Science 7–8

SITs, end-of-band review and solutions

Aboriginal and Torres Strait Islander content has been excluded as accuracy cannot be guaranteed, and it is better to be respectful than cover the entire curriculum inaccurately.

Significant effort has been made to ensure this content is legal. Please send any areas of concern to admin@vwx.au with appropriate document/legal references so errors can be verified and changes be made.

Contents

SIT-1 Reading someone else's investigation

What this task is — Scientific Investigation Task 1 (SIT-1) from the assessment plan (§7): *reading someone else's investigation*. A group's method and data set are supplied, whole. The student's job is to read them the way Chapters 2–6 taught the reading: identify the variables and the unstated assumptions (VC2S8I01, VC2S8I02), process and represent the data (VC2S8I04), describe the trend and find the anomaly (VC2S8I05), find the sources of error and say how the method could be improved (VC2S8I06), and justify a conclusion from the evidence (VC2S8I07). SIT-1 lives in the Review booklet (Ch19) and is sat **after Ch6, before the knowledge chapters** — on purpose, nothing in it needs Ch7–17 content. It is inquiry, assessed as inquiry (D7). **Achievement-standard extracts served (D13).** From the authority file, for the six CDs this task assesses: VC2S8I01 — *"Students develop hypotheses and make reasoned predictions to identify patterns, test relationships…"*; VC2S8I02 — *"They plan a range of reproducible scientific investigations, document procedures…"*; VC2S8I04 — *"They select and construct appropriate representations to organise and process data and information."*; VC2S8I05 — *"They analyse and connect data and information to identify and explain patterns, trends, relationships and anomalies."*; VC2S8I06 — *"They identify assumptions and sources of error in methods…"*; VC2S8I07 — *"They provide science-based explanations for findings, and use evidence to support conclusions and evaluate claims."* **Administration — a school instrument, not a VCAA exam.** Levels 7 and 8 carry no VCAA examination and no external assessment (D14). This task is a school-based assessment instrument of this book's own design, graded against the achievement-standard extracts above. **Completion is untimed:** students may take the time they need, over more than one session if the school chooses. **Reading support:** the plan specifies none for this task, so students may use the reading support their classroom normally provides — for example, a teacher reading a question aloud. Calculations may be done by hand or with a calculator. **Marks: 25.** The point-based marking guide and the full model response follow the questions — there is no holistic rubric anywhere in this task.

The investigation you are reading

Another group in your school has run an investigation and handed you their write-up. Your job is to read it, process it, and say what it actually shows.

Their question. *How does the height a tennis ball is dropped from affect the height it bounces back to?*

Their setup. The group worked in the school hall. They used one tennis ball, one metre ruler, and the hall floor. They read every bounce height to the nearest 0.01 m — the top of a bounce moves fast, and 0.01 m is the finest reading a metre ruler and an eye can honestly manage. Safety: bags and feet stay clear of the falling ball.

Their method, as they wrote it:

1. Tape a metre ruler to the wall, zero end at floor level.
2. Hold the tennis ball at the chosen drop height, next to the ruler. Let go, do not throw.
3. Watch the bounce and read the height the ball reaches from the ruler.
4. Do this two more times at the same height. Then move to the next height.
5. Test drop heights of 0.20 m, 0.40 m, 0.60 m, 0.80 m and 1.00 m.

Their results (simulated data for practice):

Drop height (m)	Bounce height, trial 1 (m)	Bounce height, trial 2 (m)	Bounce height, trial 3 (m)	Mean bounce height (m)
0.20	0.11	0.12	0.11	
0.40	0.22	0.21	0.22	
0.60	0.33	0.34	0.32	
0.80	0.44	0.71	0.46	
1.00	0.55	0.56	0.54	

The group stopped before they processed their data. The mean column is empty — filling it is your first job.

Answer all eight questions. Show your working wherever you calculate. The questions are worth 25 marks in total:

Question	Assesses	Marks
1	The hypothesis and the variables (VC2S8I01, VC2S8I02)	5
2	Unstated assumptions (VC2S8I02)	3
3	Processing the data — means and the anomaly (VC2S8I04, VC2S8I05)	4
4	Representing the data — the line graph (VC2S8I04)	4
5	The trend (VC2S8I05)	2
6	Sources of error (VC2S8I06)	2
7	Improvements (VC2S8I06)	2
8	A conclusion justified from the evidence (VC2S8I07)	3
	Total	**25**

Question 1 — the hypothesis and the variables *(5 marks)*

(a) Write the hypothesis this investigation is testing — a testable statement predicting the relationship between the two variables. *(1 mark)*
(b) Identify the independent variable — the variable the group changed on purpose. *(1 mark)*
(c) Identify the dependent variable — the variable the group measured. *(1 mark)*
(d) Identify two controlled variables — two things the method keeps the same on purpose. *(2 marks)*

Question 2 — the unstated assumptions *(3 marks)*

(a) State two things this method takes for granted without checking — two unstated assumptions. *(2 marks)*
(b) Choose one of your assumptions and say, in one line, how the results would be affected if it turned out to be wrong. *(1 mark)*

Question 3 — processing the data *(4 marks)*

(a) Calculate the mean bounce height at 0.20 m, 0.40 m, 0.60 m and 1.00 m. Record each mean to the nearest 0.01 m. (Mean = sum of the trials ÷ number of trials.) *(2 marks)*
(b) One reading in the table does not fit the pattern. Identify it, and give one piece of evidence from the table that shows it does not fit. *(1 mark)*
(c) Calculate the mean bounce height at 0.80 m, handling that reading the way you think is right, and give your reason in one line. *(1 mark)*

Question 4 — representing the data *(4 marks)*

Construct a line graph of the processed data: drop height on the horizontal axis, mean bounce height on the vertical axis.

(a) Label both axes with the quantity and its unit, and give the graph a title. *(1 mark)*
(b) Choose an even scale for each axis that uses most of the grid. *(1 mark)*
(c) Plot the five means you calculated in Question 3. *(2 marks)*

You may join your points or leave them as points. Do not draw a line of best fit — that skill belongs to Levels 9–10, not this band.

Question 5 — the trend *(2 marks)*

(a) Describe the trend your graph shows. Name both variables in your sentence. *(1 mark)*

(b) At every height tested, about how many times the drop height does the ball bounce back to? Show one line of working from the table to support your answer. *(1 mark)*

Question 6 — sources of error *(2 marks)*

Identify two sources of error in this method. For each one, say whether it is random or systematic, and give half a line of reason. *(2 × 1 mark)*

Question 7 — improvements *(2 marks)*

Suggest two improvements to the method. Each improvement must match one of the problems you named in Question 6 — it must fix that problem or shrink it. *(2 × 1 mark)*

Question 8 — a conclusion justified from the evidence *(3 marks)*

(a) Write a statement that answers the investigation question, covering only what was actually tested. *(1 mark)*

(b) Justify your statement with specific numbers from your processed data. *(1 mark)*

(c) State one thing this evidence does not show — one limit of the investigation. *(1 mark)*

Sources

- Victorian Curriculum and Assessment Authority, *Victorian Curriculum F–10 Version 2.0, Science, Levels 7 and 8*, content descriptions VC2S8I01, VC2S8I02, VC2S8I04, VC2S8I05, VC2S8I06 and VC2S8I07 and their elaborations, 2026. vcaa.vic.edu.au — retrieved 2026-08-22.

The tennis-ball method is an original teaching scenario and the readings in the results table are **simulated data for practice**, labelled as such above; they are teaching data, not measurements, and carry no source claim. No real group, school or measurement is represented.

Elaboration contexts drawn on: VC2S8I01.E04 (formulating a hypothesis that predicts a relationship), VC2S8I02.E01 (assumptions about variables taken to be constant), VC2S8I02.E04 (identifying variables and assumptions in a reproducible investigation), VC2S8I05.E03 (a correlational relationship in drop-height data), VC2S8I06.E01 (sources of error and matching improvements), VC2S8I07.E02 (the quality of the evidence behind a conclusion). VC2S8I04 is assessed from its CD text — tables and graphs — per D12's thin-bank note, with the D11 maths interlock carrying the processing: the mean (VC2M7ST01), rounding to an accuracy the data earns (VC2M7N04) and plotting tables of values on the Cartesian plane (VC2M7A05).

Teacher-facing note (not student text). SIT-1 is sat after Ch6, so the task is deliberately content-neutral: no Ch7–17 knowledge is assumed or assessed, and the scenario is everyday mechanics read through the inquiry spine. It is a paper task — no practical is conducted for it; the one safety line sits in the supplied method itself, where 3B models it. Marking is strictly point-based per §7: every mark above is tied to a stated point, and no holistic judgement is applied at any level. Graphing demand is capped by D11: gradient (VC2M9A04) and line of best fit (VC2M10ST02) are Levels 9–10 skills — neither is required here, and neither is penalised if a student produces one. SIT-1 carries no Aboriginal and Torres Strait Islander content; D10's protocol limb is assessed through SIT-2's risk assessment and ethics statement, as §7 specifies. The model response that follows shows a full-mark standard; annotations in parentheses carry the mark points from the guide.

Marking guide

Point-based marking: every mark is a stated point below, and there is no holistic rubric. Award each point on its own; accept any answer listed, or any answer of the same standard. Spelling and grammar do not lose marks unless a word cannot be read. Where a later question builds on an earlier answer (Question 4 on Question 3), mark the later question on the student's own processed values, not on the model's. **Total: 25 marks.**

Question 1 — 5 marks

- (a) *(1 mark)* A testable statement predicting the relationship: the greater the drop height, the greater the bounce height. Accept "if the ball is dropped from a greater height, then it bounces back higher". No mark for restating the question or for a prediction with no direction.
- (b) *(1 mark)* The drop height of the ball.
- (c) *(1 mark)* The bounce height — the height the ball reaches after it bounces.
- (d) *(2 × 1 mark)* Any two things the method actually keeps the same: the same tennis ball; the same floor (the hall floor); the same release rule (let go, do not throw); the same metre ruler. No mark for something the method merely takes for granted — "the floor is equally hard everywhere" is an assumption (Question 2), not a controlled variable; the distinction is part of what is being assessed.

Question 2 — 3 marks

- (a) *(2 × 1 mark)* Any two unstated assumptions. Accept list: the ball bounces the same way every time (it does not warm up, soften or lose bounce across the trials); the ball lands on the same patch of floor each time / the floor is equally hard wherever it lands (the method never marks a landing spot); every release is the same — "let go, do not throw" is an instruction, not a check; the air in the hall stays still; the ruler stays upright with its zero at floor level; the height is read the same way every time (same part of the ball, eye level with the reading). Must be something the method takes for granted, not something it states.
- (b) *(1 mark)* One line linking the broken assumption to its effect on the results. Example: if the ball softened with use, the later drops — the higher heights, tested last — would bounce lower than they should, flattening the trend. Example: if some releases were tiny throws, those bounces would jump and the readings would scatter.

