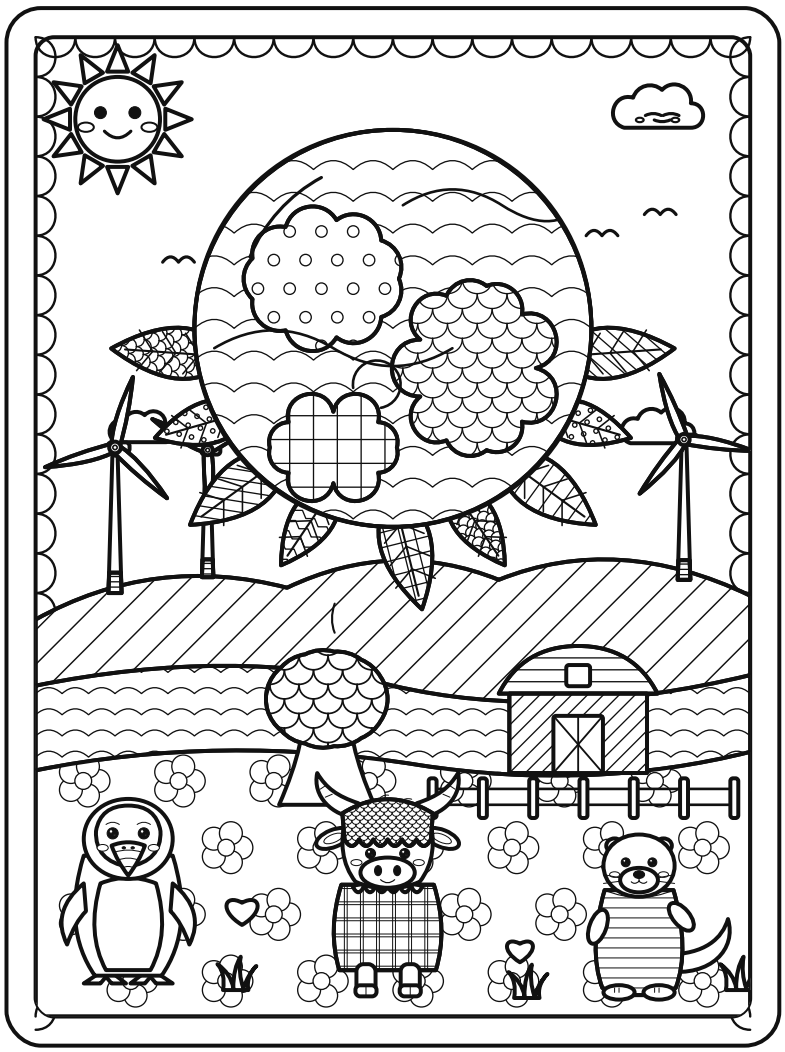
REAL-LIFE SCIENCE

Fragile Earth

Workbook for National 3 Science

Unit: Fragile Earth



C. Blewis

Blewis LEARNING

Contents

GETTING STARTED

	How to use this book	4

ENERGY

Topic 1	Fuels and energy	6
Topic 2	Renewable energy	15

METALS

Topic 3	Metals and their properties	24
Topic 4	Getting and using metals	33

WATER

Topic 5	Our water supply	42
Topic 6	Clean water for everyone	51

FOOD

Topic 7	How plants grow	60
Topic 8	Farming and food	69
Topic 9	Feeding the world	78

AT THE BACK

	My progress tracker	87
	My practical skills	88

How to use this book

This book is about the resources our planet gives us: energy, metals, water and food. You will find out where they come from, how we use them, the problems this causes, and what we can do to help. Each topic follows the same pattern, so you always know what comes next.

