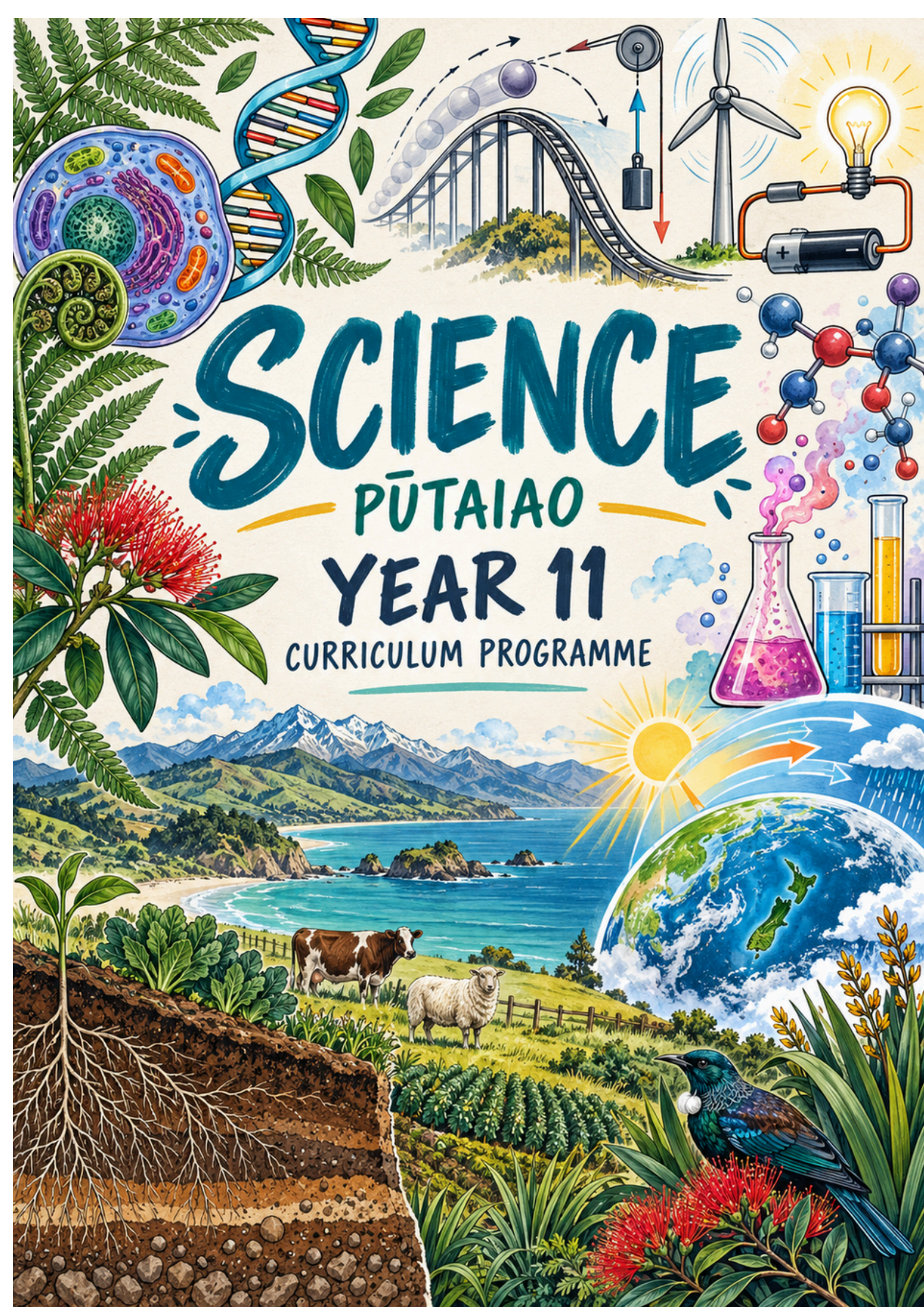




SCIENCE

PŪTAIAO

YEAR 11

CURRICULUM PROGRAMME

PART 1

CURRICULUM FOUNDATIONS



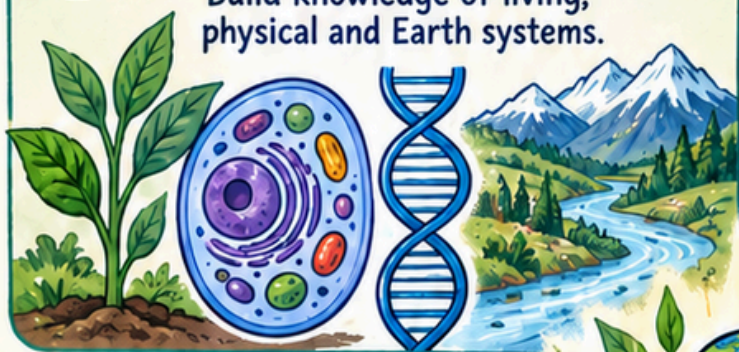
PURPOSE OF SCIENCE

Science helps students understand the natural and physical world through knowledge, investigation and evidence.