Question 3 — 4 marks

- (a) *(2 marks)* Means to the nearest 0.01 m: 0.20 m → 0.11 m, 0.40 m → 0.22 m, 0.60 m → 0.33 m *(1 mark)*; 1.00 m → 0.55 m *(1 mark)*. Unrounded values (0.113, 0.217, 0.33, 0.55) are accepted.
- (b) *(1 mark)* The reading is 0.71 m — trial 2 at 0.80 m — with one piece of evidence from the table: the other two trials at 0.80 m are 0.44 m and 0.46 m; or the pattern elsewhere puts the bounce at about 0.55 of the drop height, so about 0.44 m is expected at 0.80 m; or the mean at the greater drop of 1.00 m is only 0.55 m, so a lower drop bouncing to 0.71 m breaks the whole pattern.
- (c) *(1 mark)* The handling, with a reason. Preferred: exclude the 0.71 m reading and average the two trials that agree with each other and with the pattern: (0.44 + 0.46) ÷ 2 = 0.45 m. Also accepted: keep it, giving (0.44 + 0.71 + 0.46) ÷ 3 = 0.54 m, **if** the student says the odd reading pulls the mean above where the pattern puts it. A choice with no reason earns no mark here.

Question 4 — 4 marks

- (a) *(1 mark)* Both axes labelled with quantity and unit — drop height (m) horizontal, mean bounce height (m) vertical — and a title (e.g. *Mean bounce height against drop height for a tennis ball*).
- (b) *(1 mark)* Even scales that use most of the grid — e.g. steps of 0.10 m or 0.20 m on the horizontal axis and 0.05 m or 0.10 m on the vertical. Starting at zero is expected at this band but not enforced if the graph still reads clearly.
- (c) *(2 marks)* The five means from the student's Question 3 plotted accurately: four correct *(1 mark)*, five correct *(2 marks)*. Allow half a small square either way. Raw trials plotted instead of means earn at most 1 mark here.
- Note: points may be joined or left; a line of best fit is not required (D11) and is not penalised if drawn.

Question 5 — 2 marks

- (a) *(1 mark)* The trend names both variables: as the drop height increases, the bounce height increases. A stronger answer adds the shape: in roughly equal steps — about 0.11 m more bounce for each 0.20 m step of drop height. "It goes up" without both variables named earns no mark.
- (b) *(1 mark)* About 0.55 times (accept about one half, or anything from 0.5 to 0.6) with one line of working from the table: $0.55 \div 1.00 = 0.55$, or $0.11 \div 0.20 = 0.55$, or the same point made with any other height.

Question 6 — 2 marks

- *(2 × 1 mark)* One mark per source of error named for this method, with a correct random or systematic label and half a line of reason. Accept list: judging the top of a fast bounce by eye — readings land a little high or a little low by chance — random; reading the ruler from an angle instead of straight on — random (or systematic if the reader always stands in the same place, and the student says so); reading the top of the ball instead of the bottom every time — systematic, every reading about a ball diameter (about 0.07 m) too high; the ruler's zero not exactly at floor level — systematic, every reading shifted the same way; the ball bouncing a different distance from the ruler each time — random, the reading gets harder to make. Errors must belong to this method — generic answers ("human error") earn no mark.

Question 7 — 2 marks

- *(2 × 1 mark)* One mark per improvement that matches a Question 6 error — it must fix or shrink that error. Accept list: film each bounce and read the peak from the paused or slow-motion video (matches the by-eye peak judgement); agree before starting to read the bottom of the ball every time (matches the top/bottom reading error); check the ruler's zero and upright position before starting, and re-tape it if it moves (matches the ruler error); mark a landing spot on the floor and re-drop any ball that bounces away from it (matches the changing landing spot); more trials per height and the mean (matches a random error only — no mark when the Question 6 error was systematic, because repeating a systematic error changes nothing).

Question 8 — 3 marks

- (a) *(1 mark)* A statement answering the question, scoped to what was tested: for this ball on this floor, over 0.20–1.00 m, the greater the drop height, the greater the bounce height.
- (b) *(1 mark)* Specific processed numbers cited: the means rise 0.11, 0.22, 0.33, 0.45 and 0.55 m as the drop height rises in equal 0.20 m steps; or the bounce is about 0.55 of the drop height at every height tested.

(c) *(1 mark)* One real limit: this one ball only; this one floor only; the range 0.20–1.00 m only, with nothing shown above 1.00 m; three trials per height read to 0.01 m; one reading set aside as an anomaly. “We could be more careful” without a named limit earns no mark.

Total: 5 + 3 + 4 + 4 + 2 + 2 + 2 + 3 = 25 marks.

Model response

A full-mark response, written out in full so the standard is visible. Mark points from the guide are annotated in parentheses.

Question 1. (a) Hypothesis: *the greater the height the tennis ball is dropped from, the greater the height it bounces back to (1 mark)*. (b) Independent variable: the drop height of the ball *(1 mark)*. (c) Dependent variable: the height the ball bounces back to *(1 mark)*. (d) Controlled variables: the same tennis ball is used for every drop, and every release follows the same rule — let go, do not throw *(1 mark each; the same hall floor and the same metre ruler also earn the marks) (2 marks)*.

Question 2. (a) Two unstated assumptions. First, the method takes for granted that the ball bounces the same way on every drop — it never checks that the ball is not warming up or going soft as the trials go on. Second, the method never marks a landing spot, so it takes for granted that the floor is equally hard wherever the ball happens to land *(1 mark each)*. (b) If the first assumption failed — the ball going soft with use — the later drops, which are the higher heights, would bounce lower than they should, and the trend would come out flatter than it really is *(1 mark)*.

Question 3. (a) Means to the nearest 0.01 m: at 0.20 m, (0.11 + 0.12 + 0.11) ÷ 3 = 0.11 m; at 0.40 m, (0.22 + 0.21 + 0.22) ÷ 3 = 0.22 m; at 0.60 m, (0.33 + 0.34 + 0.32) ÷ 3 = 0.33 m; at 1.00 m, (0.55 + 0.56 + 0.54) ÷ 3 = 0.55 m *(2 marks)*. (b) The reading that does not fit is 0.71 m — trial 2 at 0.80 m. Evidence from the table: the other two trials at 0.80 m are 0.44 m and 0.46 m, and the mean at the greater drop of 1.00 m is only 0.55 m — in this pattern a lower drop cannot bounce higher than a higher one *(1 mark)*. (c) I set the 0.71 m reading aside and average the two trials that agree with each other and with the pattern: (0.44 + 0.46) ÷ 2 = 0.45 m. One reading that fights its two partners and the whole pattern should not outweigh them *(1 mark)*.

Question 4. The full-mark graph *(4 marks)*: title — *Mean bounce height against drop height for a tennis ball (simulated data for practice)*; horizontal axis — drop height (m), 0 to 1.10 m in even steps of 0.10 m; vertical axis — mean bounce height (m), 0 to 0.60 m in even steps of 0.05 m; the five means plotted at (0.20, 0.11), (0.40, 0.22), (0.60, 0.33), (0.80, 0.45) and (1.00, 0.55), using the values from Question 3. The points may be joined; no line of best fit is drawn. The rise is steady: each point sits about the same distance above the one before it.

Question 5. (a) As the drop height increases, the bounce height increases — in roughly equal steps of about 0.11 m for each 0.20 m step up in drop height *(1 mark)*. (b) At every height tested, the bounce is about 0.55 times the drop height: 0.55 ÷ 1.00 = 0.55, and 0.11 ÷ 0.20 = 0.55 *(1 mark)*.

Question 6. Two sources of error. First, judging the top of a fast bounce by eye — the reading lands a little high on one drop and a little low on the next, by chance, so it is a random error. Second, if the group read the top of the ball instead of the bottom, every reading would come out about a ball diameter — about 0.07 m — too high, the same way every time, so it would be a systematic error *(1 mark each)*.

Question 7. Two improvements, matched to Question 6. First, film each bounce on a phone camera and read the peak from the paused video — this matches the by-eye judgement error, because the peak can be read from a still picture instead of a guess. Second, agree before starting to read the bottom of the ball every time — this matches the top/bottom error, because it removes the same-direction shift *(1 mark each)*.

Question 8. (a) For this tennis ball on this floor, over the range 0.20–1.00 m, the greater the height the ball is dropped from, the greater the height it bounces back to *(1 mark)*. (b) The processed means rise in nearly equal steps — 0.11 m, 0.22 m, 0.33 m, 0.45 m and 0.55 m — as the drop height rises in equal 0.20 m steps, and at every height tested the bounce is about 0.55 times the drop height *(1 mark)*. (c) The evidence does not show what happens above 1.00 m — the pattern may keep going, or the bounce may level out — and it covers only this one ball and this one floor, so the same result cannot be claimed for other balls or surfaces *(1 mark)*.

SIT-2 Running your own

What this task assesses — Science inquiry strand: VC2S8I02, VC2S8I03, VC2S8I04, VC2S8I05, VC2S8I06, VC2S8I07 and VC2S8I08 (Victorian Curriculum F–10 Version 2.0, Science, Levels 7 and 8). SIT-2 is the second of the two Scientific Investigation Tasks that assess Chapter 2–6's inquiry spine (D7). Where SIT-1 reads someone else's investigation, SIT-2 runs one of your own: you choose one of four approved contexts drawn from Chapters 7–14, plan the investigation, write the risk assessment and the ethics statement, conduct it, keep the logbook, process the data, analyse it, evaluate the method and the conclusion, and report the finding to a stated audience. **Achievement-standard extracts served here (D13), as the authority file gives them:** VC2S8I02 — *"They plan a range of reproducible scientific investigations, document procedures and identify potential ethical issues and intercultural considerations required for fieldwork or use of secondary data."* · VC2S8I03 — *"They select and use equipment to generate and record data with precision."* · VC2S8I04 — *"They select and construct appropriate representations to organise and process data and information."* · VC2S8I05 — *"They analyse and connect data and information to identify and explain patterns, trends, relationships and anomalies."* · VC2S8I06 — *"They identify assumptions and sources of error in methods and analyse conclusions and claims with reference to conflicting evidence and unanswered questions."* · VC2S8I07 — *"They provide science-based explanations for findings, and use evidence to support conclusions and evaluate claims."* · VC2S8I08 — *"They select and use appropriate presentation formats, scientific vocabulary, models and other representations when communicating their ideas, findings and arguments for specific purposes to specific audiences."* **The cultural-heritage and permissions check (D10 protocol limb).** Part 3 of this task is where the protocol limb of VC2S8I02 is assessed: every student works through the permissions pathway taught in subtopic 3B — the *National Parks Act 1975* (Vic), the *Wildlife Act 1975* (Vic) and the *Aboriginal Heritage Act 2006* (Vic), and the land manager's permission where none of the three applies — and records the outcome for their chosen context, because the achievement standard above asks students to identify potential ethical issues and intercultural considerations required for fieldwork or the use of secondary data. The instruments are named; no provision numbers are cited in this task. **Elaboration contexts drawn on:** VC2S8I02.E05 (acknowledging sources when using secondary data, and respecting cultural protocols) and VC2S8I02.E06 (permission sought before fieldwork, and no harm caused to cultural sites and artefacts) are assessed through Part 3.