EACH TOPIC HAS

Opener	the story for the topic, what you will learn and the key words
Learn pages	short explanations with diagrams, and questions to try
Practical	You follow the method, record your results, draw a graph, and say what you found.
Brain break	a calm puzzle or colouring page
Check-up	a few questions to show what you know, and a checklist

PRACTICAL WORK: STAY SAFE

- Only start a practical when an adult says it is OK.
- Read the whole method and the Stay safe table first.
- Tell your teacher about anything that might affect you, like asthma or an allergy.
- Stop and tell an adult if you feel unwell or something goes wrong.

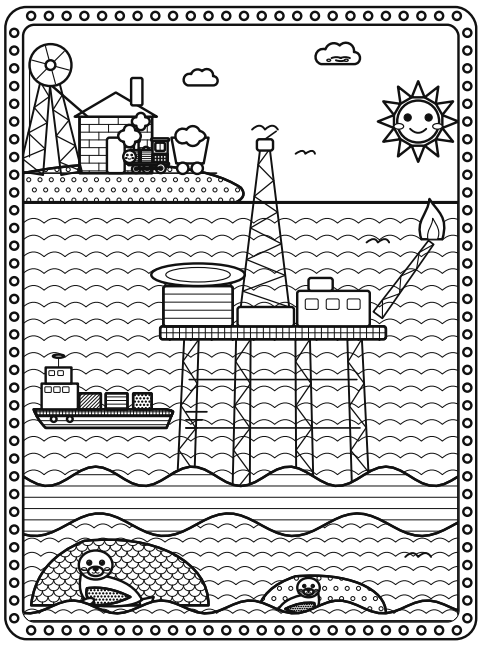
NO LAB TODAY?

Every practical has a set of example results. If you could not do the experiment, use these to finish the results, graph and conclusion.

DOODLE CORNERS

Some pages have a doodle corner. Colour it or doodle in it when you need a short break.

Fuels and energy



We burn fuels to heat our homes, cook our food and drive our cars. But where do fuels come from, and what happens when we burn them?

Theme: energy for Glen Arrin. The Glen Arrin Youth Club is running an energy week. Mia's uncle works offshore in the North Sea, and he is coming to talk about where our oil and gas come from. The club wants to find out how fuels work and what burning them does to our planet.

IN THIS TOPIC YOU WILL LEARN TO

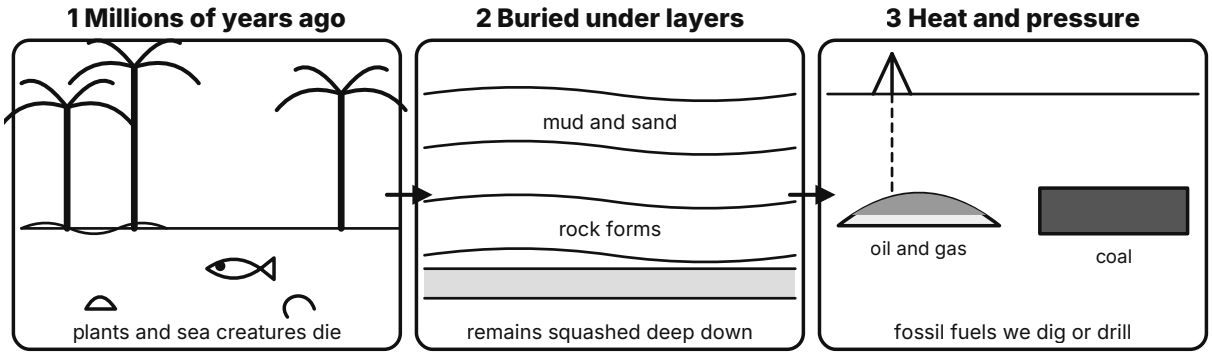
Skill 1	say what a fuel is and name the three fossil fuels
Skill 2	say what burning needs and what it makes
Skill 3	say how burning fossil fuels harms the environment

KEY WORDS

Fuel	something we burn to release energy
Fossil fuel	coal, oil or gas, made from living things that died long ago
Finite	it will run out one day
Oxygen	the gas in the air that fuels need to burn
Acid rain	rain made acidic by gases from burning fuels

❶ What is a fuel?