1

UNDERSTAND THE WORLD

Build knowledge of living, physical and Earth systems.



2

INVESTIGATE QUESTIONS

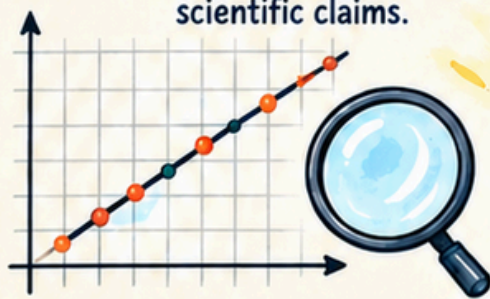
Observe, measure, test and identify patterns.



3

USE EVIDENCE

Analyse data and evaluate scientific claims.



4

EXPLAIN IDEAS

Use models, diagrams and scientific language.



5

CONNECT KNOWLEDGE

Link ideas across the different sciences.



6

SHAPE THE FUTURE

Make informed decisions for people and the environment.



KNOW • INVESTIGATE • EXPLAIN • APPLY

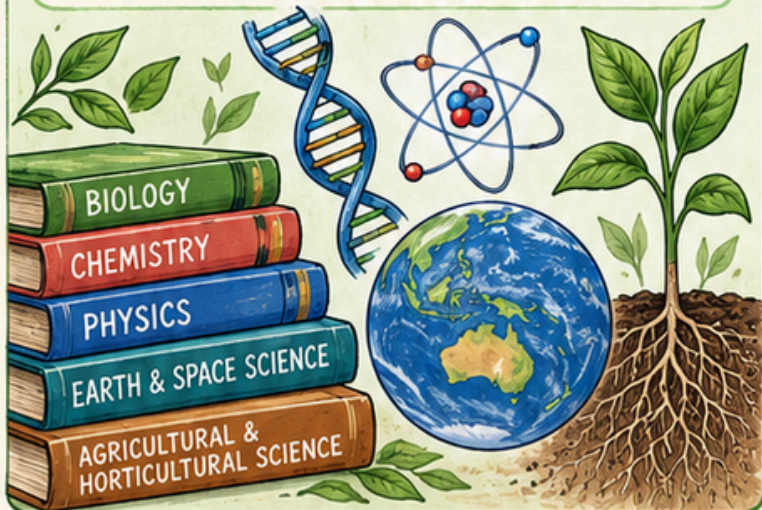
SCIENCE CAPABILITIES

1 KNOWING & UNDERSTANDING

What scientific ideas do students need to know and understand?

FOCUS

Build, organise and recall scientific knowledge. Explain concepts, systems, principles and models. Connect ideas within and across the sciences.



2 ANALYSING & APPLYING

How can students use scientific knowledge to interpret and investigate?

FOCUS

Analyse observations, data, patterns and relationships. Apply models, measurements and practical methods. Make predictions and solve problems.

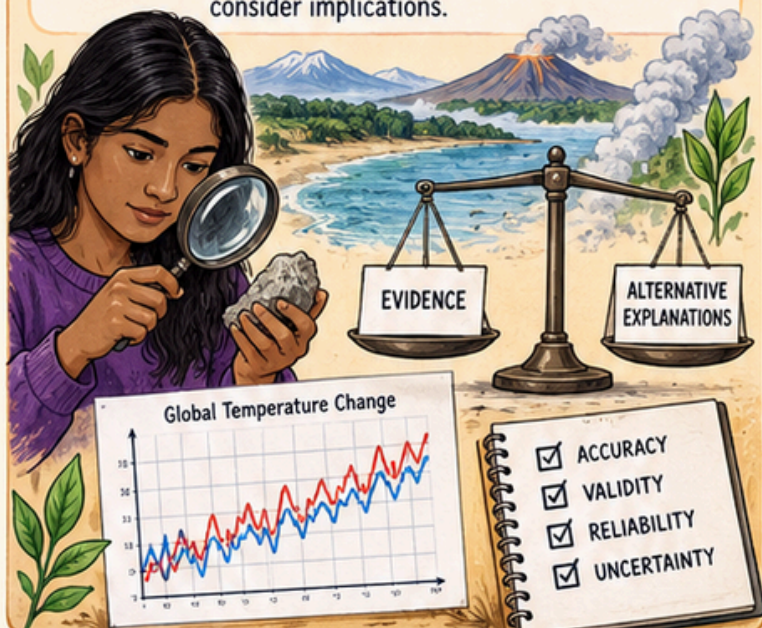


3 EVALUATING & SYNTHESISING

How can students judge evidence and combine scientific ideas?