Scientific Investigation Task 2 — Running your own

Science inquiry · Chapter 19, hosted after Chapter 14 · Codes VC2S8I02, VC2S8I03, VC2S8I04, VC2S8I05, VC2S8I06, VC2S8I07 and VC2S8I08

Total: 35 marks · Part 1 Plan: 6 marks · Part 2 Risk assessment: 5 marks · Part 3 Ethics statement: 5 marks · Part 4 Logbook: 4 marks · Part 5 Processed data: 5 marks · Part 6 Analysis: 3 marks · Part 7 Evaluation: 4 marks · Part 8 Report: 3 marks

Planned for about three weeks of class time. This task is untimed — there is no time to beat.

This is a school-designed task. It is not a VCAA instrument. There is no external examination at Levels 7 and 8; achievement is reported against the Victorian Curriculum achievement standard on teacher judgement, and the marks here are one source of evidence towards that judgement.

Conditions

- Completion is **untimed**. The three weeks is planning guidance only; your teacher will set the checkpoints and the due dates.
- **Reading support** is permitted. Your teacher may read any part of this task out to you if you need it. Reading is not what is being looked at, and your teacher will not help with the answers.
- A **scientific calculator is permitted** for processing your data.
- You may work with one partner for the bench work, but **each student keeps their own logbook and writes their own plan, risk assessment, ethics statement, analysis, evaluation and report.**
- **Write down what you actually saw**, even when it is messy. Made-up numbers are not science. A messy result you can explain is worth more than a tidy one you invented.

The task in one paragraph

Plan and run your own investigation from one of the four approved contexts below. Before any bench work starts, your teacher must approve three things: your plan (Part 1), your risk assessment (Part 2) and your ethics statement (Part 3). Then run the investigation and keep a logbook (Part 4). Process your data into a table and a graph (Part 5), analyse it for trends and anomalies (Part 6), evaluate your method and your conclusion (Part 7), and finish with a report written for a stated audience (Part 8). The eight parts are marked separately, with the point-based marking guide at the back of this task.

Part 1 — Context and plan (6 marks)

Your investigation must stay inside one of these four contexts. You may sharpen the question, change the values you test, and choose your own equipment within the list, but the question must stay one your class can answer with standard school laboratory equipment, in class time, safely. Each context names the subtopic that gives it its science.

Context 1 — Thirsty potato *(Chapter 8 · subtopic 8B — organelles, including the large central vacuole of plant cells)*

Plant cells keep their water in a large central vacuole — a storage sac inside the cell. Put a potato strip into water, and into salty water, and the strip can gain mass or lose mass as water moves into or out of its cells.

Seed question: How does the amount of salt dissolved in water change the mass of a potato strip?

Standard equipment: potato strips cut by the teacher, salt, beakers, measuring cylinder, electronic balance (to 0.1 g), ruler, paper towel. The change in mass can be positive (+0.4 g, say) or negative (−0.4 g, say) — both tell you something.

Context 2 — Sugar and heat *(Chapter 10 · subtopic 10C — solutions; 10A — the particle model)*

Sugar dissolves in water to form a solution — a homogeneous mixture of a solute in a solvent. The particle model says that hotter particles move faster.

Seed question: How does the temperature of the water change the time it takes for a measured amount of sugar to dissolve?

Standard equipment: sugar, beakers, measuring cylinder, thermometer, stopwatch, glass stirring rod, electronic balance (to 0.1 g), hot water prepared by the teacher.

Context 3 — Fizzing faster *(Chapter 11 · subtopic 11C — the indicators of chemical change, and the preparation of carbon dioxide)*

When baking soda and vinegar are mixed, bubbles of a new gas — carbon dioxide — fizz up. A new gas being made is one of the indicators of chemical change.

Seed question: How does the temperature of the vinegar change how fast carbon dioxide is made when baking soda is added?

Standard equipment: vinegar, baking soda, conical flask, bung and delivery tube, water trough, inverted measuring cylinder for collecting the gas, stopwatch, thermometer, water bath.

Context 4 — Angle of light, warmth of ground *(Chapter 14 · subtopic 14A — Earth's tilt and the seasons)*

Sunlight arriving at a steep angle lands packed together and warms the ground more than the same light arriving at a shallow angle and spread out — the reason Victoria's seasons run opposite to the northern hemisphere's. A lamp can stand in for the Sun, as the torch did in 14A's try-it.

Seed question: How does the angle at which lamp light hits a surface change how much the surface warms?

Standard equipment: lamp, thermometer, protractor, ruler, black card, stand to hold the lamp at a fixed distance.

What Part 1 must contain

Write, under clear headings:

1. **Your context** — which one of the four you chose.
2. **Your question** — an investigable question (2A) inside that context. Name the two amounts it links.
3. **Your hypothesis** — a testable idea with a reason attached: *I predict … because …* (2B).
4. **Your variables** — the independent variable (the one you change), the dependent variable (the one you measure), and at least three controlled variables (the ones you keep the same), each with how you will keep it the same (3A).
5. **Your assumptions** — at least one thing you are taking for granted that could affect the result (3A).
6. **Your method** — numbered steps another group could follow exactly, including how many values of the independent variable you will test and how many repeat readings you will take at each one (3A).

Do not start any bench work until your teacher has approved Parts 1, 2 and 3.

Part 2 — Risk assessment (5 marks)

Write a risk assessment for your method, the way 3B teaches it:

1. **Find the hazards** — anything in your method with the potential to cause harm: hot water, glass, spills, chemicals, a hot lamp, electrical equipment.
2. **Rate each risk before any controls** — likelihood (1–4) times severity (1–4), using the 3B grid: 1–2 LOW, 3–4 MEDIUM, 6–8 HIGH, 9–16 EXTREME.
3. **Bring each risk down** with controls, working down the hierarchy of controls — eliminate, substitute, isolate, safe procedures, and only then PPE. Name the PPE you will wear.
4. **Rate each risk again** with the controls in place.
5. **Get the sign-off** — your teacher signs and dates the risk assessment before any bench work starts. Approval comes before the work starts, never after.

Present it as a table with one row per hazard.

Part 3 — Ethics statement, including the cultural-heritage and permissions check (5 marks)

Ethics asks who and what else the work touches, and holds the work to what is right and fair. Write an ethics statement covering these four points:

1. **Living things.** Does your investigation use or affect any living thing? If yes, how will it be treated with care and respect, and kept from harm? If no, say so plainly.
2. **People.** Does your investigation ask anything of people — a survey, a reaction-time test, data about them? If yes, how will you keep it fair, voluntary and private? If no, say so.
3. **Secondary data.** Will you use anyone else's data or ideas — from a book, a website, a class investigation? Every borrowed thing gets credited in your report's reference list (5B, 6A).
4. **The cultural-heritage and permissions check.** Work through the permissions pathway from 3B, question by question, and record your answer for your chosen context:
    - *Is the work on national park, state park or other land managed by Parks Victoria?* If yes, the work needs a Parks Victoria research permit under the *National Parks Act 1975* (Vic).
    - *Will you handle, trap, mark or keep any wild animal?* If yes, the work needs a DEECA wildlife research permit under the *Wildlife Act 1975* (Vic).
    - *Could the work touch Aboriginal cultural heritage — artefacts, rock art, scarred trees, middens, a registered site?* If yes, permission comes from the Registered Aboriginal Party for that Country, under the *Aboriginal Heritage Act 2006* (Vic) — and it comes **before anything else**. Protection can be

invisible: nothing about the look of a place tells you it is registered, so you find out before the work starts, not after you arrive.
    - *If none of the three applies:* every place has an owner or a manager. Name yours, and record their permission. For work on school grounds, that is your teacher and the school.
    - *If anything that might be an artefact turns up:* the work stops, the spot is noted, a teacher is told, and it stays put. Artefacts are protected by law, and an artefact moved is evidence destroyed.

Part 3 is where this book checks what 3B taught. A context run entirely inside the school laboratory still gets the full check — the right answer there is not *not applicable*, it is the check itself: which questions do not apply, why, whose permission you did get, and what you would do if something that might be an artefact turned up. If your teacher approves a version of your context that runs off the school grounds, the check must name the real permissions that version needs.

Part 4 — Logbook (4 marks)

A **logbook** is the dated, written record of everything you did and observed, made at the time — not copied up afterwards. Your logbook must show:

- an entry for each session, dated;
- your raw readings, as you took them, with units, recorded to the finest graduation of each instrument (3C) — a stopwatch that reads to 0.01 s still gets its times recorded to the second if that is what the reading is good for; say what each instrument reads to;
- repeat readings at every value of the independent variable;
- honest mistakes handled the right way — a single line through the wrong reading, still legible, with a note in the margin. Never rub out, never overwrite;
- anything unexpected — a spill, a cooled beaker, a cracked glass — recorded when it happened.

Part 5 — Processed data (5 marks)

Process your raw data the way Chapter 4 teaches:

1. **A processed table** — one row per value of the independent variable, your repeat readings, and the mean at each value. Round each mean to the decimal place of the readings (4A). Units appear once, in the heading of each column.
2. **The right representation** — choose and construct the graph that fits your data (4A): independent variable on the horizontal axis, dependent variable on the vertical axis, both labelled with the quantity and its unit, a sensible scale on each axis, points plotted accurately and joined or marked so the trend can be read.
3. **Captions** — number your table and your graph and give each one a caption that says what it shows (6A).
4. **Anomalies in view** — if you exclude a reading, show it, cross it out, and say why, in the table itself. Nothing disappears silently (4C).

Part 6 — Analysis (3 marks)

Read your processed data for what it shows (4C):

- state the **pattern, trend or relationship** — in words, and then with the numbers that show it;
- **identify the anomalies** — readings that sit away from the rest — and give your best account of them;
- say what your data **cannot** show — one investigation answers one question.

Part 7 — Evaluation (4 marks)

Interrogate your own method and your own conclusion (5A):

- name **two sources of error** in your method — not *human error*, but the particular thing — and for each one say which way it would push your readings;
- return to your **assumptions** from Part 1: did each one hold? How do you know?
- say how much you can **trust the conclusion** — the repeat readings, the size of the trend against the scatter;
- give **one improvement** to the method, and **one question your investigation leaves unanswered**.

Part 8 — Report to a stated audience (3 marks)

Write the report in the nine-section shape of 6A — title, aim, introduction, hypothesis, method, results, discussion, conclusion, references — and write it for a **stated audience**: name who the report is for, and why they would want the finding. The audience can be real (the school canteen, the school garden team, the principal, a Year 5 class) or clearly labelled as practice. The mark goes to the fit: the format, the register and the vocabulary must suit the reader you named (6B) — a reader who did not do the investigation and may not be a scientist. Your conclusion must answer the aim, and the evidence for it must be visible in the results (5B, 6A). Credit every borrowed thing in the reference list.

What to hand in

Part	What	Marks	Code
1	Plan: context, question, hypothesis, variables, assumptions, method	6	VC2S8I02
2	Risk assessment, signed by your teacher before bench work	5	VC2S8I02
3	Ethics statement with the cultural-heritage and permissions check	5	VC2S8I02
4	Logbook: dated entries, raw readings, repeat readings, precision	4	VC2S8I03
5	Processed table and graph, captioned, anomalies in view	5	VC2S8I04
6	Analysis: trend, numbers, anomalies	3	VC2S8I05
7	Evaluation: errors, assumptions, trust, improvement, next question	4	VC2S8I06
8	Report to a stated audience, nine-section shape, referenced	3	VC2S8I07, VC2S8I08
	Total	**35**	

Checkpoints

- **Checkpoint 1** — Parts 1, 2 and 3 approved by your teacher. No bench work before this.
- **Checkpoint 2** — bench work done, logbook kept.
- **Checkpoint 3** — Parts 5, 6 and 7 drafted and checked against the data.
- **Checkpoint 4** — Part 8 submitted.