A **fuel** is something we burn to release **energy**, usually as heat and light. **Coal**, **oil** and **gas** are **fossil fuels**. They formed from plants and sea creatures that died millions of years ago.



KEY FACTS

Fossil fuels take **millions of years** to form. We are using them much faster than that, so they will **run out**. We say they are **finite**.

1 Name the three fossil fuels.

Answer: .....

2 Circle the right words.

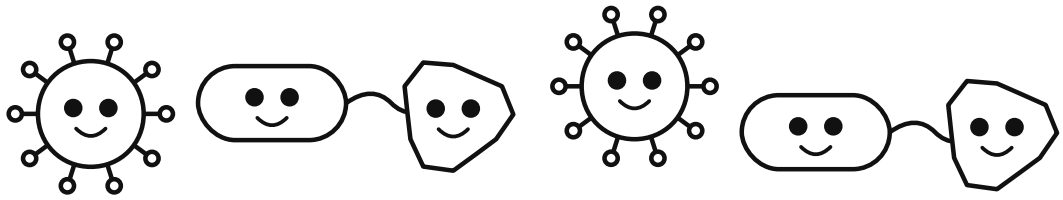
Fossil fuels formed from dead (plants and sea creatures) / (rocks and metals) .

They took (millions of years) / (a few weeks) to form.

3 Why will fossil fuels run out one day?

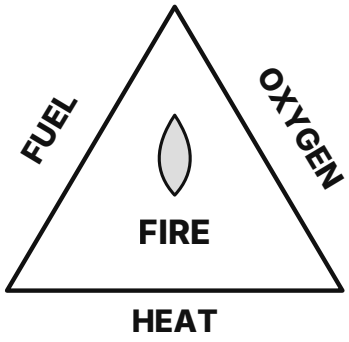
Answer: .....

DOODLE CORNER



❷ Burning fuels

A fire needs **three** things: **fuel**, **oxygen** from the air, and **heat** to get it started. Take one away and the fire goes out. That is how fire blankets work: they stop oxygen getting to the flames.



WHEN A FUEL BURNS

It uses up oxygen and makes:

- **carbon dioxide** gas
- **water** (as steam)
- lots of **energy**: heat and light

fuel + oxygen → carbon dioxide + water

1 What three things does a fire need?

Answer: .....

2 A fire blanket is put over a pan fire. Why does the fire go out?

Answer: .....

3 Fill in the gaps.

gas + ... **→** ..... **+ water**

4 Tick the **two** things a fuel gives out when it burns.

- ☐ Heat
- ☐ Oxygen
- ☐ Light
- ☐ Fossils

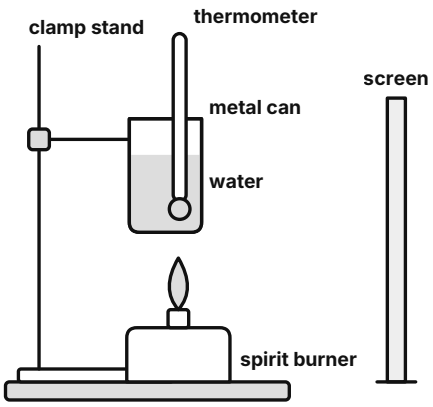
PRACTICAL 1

Which fuel gives out the most heat?

AIM To watch your teacher burn four fuels and find out which one heats water the most.

WATCH, RECORD, ANALYSE

Teacher demonstration only. These fuels catch fire easily. Your teacher does the burning behind a safety screen. You watch from where your teacher tells you, wearing eye protection, and record the results.



WHAT YOUR TEACHER USES

- 4 spirit burners
- Metal can
- Thermometer
- Balance
- Safety screen

Stay safe

Read each hazard. Write how you will stay safe. The last one is done for you.