FOCUS

Evaluate accuracy, validity, reliability and uncertainty. Identify limitations and assumptions. Integrate evidence to justify conclusions and consider implications.

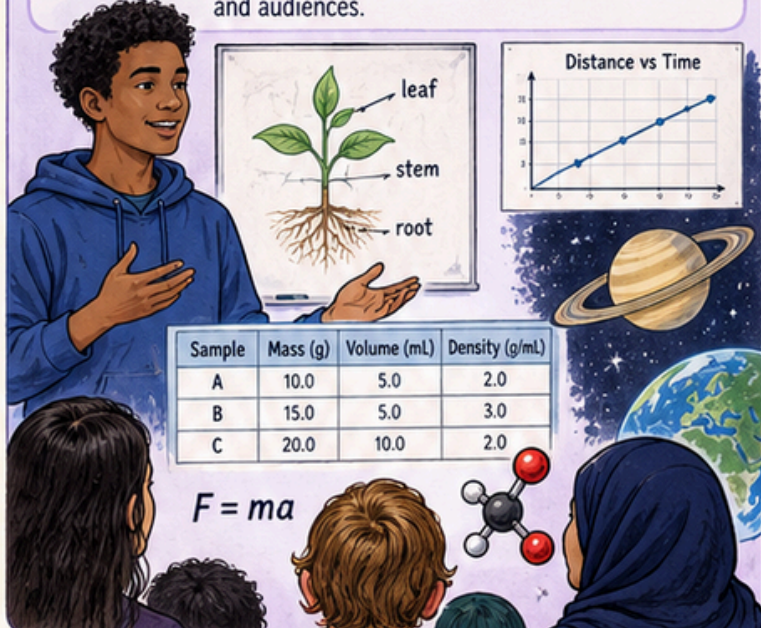


4 REPRESENTING & COMMUNICATING

How can students communicate their scientific thinking clearly?

FOCUS

Use scientific language, explanations, diagrams, graphs, tables, symbols and models. Present evidence-based arguments for different purposes and audiences.



DISCIPLINARY WRITING IN SCIENCE

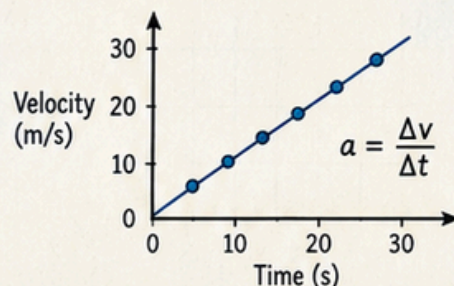
What students need to understand

1 SCIENTIFIC IDEAS ARE BUILT USING EVIDENCE

Scientific explanations combine evidence with precise scientific language.

EXAMPLE — PHYSICS

A velocity–time graph provides evidence about an object's acceleration.

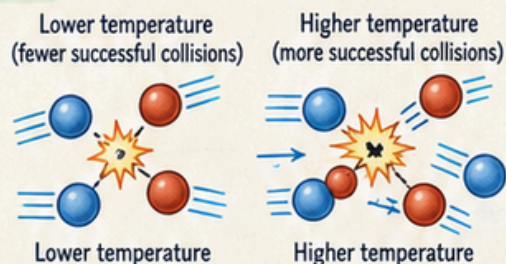


2 SCIENTIFIC PRINCIPLES EXPLAIN HOW AND WHY

Established theories and principles explain events in the natural and physical world.

EXAMPLE — CHEMISTRY

Collision theory explains why increasing temperature increases reaction rate.



3 SCIENTIFIC TEXTS USE RECOGNISED STRUCTURES

Clear methods, results, reasoning and conclusions help make scientific writing credible and reliable.

EXAMPLE — INVESTIGATION

A report shows how data were collected, what pattern was found and what the evidence means.

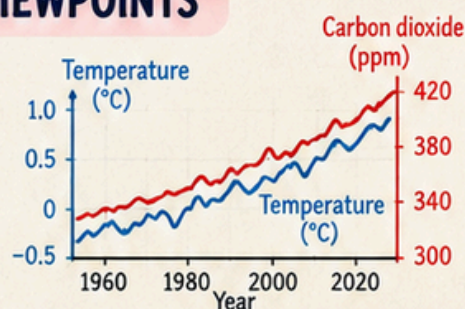


4 SCIENTIFIC TEXTS PRESENT EVIDENCE-BASED VIEWPOINTS

Explanations and viewpoints must be supported by the available scientific evidence.

EXAMPLE — EARTH'S CLIMATE

A climate explanation uses temperature and carbon dioxide data to support its conclusion.



SCIENTIFIC WRITING MAKES SCIENTIFIC THINKING VISIBLE

HOW DISCIPLINARY WRITING FITS INTO A SCIENTIFIC REPORT

One investigation — different purposes for scientific writing

SCIENTIFIC INVESTIGATION REPORT

EXPLAIN & JUSTIFY



Builds the background science and justifies the hypothesis.