Marking guide — SIT-2 Running your own

This guide is written for the classroom teacher. Award a mark when the student's response matches a descriptor below or says the same idea in other words. **Do not award half marks.** The marks are a record that evidence was seen; they are not used to rank students.

The model response that follows this guide is worked for **Context 2 — Sugar and heat**. It is one acceptable response of many: all four contexts are equally open, and a student's own sharpening of the seed question is expected. Judge every part against the descriptors, not against the model's numbers.

Approvals before marking. Confirm before you mark Part 4 onward that the student's Part 2 carries your own (or a colleague's) sign-off dated before the first bench session, and that the logbook entries are dated after it. Bench work that started before approval loses the Part 2 sign-off mark.

Part 1 — Plan (6 marks · VC2S8I02)

Descriptor	Marks
A context from the four approved, named.	1
An investigable question inside that context, linking two named amounts — one to change, one to measure. A question that is a yes/no question, or that cannot be answered with school equipment, does not earn this mark.	1
A hypothesis written as a testable idea with a reason attached — *I predict … because …* — where the reason uses science from the named chapter. A prediction with no reason earns no mark here.	1
The independent and dependent variables each named, with a unit or a scale for the one to be measured.	1
At least three controlled variables, each with *how* it will be kept the same — not just a list of things kept the same.	1
At least one assumption stated plainly, and a numbered method another group could follow — values of the independent variable named, repeat readings named.	1

Part 2 — Risk assessment (5 marks · VC2S8I02)

Descriptor	Marks
The hazards of the chosen method identified — at least two real hazards of that method, not a generic list.	1
Each hazard rated before controls as likelihood × severity on the 3B grid, with the band named.	1
Controls given that work down the hierarchy of controls — eliminating or isolating the hazard where that is possible, not jumping straight to PPE.	1
The PPE named, and each risk re-rated with the controls in place, lower than before.	1
The teacher's sign-off, dated before the first bench session.	1

Part 3 — Ethics statement (5 marks · VC2S8I02)

Descriptor	Marks
Living things and people: the student says who and what the work touches, or says plainly that it touches none,	1

Descriptor	Marks
and where it touches any, how it is treated in a fair way and kept from harm.	
Secondary data: what is borrowed is named, with the promise of credit in the reference list.	1
The permissions pathway worked through question by question for the chosen context — Parks Victoria land, wild animals, Aboriginal cultural heritage, and the land manager where none applies — with a reasoned answer at each question, not a blank.	2
The artefact rule stated for the context: if anything that might be an artefact turns up, stop, note the spot, tell the teacher, leave it in place — or a reasoned account of why the work cannot disturb the ground at all.	1

Marking note. The full marks for the check are available to a school-based investigation whose student reaches the right conclusion by the right route: no Parks Victoria land, no wild animals, no registered site known on the school grounds (checked with the land manager), permission gained from the school, and the artefact rule recorded. A student whose approved context runs off the school grounds must name the real permission that context needs — a Parks Victoria permit, a DEECA permit, or the Registered Aboriginal Party's permission — and is marked against the same descriptor.

Part 4 — Logbook (4 marks · VC2S8I03)

Descriptor	Marks
Entries dated, written as the work happened — not a clean copy written up afterwards.	1
Raw readings recorded with units, to the instrument's finest graduation, and the graduation of each instrument stated somewhere the reader can find it.	1
Repeat readings at every value of the independent variable.	1
Mistakes and surprises recorded honestly — the wrong reading crossed out with one line, still legible, noted in the margin; the unexpected event recorded at the time. A logbook with no crossing at all in a real investigation is a warning sign, not a strength.	1

Part 5 — Processed data (5 marks · VC2S8I04)

Descriptor	Marks
A processed table with one row per value of the independent variable, the repeat readings, and the mean at each value.	1
Each mean rounded to the decimal place of the readings, and units written once, in the column headings.	1
The right representation chosen for the data — a line graph where both variables are measured on a scale, a column graph where the independent variable is a set of categories — constructed, not described.	1
Both axes labelled with the quantity and its unit, a sensible scale on each axis, and the points placed accurately.	1
Table and graph numbered and captioned; any excluded	1

Descriptor	Marks
reading shown, crossed out, with the reason — nothing disappears silently.	

Part 6 — Analysis (3 marks · VC2S8I05)

Descriptor	Marks
The pattern, trend or relationship stated in words — with direction (rises, falls, stays level) and shape (steadily, sharply at first, then less).	1
The trend carried by real numbers from the processed data.	1
Anomalies identified and given a best account, or a reasoned statement that there are none.	1

Part 7 — Evaluation (4 marks · VC2S8I06)

Descriptor	Marks
Two sources of error named from the student's own method — particular things, not *human error* — each with which way it would push the readings. One mark each.	2
The assumptions from Part 1 revisited: did each hold, and what is the evidence?	1
How far the conclusion can be trusted, argued from the repeat readings and the size of the trend against the scatter — plus one real improvement to the method and one question the investigation leaves unanswered.	1

Part 8 — Report (3 marks · VC2S8I07, VC2S8I08)

Descriptor	Marks
A conclusion that answers the aim, supported by visible evidence from the results — the finding, and the numbers it stands on.	1
A stated audience, and a report shaped for that reader — format, register and vocabulary suited to someone who did not do the investigation. A report written at nobody in particular earns no mark here.	1
The nine-section shape of 6A followed; tables and figures numbered and captioned; units written once; every borrowed thing credited in the reference list.	1

Tracing the parts to the achievement standard

Every part traces to the achievement-standard extract of the CD it serves (§4 of the plan of record). The extracts are quoted as the authority file gives them.

Code	Subtopic that teaches it	Achievement-standard extract	Parts
VC2S8I02	3A, 3B	"They plan a range of reproducible scientific investigations, document procedures and identify potential ethical issues and	1, 2, 3

Code	Subtopic that teaches it	Achievement-standard extract	Parts
		intercultural considerations required for fieldwork or use of secondary data.”	
VC2S8I03	3C	“They select and use equipment to generate and record data with precision.”	4
VC2S8I04	4A, 4B	“They select and construct appropriate representations to organise and process data and information.”	5
VC2S8I05	4C	“They analyse and connect data and information to identify and explain patterns, trends, relationships and anomalies.”	6
VC2S8I06	5A	“They identify assumptions and sources of error in methods and analyse conclusions and claims with reference to conflicting evidence and unanswered questions.”	7
VC2S8I07	5B	“They provide science-based explanations for findings, and use evidence to support conclusions and evaluate claims.”	8
VC2S8I08	6A, 6B	“They select and use appropriate presentation formats, scientific vocabulary, models and other representations when communicating their ideas, findings and arguments for specific purposes to specific audiences.”	8

Inquiry weighting: 35 of 35 marks — this task is the student-run half of the authentic assessment of Chapter 2–6’s inquiry spine (D7), and every mark is an inquiry-strand mark.

Mark record

Part	Code	Worth	Given
Part 1 — plan	VC2S8I02	6	
Part 2 — risk assessment	VC2S8I02	5	
Part 3 — ethics statement with the cultural-heritage and permissions check	VC2S8I02	5	
Part 4 — logbook	VC2S8I03	4	

Part	Code	Worth	Given
Part 5 — processed data	VC2S8I04	5	
Part 6 — analysis	VC2S8I05	3	
Part 7 — evaluation	VC2S8I06	4	
Part 8 — report to a stated audience	VC2S8I07, VC2S8I08	3	
Total		**35**	

Model response — SIT-2 Running your own

This is a simulated student response, written for this book. It is worked for Context 2 — Sugar and heat. The student, the teacher and the audience are not real people, and the data are simulated data for practice, made up to show what each part of a strong submission looks like — the dated logbook with its honest mistake, the flagged trial, the mean rounded to the decimal place of the readings, and the report written for a named reader. It is one acceptable response, not the only one.

Part 1 — Plan

Context. Context 2 — Sugar and heat (Chapter 10, subtopic 10C, with the particle model from subtopic 10A).

Question. How does the temperature of the water affect the time it takes for 5.0 g of caster sugar to dissolve in 100 mL of water?

Hypothesis. I predict that the hotter the water, the shorter the dissolving time, because the particle model says that hotter particles move faster, so the faster-moving water particles should pull the sugar particles apart and spread them through the water more quickly.

Variables.

Variable	What it is	How it is handled
Independent	Temperature of the water	Set at four values: 15, 30, 45 and 60 °C, checked with the thermometer before the sugar goes in
Dependent	Time for all the sugar to dissolve	Measured with a stopwatch, in seconds, from when the sugar goes in until no crystals are visible
Controlled	Volume of water	100 mL, measured with the same 100 mL measuring cylinder every time
Controlled	Mass of sugar	5.0 g of the same caster sugar, weighed on the same balance every time
Controlled	Stirring	The same glass rod, stirred at about two circles per second, by the same person
Controlled	Beaker	The same 250 mL beaker, rinsed between trials

Assumptions. I assume the water stays within about 1 °C of its starting temperature during a trial, which runs about one to three minutes. I also assume that *fully dissolved* — no crystals visible through the side of the beaker — is close enough to the real end point to compare trials.

Method.

1. Put on safety glasses and tie back long hair.
2. Measure 100 mL of water into the beaker with the measuring cylinder.
3. Bring the water to the first target temperature: cold tap water for 15 °C; the teacher adds hot water from the kettle, a little at a time, for 30, 45 and 60 °C. Stir gently and check with the thermometer.
4. Weigh 5.0 g of caster sugar on the balance.
5. When the water is at the target temperature, add the sugar and start the stopwatch at the same moment.
6. Stir at about two circles per second. Watch through the side of the beaker.
7. Stop the watch the moment no crystals are visible. Record the time and the actual water temperature.
8. Repeat steps 2–7 two more times at the same temperature — three trials in total.
9. Repeat steps 2–8 for 30, 45 and 60 °C.

10. Let everything cool before washing up. Wipe spills at once.

Marks earned: 6 of 6 — context named; investigable question linking two named amounts; hypothesis with a reason from the particle model; both variables named with units; four controlled variables each with its *how*; one assumption stated and a numbered method another group could follow, with four values and three repeat readings.

Part 2 — Risk assessment

Hazards are rated on the 3B grid: likelihood (1–4) × severity (1–4); 1–2 LOW, 3–4 MEDIUM, 6–8 HIGH, 9–16 EXTREME.

Hazard	Who could be hurt	Rating before controls	Controls, working down the hierarchy	Rating with controls
Hot water (up to 60 °C)	Burns to hands when pouring or carrying	2 × 3 = 6, HIGH	The teacher pours all hot water; nobody carries a beaker holding water hotter than about 45 °C; beakers are moved with beaker tongs; water cools before it goes down the sink	1 × 3 = 3, MEDIUM
Glass beaker or cylinder breaks	Cuts from sharp edges	2 × 2 = 4, MEDIUM	Glassware checked for cracks before use and carried with two hands; broken glass swept with a brush and dustpan, never picked up by hand	1 × 2 = 2, LOW
Water spilled on the floor	Someone slips	2 × 2 = 4, MEDIUM	Spills wiped up at once; bags kept out of the walkway	1 × 2 = 2, LOW

PPE. Safety glasses worn the whole session; long hair tied back; closed shoes.