Hazard What could cause harm?	**Risk** What could happen?	**Control** How will I stay safe?
Fuels catch fire easily	A fire or a burn	
Hot water and a hot metal can	Scalds and burns	
Watching the demonstration	Getting too close to the flame	Stay behind the line your teacher shows you. Wear eye protection.

What your teacher does

Your teacher does these steps for each fuel. You record the temperatures.

1. Pour **100 cm³** of cold water into the metal can.
2. Measure the **start temperature** of the water.
3. Weigh the spirit burner, then light it under the can.
4. Stir the water gently and let the fuel burn until **1 g** has been used up.
5. Put the cap on the burner to put out the flame.
6. Measure the **end temperature** of the water.
7. Use fresh cold water and a cool can for the next fuel.





Results

Temperature rise = end temperature − start temperature.

Fuel (1 g)	Start temperature (°C)	End temperature (°C)	Temperature rise (°C)
Ethanol			
Propanol			
Butanol			
Pentanol			

EXAMPLE

Start 18 °C, end 40 °C. Rise = 40 − 18 = **22 °C**.

NO LAB TODAY? USE THESE RESULTS

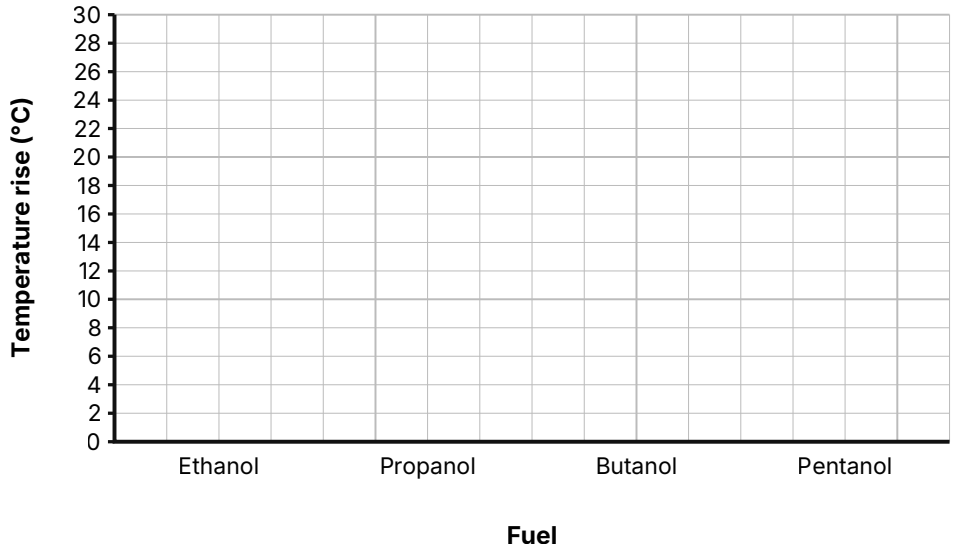
Fuel (1 g)	Start (°C)	End (°C)	Rise (°C)
Ethanol	20	41	
Propanol	19	43	
Butanol	20	46	
Pentanol	21	48	

Work out each temperature rise yourself.

What did you find?

1 Draw a bar chart

Draw one bar for the temperature rise of each fuel.



2 Conclusion

The fuel that heated the water the most was .....

The bigger the temperature rise, the (more) / (less) heat the fuel gave out.

3 Why does this matter?

A fuel that gives out more heat from each gram is (better) / (worse) for heating homes.

4 How could we make it better?

Tick **one** idea and say why it would help.

- ☐ Repeat each fuel three times and find the average
- ☐ Put a lid on the can to stop heat escaping
- ☐ Use a different amount of water for each fuel

It would help because .....

FREE SAMPLE

Fragile Earth (N3 Science)

This sample shows a few pages. The full printed workbook is available from Amazon.

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