REPRESENT DATA



Displays the results and makes patterns visible.

ARGUE FROM EVIDENCE



CLAIM EVIDENCE REASONING

Forms the discussion by connecting claims, evidence and scientific reasoning.

EVALUATE FINDINGS



- Strengths
- Limitations

Judges the quality of the investigation and the strength of the evidence.



1 QUESTION

What are we investigating?



2 BACKGROUND SCIENCE & HYPOTHESIS

What science explains the prediction?



3 METHOD

How were data collected?



4 RESULTS

What do the table and graph show?



CLAIM EVIDENCE REASONING

5 DISCUSSION

How does the evidence support the claim?



6 EVALUATION

- Strengths
- Limitations

How strong and reliable is the evidence?



7 CONCLUSION

What is the answer to the question?

COMMUNICATE THE INVESTIGATION

Organises the entire report: question, method, results, interpretation and conclusion.

One complete report — connected purposes!

THESE ARE NOT SEPARATE TASKS — THEY WORK TOGETHER INSIDE ONE SCIENTIFIC REPORT

SCIENTIFIC WRITING
STRONGER SCIENCE

PART 2

SCIENTIFIC WRITING IN PRACTICE



HOW TO READ SCIENTIFIC TEXTS CRITICALLY



Look
Think
Question
Evaluate

Purpose:

Examine how claims, evidence, language and structure are used to inform or influence a reader.

Reading lens:

CLAIM

EVIDENCE

SOURCE

LANGUAGE

LIMITATIONS

PURPOSE

TEXT TO EXAMINE

A Warmer Future?

Global temperatures are rising. Records from a global climate database show a long-term increase in mean temperature. If this trend continues, communities may face significant environmental changes.

Source: Global temperature records, 1980–2025



Read carefully
and use the
six-question
lens.

Ask yourself:

- 1 What is the main claim?
- 2 What evidence is used?
- 3 Where does the information come from?
- 4 What language is used?
- 5 What are the limitations or missing information?
- 6 What is the purpose?

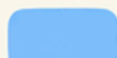
MODEL CRITICAL RESPONSE

The text claims that global temperatures are increasing and uses records from a global climate database as evidence. The long time period strengthens the evidence because it helps reveal a sustained trend rather than a short-term fluctuation. However, the text does not explain how the data were collected or discuss measurement uncertainty. The title 'A Warmer Future?' and the phrase 'significant environmental changes' create concern and attract attention. The text is intended to inform a general audience, but it may also influence readers to view future warming as a serious issue. Therefore, the claim is supported by relevant evidence, although more information about the method and uncertainty is needed.

Colour key:



CLAIM



EVIDENCE AND SOURCE



STRENGTH



LIMITATION



LANGUAGE AND PURPOSE



JUDGEMENT

TEACHER: LOOK FOR

- ✓ The author's main claim
- ✓ Relevant evidence and its source
- ✓ Comments on credibility
- ✓ Language that influences readers
- ✓ Missing information or limitations
- ✓ A balanced overall judgement



DO NOT ONLY SUMMARISE THE TEXT — QUESTION HOW IT BUILDS CREDIBILITY.

HOW EXPLAIN AND JUSTIFY LOOKS

REPORT SECTION: BACKGROUND SCIENCE & HYPOTHESIS

Purpose:

Use established scientific knowledge to explain the prediction and justify the hypothesis.

Question:

How does temperature affect reaction rate?



WRITING STRUCTURE:

SCIENTIFIC PRINCIPLE

CHANGE

HOW OR WHY

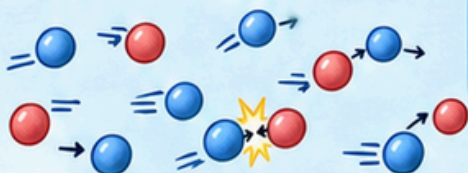
PREDICTION

HYPOTHESIS

COLLISION THEORY AND TEMPERATURE

LOWER TEMPERATURE

- Particles move more slowly
- Fewer collisions
- Less effective collisions



Fewer collisions have enough energy to overcome the activation energy.



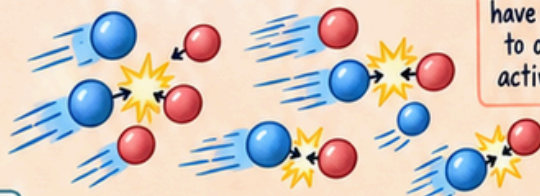
= effective collision (enough energy and correct orientation)



= reacting particles

HIGHER TEMPERATURE

- Particles move faster
- More collisions
- More effective collisions



More collisions have enough energy to overcome the activation energy.

MODEL BACKGROUND EXPLANATION

For a chemical reaction to occur, particles must collide with sufficient energy and the correct orientation.