Sign-off. Approved by the teacher on Tuesday 4 August 2026. Bench work started Thursday 6 August 2026 — after approval, not before.

Marks earned: 5 of 5 — three real hazards of this method; each rated before controls with the band named; controls work down the hierarchy (the teacher pouring the hot water is isolation, not PPE); PPE named and every risk re-rated lower; sign-off dated before the first bench session.

Part 3 — Ethics statement

Living things. This investigation uses no living things. Sugar is a food, not a living organism, and nothing alive is kept, hurt or disturbed.

People. This investigation asks nothing of people. Nobody is surveyed, tested or timed, and no data about any person is collected.

Secondary data. The science in my hypothesis — that hotter particles move faster — comes from what our class learned in subtopic 10A, and the risk-assessment method is the one taught in subtopic 3B, which follows Science ASSIST guidance. Both are credited in the report's reference list. I used nobody else's measurements: every number in this investigation is my own.

The cultural-heritage and permissions check. I worked through the pathway from subtopic 3B:

- *Is the work on land managed by Parks Victoria?* No. The whole investigation runs inside the school science laboratory. No Parks Victoria permit is needed.

- *Will we handle, trap, mark or keep any wild animal?* No. No wild animal is involved, so no DEECA wildlife research permit is needed.
- *Could the work touch Aboriginal cultural heritage?* We checked with the school before planning: there is no known registered Aboriginal cultural heritage place on the school grounds, and this investigation digs nothing, collects nothing and removes nothing — the ground is never disturbed, and nothing that could be an artefact will be touched or moved. If anything that might be an artefact were ever found on the school grounds — by this investigation or by anyone else — the rule from 3B applies: stop, do not pick it up, note the spot, tell the teacher, and leave it where it is. The *Aboriginal Heritage Act 2006* (Vic) protects these places, and an artefact moved is evidence destroyed.
- *The land manager's permission.* The work is on school grounds, so the land manager is the school. My teacher and the school approved the investigation on Tuesday 4 August 2026, before any bench work started.

Marks earned: 5 of 5 — living things and people answered plainly; borrowed ideas named with credit promised; the pathway worked question by question to the right conclusion for a school-based context, with the check with the land manager recorded; the artefact rule stated in full.

Part 4 — Logbook

Entry 1 — Tuesday 4 August 2026 (planning). Plan approved. Risk assessment signed. Read the method through once. Equipment list checked against the storeroom: beakers, 100 mL measuring cylinder (graduations every 1 mL), thermometer (graduations every 1 °C), stopwatch (reads to 0.01 s; recording to the nearest second — judging the exact end point is not good to a hundredth), balance (reads to 0.1 g), glass rod, caster sugar.

Entry 2 — Thursday 6 August 2026 (bench session). Trials run in order 15, 30, 45, 60 °C. Three trials at each. Raw readings below. Note on trial 3 at 60 °C: while we were waiting for the balance, the water cooled from 60 to 53 °C before the sugar went in. Recorded as it happened. Flagged — do not use for the 60 °C mean.

Temperature (°C)	Trial 1 time (s)	Trial 2 time (s)	Trial 3 time (s)	Notes
15	176	182	190	Ice from the freezer kept the water cold between trials
30	121	125	118	
45	84	88	81	
60	62	65	~~97~~	Trial 3: water had cooled to 53 °C before the sugar went in — flagged

Everything else went as planned. One small spill at the 45 °C changeover, wiped up at once.

Entry 3 — Monday 10 August 2026 (processing). Processed the table. Drew the graph. Wrote the analysis and the evaluation. Drafted the report.

Marks earned: 4 of 4 — dated entries written at the time; raw readings with units, to the finest graduation, and each instrument's graduation stated in Entry 1; three repeat readings at every value; the bad trial crossed out with a single line, still readable, and explained in the margin and the notes column.

Part 5 — Processed data

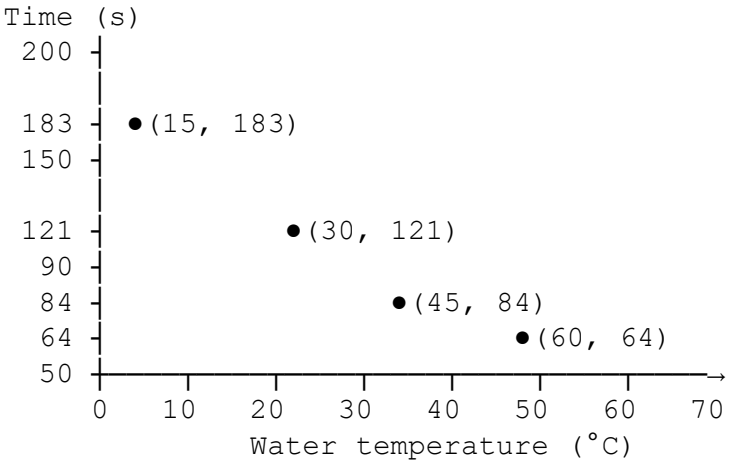
Table 1. Mean dissolving time for 5.0 g of caster sugar in 100 mL of water at four water temperatures, from three trials at each temperature.

Temperature (°C)	Trial 1 (s)	Trial 2 (s)	Trial 3 (s)	Mean time (s)
15	176	182	190	183
30	121	125	118	121
45	84	88	81	84

Temperature (°C)	Trial 1 (s)	Trial 2 (s)	Trial 3 (s)	Mean time (s)
60	62	65	~~97~~ — cooled to 53 °C	64

The readings are recorded to the nearest second, so each mean is rounded to the nearest second: at 15 °C, (176 + 182 + 190) ÷ 3 = 182.67 → 183 s; at 30 °C, 121.33 → 121 s; at 45 °C, 84.33 → 84 s; at 60 °C, the flagged trial is left out, and (62 + 65) ÷ 2 = 63.5 → 64 s. The 60 °C mean rests on two trials, not three; the Evaluation says what that costs.

Figure 1. Mean dissolving time against water temperature.



Both variables are measured on a scale — the temperature in degrees, the time in seconds — so a line graph is the right representation: temperature — the independent variable — on the horizontal axis, mean time on the vertical axis, both labelled with the quantity and its unit, points plotted from Table 1 and joined to show the trend.

Marks earned: 5 of 5 — processed table with a row per value and the mean at each; means rounded to the decimal place of the readings, units once in the headings; a line graph chosen for two smooth variables and constructed; both axes labelled with quantity and unit, sensible scales, points placed accurately; table and figure numbered and captioned; the excluded reading shown, crossed out, with its reason — nothing disappeared.

Part 6 — Analysis

The trend is clear and one-directional: **the hotter the water, the shorter the dissolving time.** From 15 to 30 °C the mean time falls 62 s, from 183 to 121 s. From 30 to 45 °C it falls another 37 s, to 84 s, and from 45 to 60 °C it falls 20 s more, to 64 s. The fall is steep at the cold end and gentler at the hot end — every 15 °C step still cuts the time, but by less than the step before.

One anomaly was found and flagged at the bench: trial 3 at 60 °C read 97 s, well away from that temperature's other two trials (62 and 65 s). The logbook records why — the water had cooled to 53 °C before the sugar went in — so the reading sits away from the rest for a known reason, and it was left out of the 60 °C mean rather than quietly dropped.

What these data cannot show: they say nothing about temperatures above 60 °C, nothing about other solutes, and nothing about stirring rates other than the one used here.

Marks earned: 3 of 3 — trend stated with direction and shape; carried by the actual means and the size of each step; the anomaly identified with its best account from the logbook.

Part 7 — Evaluation

Two sources of error.

1. **Stirring by hand is not perfectly even.** I aimed for about two circles per second, but the pace drifted, especially as my arm tired at the long cold trials. Faster stirring would shorten a time, so an uneven pace scatters the readings both ways — it shows up as scatter within a temperature, not as a drift of the whole trend.
2. **Judging the end point by eye.** *No crystals visible through the glass* is a judgement, and the last few grains are the hardest to see. A trial called finished a moment early reads low; one run a moment long reads high. Again, both ways — but the effect is small against the size of the trend.

The assumptions revisited. I assumed the water would stay within about 1 °C of its target during a trial. At 15, 30 and 45 °C that held — the thermometer checked at the end of each trial stayed within 1 °C. At 60 °C it failed once: trial 3 cooled to 53 °C while we waited for the balance, which is exactly why that trial read long. The second assumption — that *no visible crystals* is close enough to fully dissolved — held well enough to compare trials, because the same eye made the same call every time.

How far the conclusion can be trusted. The trend rests on four means, each from three trials except the 60 °C mean, which rests on two. The trials at each temperature sit close together — within 9 s at every temperature — and the trend from 183 s down to 64 s is far larger than that scatter, so the direction of the finding is solid. The exact shape — steep then gentle — I trust less, because four points is few, and the weakest point (60 °C) lost one trial.

One improvement. Have everything staged before each trial — sugar weighed, beaker in place, timer ready — so the sugar goes in the moment the water reaches the target temperature. That removes the drift that cost trial 3, and it would be worth a fourth trial at 60 °C.

One question left unanswered. Does grain size matter as much as temperature? A sugar cube and caster sugar are the same substance in different-sized pieces, and surface area might change the dissolving time at least as much as heat. That is the next investigation.

Marks earned: 4 of 4 — two particular errors, each with which way it pushes the readings; both assumptions revisited with evidence from the bench; trust argued from the number of trials and the size of the trend against the scatter, with one real improvement and one real next question.

Part 8 — Report to a stated audience

Stated audience. The report is written for the person who runs the school canteen, who wants to know how water temperature changes the time sugar takes to dissolve, for making drinks on hot days and cold days. The canteen manager did not do this investigation and is not reading it for the method — so the report opens with the finding in plain words, and the full nine-section report follows underneath for anyone who wants to check the work.

How fast does sugar dissolve? A report for the school canteen

The finding in plain words. Hot water dissolves sugar much faster than cold water. In our test, a measured amount of sugar took about three times as long to dissolve in cold water (15 °C) as in hot water (60 °C): about 3 minutes against about 1 minute. On a hot day, when the canteen serves cold drinks, stirred iced drinks will sweeten slowly; for fast sweetening, dissolve the sugar into a little warm water first, then add the ice and cold water.

Title. How water temperature changes the time sugar takes to dissolve.

Aim. To find how the temperature of water affects the time it takes for 5.0 g of caster sugar to dissolve in 100 mL of water.

Introduction. Sugar dissolves in water to form a solution — a homogeneous mixture of the solute (sugar) in the solvent (water) [S1]. The particle model says that the particles of a hotter substance move faster than the particles of a colder one [S1]. If faster-moving water particles spread the sugar particles more quickly, hotter water should dissolve the sugar in less time.

Hypothesis. It was predicted that the hotter the water, the shorter the dissolving time, because hotter water particles move faster and spread the sugar particles more quickly.