Increasing temperature gives particles more kinetic energy, so they move faster and collide more frequently.

A greater proportion of collisions also have enough energy to overcome the activation energy.

Therefore, increasing temperature should increase the reaction rate and decrease the reaction time.

HYPOTHESIS

If the temperature of the reactants increases, **then** the reaction time will decrease **because** the particles will produce more frequent and effective collisions.

IF — independent variable

THEN — predicted change in the dependent variable

BECAUSE — scientific reason

COLOUR KEY

- SCIENTIFIC PRINCIPLE
- CHANGE
- HOW OR WHY
- PREDICTION

TEACHER: LOOK FOR

- ✓ Relevant scientific knowledge
- ✓ Accurate specialist vocabulary
- ✓ A clear cause-and-effect chain
- ✓ A prediction supported by science
- ✓ An if-then-because hypothesis

THE HYPOTHESIS IS NOT A GUESS — IT IS JUSTIFIED BY SCIENTIFIC KNOWLEDGE.

HOW REPRESENTING DATA LOOKS

REPORT SECTION: RESULTS

PURPOSE:

Organise measurements so patterns, relationships and evidence can be identified clearly.

QUESTION:

How does temperature affect reaction time?



THE PROCESS:

1 MEASUREMENTS

2 RESULTS TABLE

3 CALCULATE MEANS

4 GRAPH

5 DESCRIBE THE PATTERN

RESULTS TABLE

Temperature (°C)	Trial 1 (s)	Trial 2 (s)	Trial 3 (s)	Mean time (s)
10	122	119	119	120
20	76	74	75	75
30	46	44	45	45
40	26	24	25	25

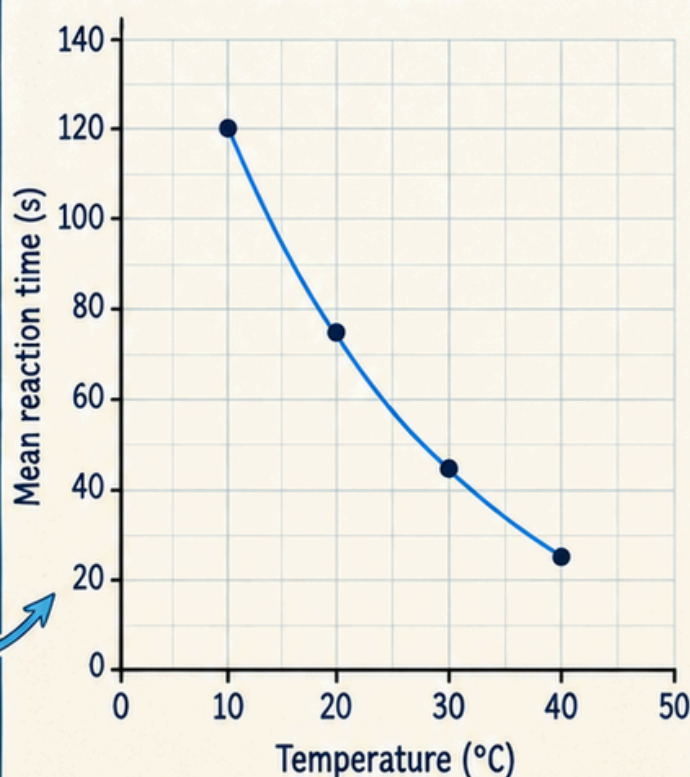
PROCESS THE DATA

Mean at 20°C = $(76 + 74 + 75) \div 3 = 75$ s

MODEL PATTERN STATEMENT

As temperature increased from 10°C to 40°C, the mean reaction time decreased from 120 s to 25 s.

MEAN REACTION TIME VS TEMPERATURE



A SCIENTIFIC GRAPH NEEDS

- ✓ A descriptive title
- ✓ Independent variable on the x-axis
- ✓ Dependent variable on the y-axis
- ✓ Quantities and units
- ✓ A sensible, even scale
- ✓ Accurately plotted points
- ✓ An appropriate line or curve of best fit

TEACHER: LOOK FOR

- ✓ Raw data are recorded
- ✓ Repeats are shown
- ✓ Processed values are correct
- ✓ Table and graph agree
- ✓ The pattern includes values
- ✓ No scientific explanation yet



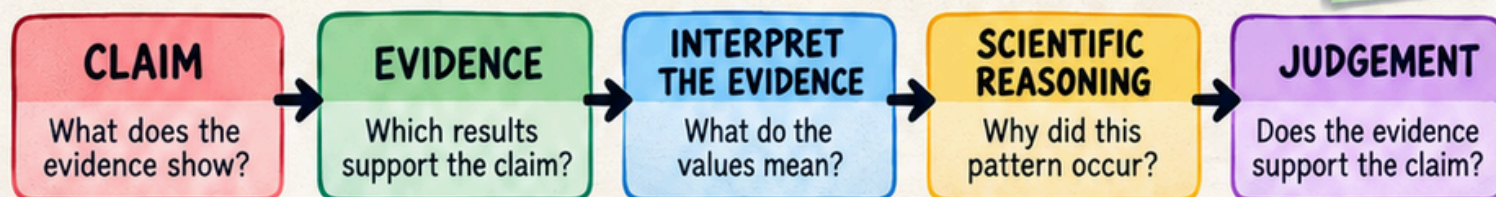
FIRST DESCRIBE WHAT THE DATA SHOW — EXPLAIN WHY IN THE DISCUSSION.