Method. Water was set at four temperatures — 15, 30, 45 and 60 °C — checked with a thermometer reading to 1 °C. At each temperature, 5.0 g of caster sugar (balance reading to 0.1 g) was added to 100 mL of water (measuring cylinder reading to 1 mL) and stirred at about two circles per second with a glass rod. The time from adding the sugar to no visible crystals was recorded with a stopwatch, to the nearest second. Three trials were run at each temperature. The full numbered method is in the plan submitted with this report. The risk assessment — written to Science ASSIST guidance [S2] and signed by the teacher before any bench work — kept hot water behind teacher control and all glassware checked before use.

Results. Table 1 and Figure 1 (both reproduced from the processed data section) show the mean dissolving time at each temperature: 183 s at 15 °C, 121 s at 30 °C, 84 s at 45 °C and 64 s at 60 °C. One trial at 60 °C was excluded: the water had cooled to 53 °C before the sugar went in, and the reason is recorded in the table.

Discussion. The results support the hypothesis: as the water temperature rose, the dissolving time fell, from 183 s at 15 °C to 64 s at 60 °C. The fall is steep between cold and warm water and gentler between warm and hot, which fits the particle story — the extra push of the hotter water matters most when the water starts cold. Two sources of error were identified: hand-stirring could not be kept perfectly even, and the end point was judged by eye; both scatter individual readings rather than moving the whole trend, and the scatter within each temperature (at most 9 s) is small next to the size of the trend (119 s from coldest to hottest). The 60 °C mean rests on two trials after the cooled trial was excluded, so the hot end of the trend is the least certain.

Conclusion. Hotter water dissolves sugar faster: at the four temperatures tested, every 15 °C step cut the dissolving time, from a mean of 183 s at 15 °C to a mean of 64 s at 60 °C. For the canteen, sweetening a cold drink by stirring alone is slow; dissolving the sugar into a little warm water first is the faster route.

References.

[S1] Science 7–8 (Victorian Curriculum F–10 Version 2.0, Levels 7 and 8), student workbook, subtopics 10A and 10C — the particle model of matter, and solutions.

[S2] Science ASSIST (ASTA), “Risk management”, 2026. asta.edu.au — retrieved 2026-08-03.

Marks earned: 3 of 3 — the conclusion answers the aim on visible evidence from the results; the audience is stated and the report is shaped for that reader — the finding up front in plain words, the checkable nine-section report underneath; the nine-section shape followed, table and figure numbered and captioned, units written once, both borrowed things credited.

Model total: 35 of 35.

Sources — SIT-2 Running your own

Web sources below were retrieved 2026-08-22.

- **[S1]** Victorian Curriculum and Assessment Authority, *Victorian Curriculum F–10 Version 2.0, Science, Levels 7 and 8*, content descriptions VC2S8I02–VC2S8I08, their elaborations and their achievement-standard extracts, 2026. vcaa.vic.edu.au
- **[S2]** Science ASSIST (ASTA), "Risk management", 2026. asta.edu.au
- **[S3]** *National Parks Act 1975* (Vic); *Wildlife Act 1975* (Vic); *Aboriginal Heritage Act 2006* (Vic) — legislation.vic.gov.au, named in this book's TOC §6 approved source list; verified 2026-08-22. Named as instruments only; no provision numbers are cited in this task.

The four approved contexts are original compositions for this task, each anchored to the subtopic named beside it — 8B (vacuoles and water storage in plant cells), 10C with 10A (solutions and the particle model), 11C (the indicators of chemical change, including the preparation of carbon dioxide from baking soda and vinegar, delivered there to Science ASSIST guidance), and 14A (Earth's tilt and the angle of sunlight). Every context is achievable with standard Victorian secondary laboratory equipment. The elaboration contexts drawn on are VC2S8I02.E05 (acknowledging sources when using secondary data, and respecting cultural protocols) and VC2S8I02.E06 (permission sought before fieldwork, and no harm caused to cultural sites and artefacts), both assessed through Part 3.

The model response is a **simulated example for practice**: the student, the teacher and the audience are not real people, the logbook dates are illustrative, and the measurements are simulated data for practice, constructed to show each part of a strong submission — including one honestly flagged trial — not records of a real investigation.

Teacher-facing note — D10 protocol limb, CONTENT_POLICY alignment (not student text). Part 3 of this task delivers the protocol limb of VC2S8I02, which is CD text and mandatory whatever the reviewer decides about cultural knowledge under TOC D10: it is assessed as process and law, exactly as subtopic 3B teaches it — the *National Parks Act 1975* (Vic), the *Wildlife Act 1975* (Vic) and the *Aboriginal Heritage Act 2006* (Vic), the Registered Aboriginal Party system, and the land manager's permission where none of the three applies. The instruments are named; no provision numbers, determinations or community names are invented in this task, per TOC §6. No cultural knowledge is authored here — no stories, practices, ceremonies or knowledge claims — which is also the position of the estate's binding content policy (Rule 1, recorded 2026-08-15): what every student must produce is the check itself — the questions asked, the permissions identified, and the artefact rule recorded for the chosen context. All four approved contexts are school-based, so every student reaches the check by the same route the model shows; a school that approves an off-grounds variant must mark it against the same Part 3 descriptors, with the real permissions named.

Review solutions and marking guide — read this first

*This is the full solutions and marking guide for the **end-of-band review** — the one cumulative paper over Chapters 1–18 that closes the Levels 7–8 book. **Total: 80 marks** — Section A (25 multiple-choice marks), Section B (45 marks of short and structured response) and Section C (one 10-mark extended response). The Scientific Investigation Tasks carry their own marking guides and model responses in `wb_sit1.md` and `wb_sit2.md`; they are not repeated here.*

What this paper is

This is a school-designed paper. It is not a VCAA instrument and it is not a VCAA examination. Levels 7 and 8 carry no VCAA examination and no external assessment; achievement at Levels 7 and 8 is reported against the Victorian Curriculum 2.0 achievement standard on teacher judgement, and the marks here are one source of evidence towards that judgement.

About this paper

- **Total: 80 marks** — Section A (25 marks), Section B (45 marks), Section C (10 marks). Answer all questions.
- **Planned for about 90 minutes.** This paper is untimed: students may take as long as they need to finish it.
- **A scientific calculator is permitted.** Nothing else is supplied: no formula sheet, except that the density relationship is printed at the point of use in Question B5.
- **Reading support is available.** The plan specifies no special reading support for this task, so students may use the reading support their classroom normally provides — for example, a teacher reading a question aloud. Reading is not being tested.
- The paper is cumulative: it draws on Chapters 1–18, and every strand of the band appears in it.

Strand weighting of the 80 marks (printed here, as in the paper's front matter, so a teacher can see the balance without counting):

Strand	Marks
Science as a human endeavour	8
Science inquiry	20
Biological sciences	13
Chemical sciences	13
Earth and space sciences	13
Physical sciences	13
Total	**80**

The inquiry weighting is deliberately the largest single block (D7) and is one quarter of the paper.

How to mark it

- Marks are **point-based**. There are no half-marks and no holistic rubric: each mark point is either earned or not earned.
- **Accept any response that carries the same idea in different words.** Spelling, grammar and handwriting do not lose marks unless the answer cannot be read.
- **Shared-error marking applies.** Where a student carries their own earlier (wrong) value into a later part and works correctly from it, award the later marks; the error is penalised once, where it was made.
- In Section B Question 1 and in Section C, marks are awarded for the quality of the reasoning and the fit of the evidence, not for the conclusion reached.

Solutions — Section A (25 marks)

Section A is 25 multiple-choice questions, 1 mark each, spread across all eleven strand groupings of the band: both sub-strands of Science as a human endeavour (VC2S8H01 and VC2S8H04), all five inquiry sub-strands (VC2S8I01; VC2S8I02–VC2S8I03; VC2S8I04–VC2S8I05; VC2S8I06–VC2S8I07; VC2S8I08) and all four Science Understanding sub-strands (biological, chemical, earth and space, physical). Choose A, B, C or D. Each correct answer earns 1 mark; there is no working required and no part-credit.

Answers at a glance

Q	Answer	As printed	Source
1	**D**	New ocean floor forms at the ridge …	Bank item `VC2S8H01.E05.S01.D2.V01` (options reordered)
2	**B**	May fail to take protective actions …	Bank item `VC2S8H04.E02.S01.D2.V01` (options reordered)
3	**C**	The two sales rise together, but …	Authored item, `VC2S8I01`
4	**D**	If the soil is wetter, more earthworms …	Authored item, `VC2S8I01`
5	**B**	So observed changes can be attributed …	Bank item `VC2S8I02.E01.S01.D3.V01` (options reordered)
6	**C**	Inappropriate — it exceeds the ruler's …	Bank item `VC2S8I03.E02.S01.D2.V01` (options reordered)
7	**A**	It may omit real-world complexity …	Bank item `VC2S8I04.E01.S01.D2.V01` (options reordered)
8	**C**	Predator–prey interaction	Bank item `VC2S8I05.E02.S01.D2.V01` (options reordered)
9	**A**	A procedural or measurement error	Bank item `VC2S8I06.E01.S01.D2.V01` (options reordered)
10	**D**	Author expertise and transparent methodology	Bank item `VC2S8I07.E01.S01.D2.V01` (options reordered)
11	**C**	A mismatched form can obscure the science …	Bank item `VC2S8I08.E02.S01.D3.V01` (options reordered)
12	**B**	Genus	Authored item, `VC2S8U01`
13	**B**	A cell wall and chloroplasts	Authored item, `VC2S8U02`
14	**D**	To carry electrical signals over long …	Bank item `VC2S8U03.E02.S01.D2.V01` (options reordered)
15	**C**	Decomposers	Bank item

Q	Answer	As printed	Source
		(e.g. bacteria, fungi)	`VC2S8U04.E01.S01.D2.V01` (options reordered)
16	**B**	Particles are close (forces hold them) …	Bank item `VC2S8U05.E02.S01.D2.V01` (options reordered; one repair)
17	**A**	Suspension	Bank item `VC2S8U06.E02.S01.D2.V01` (as banked)
18	**D**	The metals are mixed but not chemically …	Bank item `VC2S8U07.E01.S01.D3.V01` (options reordered)
19	**C**	No new substance is formed; only state …	Bank item `VC2S8U08.E01.S01.D3.V01` (options reordered)
20	**B**	Faster regeneration rates allow heavier …	Bank item `VC2S8U09.E02.S01.D3.V01` (options reordered; two repairs)
21	**D**	Underwater seismic activity and water-level …	Bank item `VC2S8U10.E02.S01.D2.V01` (options reordered)
22	**B**	Summer	Bank item `VC2S8U12.E01.S01.D2.V01` (options reordered)
23	**C**	A change in motion	Bank item `VC2S8U14.E02.S01.D2.V01` (options reordered; one repair)
24	**A**	30%	Bank item `VC2S8U15.E02.S01.D2.V01` (options reordered)
25	**A**	The same at every point	Bank item `VC2S8U17.E01.S01.D1.V01` (option B repaired, order as banked)

Key distribution as printed: A ×5, B ×7, C ×7, D ×6.

Questions and solutions

Q1 *(1 mark · `VC2S8H01`)*

Rocks near a mid-ocean ridge are young, and rocks further from the ridge are progressively older. Which conclusion does this pattern support?