HOW ARGUING FROM EVIDENCE LOOKS

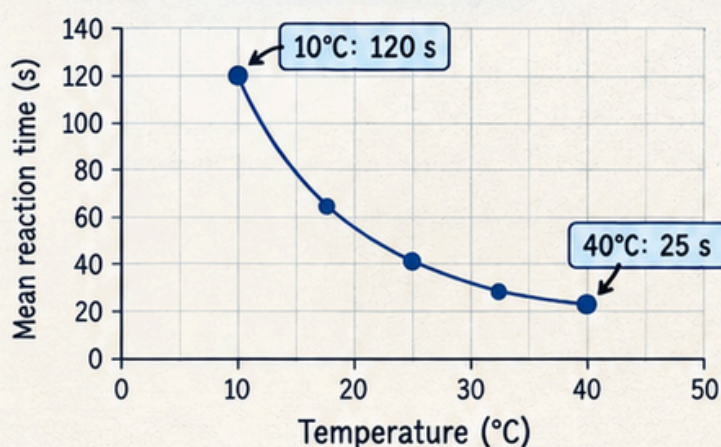
REPORT SECTION: DISCUSSION

Use evidence and scientific reasoning to support a claim.

SAME EVIDENCE. STRONGER ARGUMENTS.

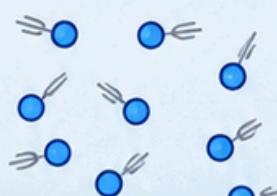


INVESTIGATION RESULTS



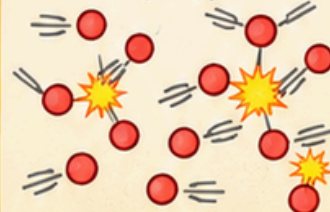
PARTICLE EXPLANATION

Low temperature (10°C)



Particles move more slowly and there are fewer effective collisions.

High temperature (40°C)



Particles move faster, producing more frequent collisions. A greater proportion of collisions also have enough energy to overcome the activation energy.

MODEL DISCUSSION PARAGRAPH

CLAIM

Increasing temperature increased the reaction rate.

EVIDENCE

The mean reaction time decreased from 120 s at 10°C to 25 s at 40°C.

INTERPRET

A shorter reaction time means the reaction occurred at a faster rate.

REASONING

At higher temperatures, particles have more kinetic energy and move faster, producing more frequent collisions. A greater proportion of collisions also have enough energy to overcome the activation energy.

JUDGEMENT

Therefore, the evidence supports the claim that increasing temperature increases reaction rate.

TEACHER CHECKLIST

- ☒ Clear claim
- ☒ Specific data values
- ☒ Explain what the values mean
- ☒ Relevant scientific principle
- ☒ Explicitly link evidence to the claim

Evidence does not speak for itself – reasoning makes the connection.

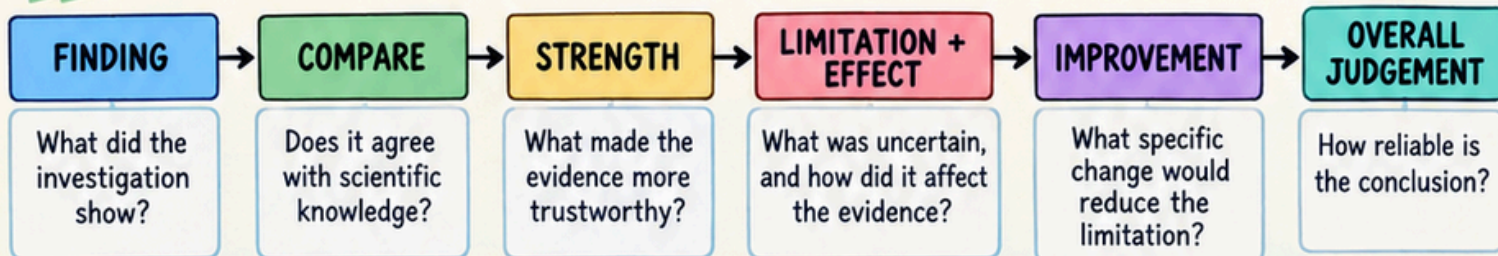


HOW EVALUATING FINDINGS LOOKS

REPORT SECTION: EVALUATION

Think
Critically
Be Specific
Improve
Science

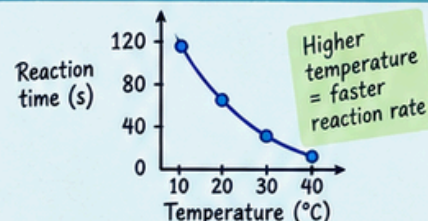
Judge the quality of the evidence and explain how the investigation could be improved.