A. The continents float on the ocean floor and plough through it B. The ocean floor is being destroyed at the ridge C. Ocean floor rocks all formed at the same time and then eroded D. New ocean floor forms at the ridge and moves away from it over time

Answer: D. Bank item `VC2S8H01.E05.S01.D2.V01` (options reordered). The age pattern is the signature of new floor forming at the ridge and moving away — the mechanism plate tectonics supplies (subtopic 12A).

Q2 *(1 mark · `VC2S8H04`)*

Without timely science communication during a heatwave, the public:

A. Will adapt physiologically without needing any information B. May fail to take protective actions and risk harm C. Will have fewer hospital admissions than during a normal week D. Will get reliable guidance from everyday conversation alone

Answer: B. Bank item `VC2S8H04.E02.S01.D2.V01` (options reordered).

Q3 *(1 mark · `VC2S8I01`)*

A shop records how many jumpers it sells each day, and the hot-chip shop next door records its own sales. On cold days both jumper sales and hot-chip sales go up. What does this pattern show?

A. Buying a jumper makes people hungry, so they buy hot chips B. The hot-chip shop causes the jumper sales to go up C. The two sales rise together, but one does not necessarily cause the other D. The pattern is a coincidence and shows nothing at all

Answer: C. Authored item, `VC2S8I01` (the bank holds no unused `VC2S8I01` item at the required difficulty; §7). The pattern is a correlation — a real togetherness — and the trap is reading it as causation; both sales have a shared third factor (cold days), as subtopic 2A teaches with its ice-cream and sunburn case.

Q4 *(1 mark · `VC2S8I01`)*

A student sees earthworms on the path after rain and wonders whether earthworms prefer wet soil. Which of these is a testable hypothesis?

A. Earthworms are interesting to watch B. Why do earthworms come out after rain? C. The earthworm seen yesterday was in wet soil D. If the soil is wetter, more earthworms will be found in it

Answer: D. Authored item, `VC2S8I01`. A hypothesis is a proposed explanation that a test can check (subtopic 2B); option B is a question, C is a single observation, and A is an opinion.

Q5 *(1 mark · `VC2S8I02`)*

Why must control variables be held constant in an experiment?

A. So the results will match the original hypothesis B. So observed changes can be attributed to the independent variable C. To make the experiment faster to complete D. Because the dependent variable cannot otherwise be measured

Answer: B. Bank item `VC2S8I02.E01.S01.D3.V01` (options reordered).

Q6 *(1 mark · `VC2S8I03`)*

Using a ruler with 1 mm graduations, recording a length as ‘23.41782 mm’ is:

A. Acceptable, since extra digits never cause any harm B. Best practice, because more decimal places mean better data C. Inappropriate — it exceeds the ruler’s precision D. Required whenever a calculator gives that many digits

Answer: C. Bank item `VC2S8I03.E02.S01.D2.V01` (options reordered).

Q7 *(1 mark · `VC2S8I04`)*

A limitation of a virtual simulation is:

A. It may omit real-world complexity that was not coded into it B. It cannot display numerical data C. It cannot be paused or replayed D. It requires physical materials to run

Answer: A. Bank item `VC2S8I04.E01.S01.D2.V01` (options reordered).

Q8 *(1 mark · `VC2S8I05`)*

If a prey population's fluctuations align closely with peaks in a predator population, the relationship suggests:

A. Coincidence only B. No interaction between the species C. Predator–prey interaction D. Climate change acting alone

Answer: C. Bank item `VC2S8I05.E02.S01.D2.V01` (options reordered).

Q9 *(1 mark · `VC2S8I06`)*

A timer started after the event begins is an example of:

A. A procedural or measurement error B. An independent variable being changed C. A correctly controlled variable D. A random error that averages out over many trials

Answer: A. Bank item `VC2S8I06.E01.S01.D2.V01` (options reordered).

Q10 *(1 mark · `VC2S8I07`)*

Which of the following is a valid criterion for judging the credibility of a scientific source?

A. Whether the source uses persuasive language B. How recently the source was published online C. Number of likes or shares the source has D. Author expertise and transparent methodology

Answer: D. Bank item `VC2S8I07.E01.S01.D2.V01` (options reordered).

Q11 *(1 mark · `VC2S8I08`)*

Why does matching the form of communication to the intended audience matter?

A. Scientists are required to use formal reports for every audience B. The audience's background never affects their understanding C. A mismatched form can obscure the science or oversimplify it D. The form changes only the appearance, not the meaning, of the science

Answer: C. Bank item `VC2S8I08.E02.S01.D3.V01` (options reordered).

Q12 *(1 mark · `VC2S8U01`)*

The scientific name of the eastern grey kangaroo is *Macropus giganteus*. In that name, *Macropus* is the name of the kangaroo's:

A. Family B. Genus C. Kingdom D. Species

Answer: B. Authored item, `VC2S8U01` (the bank holds no unused `VC2S8U01` item at the required difficulty; §7). The two-part name works as genus plus species descriptor (subtopic 7A, which uses this same organism as its worked case); option D is the live distractor, because *Macropus giganteus* together — not *Macropus* alone — names the species.

Q13 *(1 mark · `VC2S8U02`)*

Which structures are found in plant cells but not in animal cells?

A. A cell membrane and cytoplasm B. A cell wall and chloroplasts C. A nucleus and ribosomes D. Mitochondria and a cell membrane

Answer: B. Authored item, `VC2S8U02` (the bank holds no unused `VC2S8U02` item at the required difficulty; §7). Subtopic 8B's plant-against-animal case: the plant cell adds the cell wall, chloroplasts and a large central vacuole on top of the parts both cell types share.

Q14 *(1 mark · `VC2S8U03`)*

Why do nerve cells have long, thin extensions?

A. To store extra glucose to fuel the brain B. To allow them to divide and reproduce more quickly C. To increase surface area for absorbing nutrients from the blood D. To carry electrical signals over long distances in the body

Answer: D. Bank item `VC2S8U03.E02.S01.D2.V01` (options reordered).

Q15 *(1 mark · `VC2S8U04`)*

Which group is essential for breaking down dead material and recycling nutrients?

A. Herbivores only B. Primary producers only C. Decomposers (e.g. bacteria, fungi) D. Top predators

Answer: C. Bank item `VC2S8U04.E01.S01.D2.V01` (options reordered).

Q16 *(1 mark · `VC2S8U05`)*

Why does a liquid have a fixed volume but no fixed shape?

A. Particles vibrate in fixed positions B. Particles are close (forces hold them) but can slide past each other C. Forces are absent D. Particles fly freely

Answer: B. Bank item `VC2S8U05.E02.S01.D2.V01` (options reordered). Repair: the bank's option reads "Particles vibrate fixed"; it is printed as "Particles vibrate in fixed positions" (grammar).

Q17 *(1 mark · `VC2S8U06`)*

Muddy water that settles when left standing is best classified as:

A. Suspension B. Solution C. Compound D. Element

Answer: A. Bank item `VC2S8U06.E02.S01.D2.V01` (options as banked; the settling is the tell, as subtopic 11A teaches with particle pictures).

Q18 *(1 mark · `VC2S8U07`)*

Why is brass (a mixture of copper and zinc) not a compound, even though it contains two types of atoms?

A. Copper and zinc atoms are too similar in size to form a compound B. Compounds can only form between non-metal atoms C. Brass cannot conduct electricity like a true compound D. The metals are mixed but not chemically bonded, and the ratio of copper to zinc can vary

Answer: D. Bank item `VC2S8U07.E01.S01.D3.V01` (options reordered).

Q19 *(1 mark · `VC2S8U08`)*

Why is melting not considered a chemical change?

A. Volume changes B. Heat is required C. No new substance is formed; only state changes D. All changes are chemical

Answer: C. Bank item `VC2S8U08.E01.S01.D3.V01` (options reordered).

Q20 *(1 mark · `VC2S8U09`)*

How does resource regeneration time affect sustainability decisions?

A. Sustainability depends only on cost, not regeneration time B. Faster regeneration rates allow heavier use; slow rates demand restraint C. All resources should be used at the same rate regardless of regeneration time D. Slow-regenerating resources can be used freely without consequence

Answer: B. Bank item `VC2S8U09.E02.S01.D3.V01` (options reordered). Repair: the bank's shorthand "regen" is printed as "regeneration" in two places (options B and C) — the shorthand is not in the book's vocabulary.

Q21 *(1 mark · `VC2S8U10`)*

Tsunami warning systems primarily detect:

A. Regular tidal cycles only B. Storm activity over the open ocean C. Surface wind speed and direction D. Underwater seismic activity and water-level changes

Answer: D. Bank item `VC2S8U10.E02.S01.D2.V01` (options reordered).

Q22 *(1 mark · `VC2S8U12`)*

When the Southern Hemisphere is tilted toward the Sun, the Southern Hemisphere experiences:

A. Winter B. Summer C. Spring only D. Autumn only

Answer: B. Bank item `VC2S8U12.E01.S01.D2.V01` (options reordered).

Q23 *(1 mark · `VC2S8U14`)*

An unbalanced force on an object causes:

A. No change in motion B. The object to immediately stop C. A change in motion D. The object to keep moving at constant speed

Answer: C. Bank item `VC2S8U14.E02.S01.D2.V01` (options reordered). Repair: the bank's option reads "A change in motion (acceleration)"; the bracketed word is dropped in print, because acceleration sits above the band's scope ceiling (D9) and is not taught in this book. Subtopic 15A's rule stands as printed in the book: unbalanced forces change an object's motion, toward the direction of the net force.

Q24 *(1 mark · `VC2S8U15`)*

A Sankey diagram shows 100 J of energy in, 30 J useful and 70 J wasted. The efficiency is:

A. 30% B. 0% C. 70% D. 100%

Answer: A. Bank item `VC2S8U15.E02.S01.D2.V01` (options reordered). Efficiency is the useful share of the input: 30 J of 100 J = 30% (subtopic 16B).

Q25 *(1 mark · `VC2S8U17`)*

In a series circuit, the current through each component is:

A. The same at every point B. Different for each component C. Largest in the component closest to the battery D. Shared equally between separate branches

Answer: A. Bank item `VC2S8U17.E01.S01.D1.V01` (order as banked). Repair: the bank's option B reads "Different for each component, depending on its resistance"; the clause is dropped in print, because resistance is not a taught concept in this book (D9's cap on subtopics 17A and 17B).

Solutions — Section B (45 marks)

Section B is short and structured response across the inquiry strands (Question B1, 7 marks) and the four knowledge strands (Questions B2–B9). Mark every part as set out below. Where a part names a code, the mark is evidence towards that content description's achievement-standard extract.

B1 — Investigation: cans in the Sun (7 marks)

Science inquiry: VC2S8I02 (2), VC2S8I04 (1), VC2S8I05 (2), VC2S8I06 (2).

Two identical cans are used. One has a matt black surface; the other has a shiny metal surface. Each can is filled with 200 mL of water at 20.0 °C. The cans are placed side by side in direct sunlight, and the water temperature in each can is measured every 2 minutes. **The table below is simulated data for practice.**

Time (min)	0	2	4	6	8	10
Black can (°C)	20.0	21.5	23.0	24.5	30.0	27.5
Shiny can (°C)	20.0	20.5	21.0	21.5	22.0	22.5

B1(a) *(2 marks · VC2S8I02)* State the independent variable and one controlled variable in this investigation.