OUR EVIDENCE

Mean reaction time decreased from 120 s at 10°C to 25 s at 40°C.

The pattern agrees with collision theory: higher temperature produces more frequent collisions and a greater proportion of collisions with enough energy to overcome the activation energy.



MODEL EVALUATION

FINDING + COMPARE	The results showed that increasing temperature decreased reaction time, indicating a faster reaction rate. This agrees with collision theory.
STRENGTH	Three trials were completed at each temperature and a mean was calculated, reducing the influence of an unusual result.
LIMITATION + EFFECT	However, the endpoint was judged by eye, so the timer may have been stopped at slightly different points. This could make the reaction times less consistent and reduce confidence in the exact values.
IMPROVEMENT	Using a light sensor to detect the endpoint would provide the same stopping point for every trial and reduce human judgement.
OVERALL JUDGEMENT	Overall, the consistent decreasing pattern supports the conclusion, but the exact reaction times have some uncertainty.

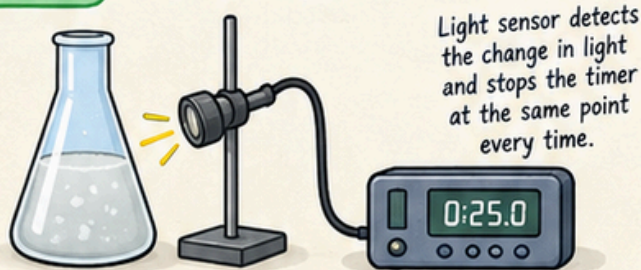
BEFORE

Endpoint judged by eye



AFTER

Objective endpoint



TEACHER CHECKLIST

- ☐ Compare with scientific knowledge
- ☐ Identify a real strength
- ☐ Name a specific limitation
- ☐ Explain its effect on the evidence
- ☐ Suggest an improvement that addresses it

KEY TEACHING MESSAGE

Do not only name a limitation — explain its effect on the evidence.

ONE INVESTIGATION – ONE COMPLETE SCIENTIFIC REPORT

Each writing purpose has a different job, but they work together to communicate the investigation.

QUESTION

BACKGROUND SCIENCE & HYPOTHESIS

METHOD

RESULTS

DISCUSSION

EVALUATION

CONCLUSION

PLANNING AND EVIDENCE

SETS UP, CARRIES OUT AND PRESENTS THE INVESTIGATION.



1. QUESTION

How does temperature affect reaction rate?

Defines what will be investigated.



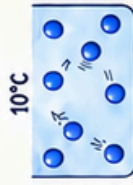
2. BACKGROUND SCIENCE & HYPOTHESIS

EXPLAIN AND JUSTIFY

Particles must collide with enough energy for a reaction to occur. Increasing temperature gives particles more kinetic energy, producing more frequent collisions and a greater proportion of collisions that overcome the activation energy.

Hypothesis:

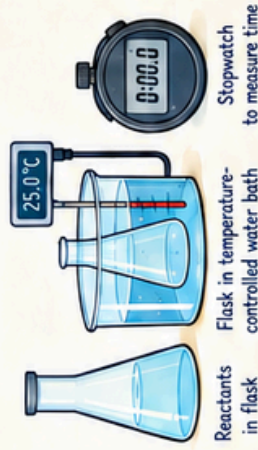
If temperature increases, reaction time will decrease because particles will produce more frequent and effective collisions.



3. METHOD

COMMUNICATE THE INVESTIGATION

Change: temperature – 10°C, 20°C, 30°C, 40°C
Measure: reaction time
Control: reactant volumes and concentrations
Repeat: three trials at each temperature



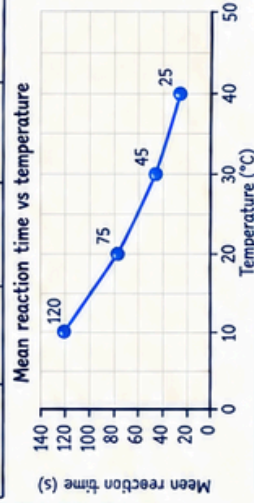
Reactants in flask
Flask in temperature-controlled water bath
Stopwatch to measure time



4. RESULTS

REPRESENT DATA

Temperature (°C)	Trial 1 (s)	Trial 2 (s)	Trial 3 (s)	Mean (s)
10	122	119	119	120
20	76	74	75	75
30	46	44	45	45
40	26	24	25	25



Pattern statement:
As temperature increased from 10°C to 40°C, mean reaction time decreased from 120 s to 25 s.

REASONING AND JUDGEMENT

INTERPRETS THE EVIDENCE, CONSIDERS ITS QUALITY AND ANSWERS THE QUESTION.



5. DISCUSSION

ARGUE FROM EVIDENCE

CLAIM → EVIDENCE → INTERPRET → REASONING → JUDGEMENT

Model paragraph:

Claim Increasing temperature increased the reaction rate.
Evidence The mean reaction time decreased from 120 s at 10°C to 25 s at 40°C.
Interpret A shorter reaction time means the reaction occurred faster.
Reasoning At higher temperatures, particles have more kinetic energy, causing more frequent collisions and a greater proportion of collisions with enough energy to overcome the activation energy.
Judgement Therefore, the evidence supports the claim that increasing temperature increases reaction rate.



7. CONCLUSION

Answers the investigation question.

Increasing temperature increased reaction rate, shown by the decrease in mean reaction time from 120 s at 10°C to 25 s at 40°C.



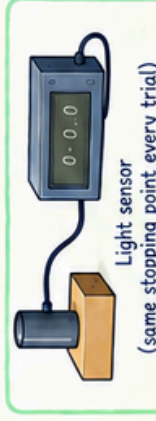
6. EVALUATION

EVALUATE FINDINGS

STRENGTH → LIMITATION + EFFECT → IMPROVEMENT → OVERALL JUDGEMENT

Model paragraph:

Repeating each temperature three times and calculating a mean reduced the influence of an unusual result. However, judging the endpoint by eye could make the times less consistent and reduce confidence in the exact values. A light sensor would provide the same stopping point for every trial. Overall, the consistent pattern supports the conclusion, but the exact times have some uncertainty.



KEY:

EXPLAIN AND JUSTIFY – builds the hypothesis

REPRESENT DATA – presents the evidence

ARGUE FROM EVIDENCE – explains the discussion

EVALUATE FINDINGS – judges evidence quality

COMMUNICATE THE INVESTIGATION – organises the whole report

These are not separate writing tasks. They are connected parts of one scientific report.

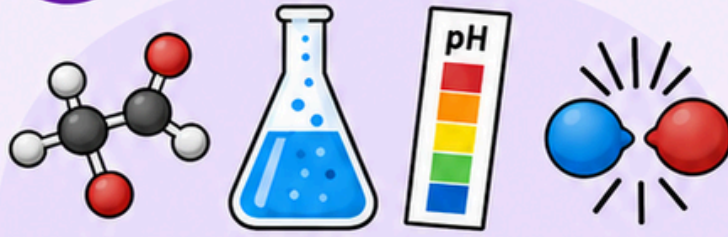
PART 3

CURRICULUM STRUCTURE



1

CHEMISTRY

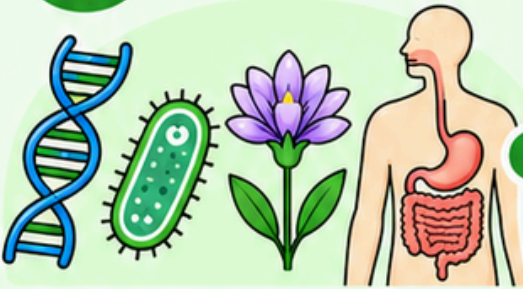


FOCUS AREAS

- Properties and bonding
- Chemical reactions
- Acids, bases and pH
- Rates of reaction

2

BIOLOGY



FOCUS AREAS

- Inheritance
- Microorganisms
- Plant biology
- Animal biology

3

PHYSICS



FOCUS AREAS

- Motion and acceleration
- Forces and falling objects
- Energy and power
- Electrical circuits

SCIENCE COURSE STRUCTURE

4

EARTH AND SPACE SCIENCE

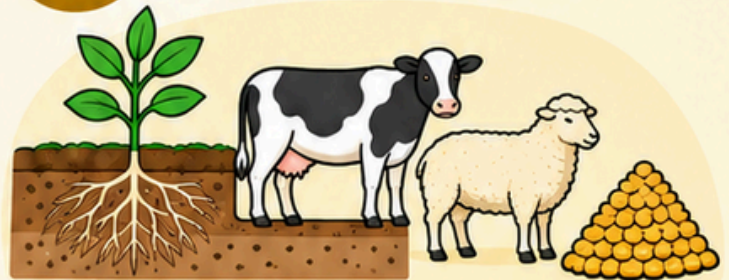


FOCUS AREAS

- Earth's energy budget
- Albedo and insolation
- The greenhouse effect
- Carbon cycle and climate change

5

AGRICULTURAL AND HORTICULTURAL SCIENCE



FOCUS AREAS

- Soil composition and properties
- Soil fertility and plant growth
- Livestock digestion and nutrition
- Livestock reproduction