B1(b) *(1 mark · VC2S8I05)* There is one anomalous reading in the table. Identify it and give the evidence that it is an anomaly.

B1(c) *(1 mark · VC2S8I05)* Leaving the anomaly aside, describe the trend shown by the black can.

B1(d) *(1 mark · VC2S8I04)* Explain why a line graph is the right representation for these data.

B1(e) *(2 marks · VC2S8I06)* State one source of error in this method and give an improvement that matches it.

Safety at point of use: if this investigation is repeated in class, use sunlight rather than a flame to heat the cans, and handle glass thermometers with care.

Marking B1

- **(a)** 1 mark — the independent variable is the surface of the can (matt black or shiny). 1 mark — any one controlled variable, for example: the volume of water (200 mL); the starting temperature (20.0 °C); identical cans; both cans side by side in the same sunlight; the same 2-minute reading interval; the same thermometer.
- **(b)** The black can's 30.0 °C reading at 8 minutes. Evidence: the black can's readings rise by exactly 1.5 °C every 2 minutes at every other step (and the next reading falls back to 27.5 °C), so 30.0 °C is the only reading that breaks the steady pattern. 1 mark for both the identification and the evidence.
- **(c)** The temperature of the water in the black can rises steadily over the 10 minutes — by 1.5 °C every 2 minutes. Accept any version carrying a steady rise, with or without the numbers.
- **(d)** The data are measurements taken continuously over time, and a line graph shows how one variable (temperature) changes as the other (time) changes. Accept: time is continuous, and the graph shows the trend.
- **(e)** 1 mark for a named source of error; 1 mark for an improvement that matches it — the improvement must address the error named. Accept any matched pair, for example: cloud cover changing the sunlight during the run → repeat on a clear day or use a lamp at a fixed distance; the two cans read at slightly different moments → one person reads both cans at the same moment; the thermometer read from an angle → read it at eye level.

B2 — Cells and classification (4 marks)

VC2S8U02 (2), VC2S8U01 (2).

B2(a) *(1 mark · VC2S8U02)* State one function of the cell membrane.

B2(b) *(1 mark · VC2S8U02)* What does a mitochondrion do?

B2(c) *(1 mark · VC2S8U01)* The key below is a dichotomous key to four Victorian animals. A specimen is covered in scales and has legs. Trace the key and identify the specimen.

Couplet	Statement	Result
1a	Body covered in fur	eastern grey kangaroo
1b	Body not covered in fur	go to 2
2a	Body covered in feathers	little penguin
2b	Body not covered in feathers	go to 3
3a	Has legs	blue-tongue lizard
3b	Has no legs	tiger snake

B2(d) *(1 mark · VC2S8U01)* The tiger snake and the blue-tongue lizard both have scales. State the feature this key uses to separate them.

Marking B2

- **(a)** The cell membrane controls what goes in and out of the cell: useful substances are let in, wastes are let out, and things the cell does not want are kept out. Any one of these functions earns the mark (subtopic 8B's gatekeeper).
- **(b)** It releases the energy stored in food, using oxygen (subtopic 8B).
- **(c)** Blue-tongue lizard. Path: 1b → 2b → 3a. 1 mark for the correct name; do not require the path to be written, but if the student names a different animal and their written path is consistent with it, award the mark for the tracing (shared-error marking).
- **(d)** Whether or not the animal has legs.

B3 — Organ systems and ecosystems (5 marks)

VC2S8U03 (2), VC2S8U04 (3).

B3(a) *(2 marks · VC2S8U03)* The inner wall of the small intestine is covered in millions of tiny finger-like projections called villi. Explain how the villi help the small intestine do its job.

The food web below is **simulated data for practice**, built for this paper from organisms of a Victorian wetland.

> Algae are eaten by water snails and by mosquito larvae. Mosquito larvae are eaten by dragonfly larvae. Water snails and dragonfly larvae are eaten by short-finned eels.

B3(b) *(1 mark · VC2S8U04)* Name the producer in this food web.

B3(c) *(1 mark · VC2S8U04)* The algae store 10 000 kJ of energy. About how much energy reaches the water snails?

B3(d) *(1 mark · VC2S8U04)* All the short-finned eels are removed from the wetland. Predict what happens to the dragonfly larvae population, and explain your prediction.

Marking B3

- **(a)** 1 mark — the villi give the intestinal wall a very large surface. 1 mark — so more digested food substances pass through that surface into the blood (subtopic 8D). Accept any version carrying large surface → more absorption.
- **(b)** Algae.
- **(c)** About 1 000 kJ — about one tenth of the energy passes from one trophic level to the next (subtopic 9A's food pyramid).
- **(d)** The dragonfly larvae population increases, because the eels that eat them are gone. Accept any version carrying increase + predator removed.

B4 — States of matter and mixtures (4 marks)

VC2S8U05 (2), VC2S8U06 (2).

B4(a) *(2 marks · VC2S8U05)* Use the particle model to explain why a gas can be compressed but a solid cannot.

B4(b) *(2 marks · VC2S8U06)* Water is a compound. Sea water is a mixture. Give the reason for each classification.

Marking B4

- **(a)** 1 mark — gas particles are far apart, so they can be pushed closer together. 1 mark — solid particles are already closely packed, with no space to be pushed into.
- **(b)** 1 mark — water is a single substance made of two elements (hydrogen and oxygen) chemically combined, in a fixed proportion. 1 mark — sea water holds several substances (water, salts and other dissolved material) that are not chemically combined; they keep their own properties, can be separated by physical means, and their amounts can vary.

B5 — Density and separation (5 marks)

VC2S8U05 (2), VC2S8U06 (3).

B5(a) *(2 marks · VC2S8U05)* A pebble has a mass of 54 g and a volume of 20 cm³. Calculate its density. Show your working. (Density = mass ÷ volume.)

B5(b) *(3 marks · VC2S8U06)* A student is given a dry mixture of iron filings, salt and sand. Design a method that separates all three materials, and for each step state the property the separation uses.

Safety at point of use: the evaporation step needs heating — teacher supervision, eye protection, and the low flame or hotplate setting the classroom normally uses.

Marking B5

- **(a)** 1 mark — correct substitution: density = 54 g ÷ 20 cm³. 1 mark — **2.7 g/cm³**, with the unit. Shared-error marking: a student who carries in a wrong value from elsewhere and divides correctly earns the method mark.
- **(b)** 1 mark for each step paired with the property it uses (3 marks):
  - Step 1: move a magnet through the mixture to pull out the iron filings — property: iron is magnetic; salt and sand are not.
  - Step 2: add water to what remains; the salt dissolves; filter — the sand stays in the filter paper — property: salt dissolves in water; sand does not.
  - Step 3: evaporate the water from the filtered liquid to recover the salt — property: water evaporates; salt does not. Accept any workable order and any wording that carries the same property.

B6 — The rock cycle on Victoria's basalt plains (5 marks)

VC2S8U11 (5).

Much of Victoria's western plains is basalt — dark rock laid down by the eruptions of the Newer Volcanics Province [S6]. Basalt is an igneous rock.

B6(a) *(1 mark)* Explain why basalt is classified as igneous.

B6(b) *(2 marks)* State two processes that, over time, turn basalt into sedimentary rock.

B6(c) *(1 mark)* State the conditions that would change basalt into metamorphic rock.

B6(d) *(1 mark)* Cooling lava can form new rock within days, but turning sediment into sedimentary rock takes millions of years. State what makes the sedimentary process so slow.

Marking B6

- **(a)** It formed from melted rock (lava) cooling and solidifying (subtopic 13B).

- **(b)** 1 mark — weathering and erosion break the basalt down into grains and sediment. 1 mark — the grains settle, are buried, and are pressed and cemented together, often in layers.
- **(c)** Heat and pressure, while the rock stays solid.
- **(d)** Burial and cementation need layer after layer of sediment to build up and be pressed together, which only happens over very long timescales. Accept any version carrying slow build-up of layers + slow pressing and cementing.

B7 — Earth, seasons, the Moon and tides (5 marks)

VC2S8U12 (5).

B7(a) *(2 marks)* Melbourne has summer in January and winter in July. Use Earth's tilt to explain why.

B7(b) *(1 mark)* The table shows the mean daily maximum temperatures recorded at Melbourne Airport, 1991–2020 averages [S4]. State the pattern the table shows.

Month	Jan	Apr	Jul	Oct
Mean daily maximum (°C)	27.0	20.6	13.4	20.0

B7(c) *(1 mark)* One night, the Moon sits between Earth and the Sun, and its lit half faces away from us. Name this phase of the Moon.

B7(d) *(1 mark)* High tide at Williamstown is at 6:00 am. About when is the next high tide?

Marking B7

- **(a)** 1 mark — Earth's axis is tilted, and the tilt keeps pointing the same way all year as Earth travels around the Sun (subtopic 14A). 1 mark — in January the Southern Hemisphere is tilted toward the Sun, so its sunlight is more concentrated and its days are longer (summer); in July it is tilted away (winter).
- **(b)** Warmest in summer (January) and coldest in winter (July), with the in-between months in between — matching the Southern Hemisphere's seasons.
- **(c)** New moon (subtopic 14B).
- **(d)** About 12 h 25 min later — about **6:25 pm**. Accept 6:20 pm to 6:30 pm. The interval is the real one: from one high tide to the next is about 12 h 25 min [S5].

B8 — Forces on a cart (5 marks)

VC2S8U14 (5).

A child pushes a cart along level ground. The push is 30 N forward; friction from the ground is 10 N backward. Gravity pulls down on the cart with 50 N, and the ground pushes up on it with 50 N.

B8(a) *(2 marks)* Draw the force diagram for the cart: one arrow for each force, drawn to scale and labelled.

B8(b) *(1 mark)* The vertical forces are balanced. State what that means for the cart's vertical motion.

B8(c) *(1 mark)* Calculate the net horizontal force.

B8(d) *(1 mark)* The horizontal forces are unbalanced. State what happens to the cart's motion.

B8(e) *(1 mark)* The same child pushes an empty cart and a loaded cart with the same force. Which cart is harder to get moving, and why?

Marking B8

- **(a)** 1 mark — the vertical pair drawn equal in length: 50 N down (gravity) and 50 N up (the ground's support). 1 mark — the horizontal pair drawn to scale: 30 N forward drawn longer than 10 N backward, both labelled. Arrows start on the cart.

- **(b)** No change in motion — the cart does not lift off the ground or sink into it. Balanced forces produce no change in motion (subtopic 15A).
- **(c)** 30 N − 10 N = **20 N forward**. Award the mark for the correct net force with its direction.
- **(d)** The cart's motion changes toward the direction of the net force — it speeds up. (Acceleration is not required and not assessed; the book's rule stands as printed in subtopic 15A.)
- **(e)** The loaded cart, because it has the greater mass — the same force changes the motion of a smaller mass more than the motion of a larger one.

B9 — Energy transfers and circuits (5 marks)

VC2S8U15 (2), VC2S8U17 (3).

B9(a) *(2 marks · VC2S8U15)* Give one example of heating by conduction and one example of heating by radiation.

B9(b) *(1 mark · VC2S8U17)* A circuit holds a cell, a closed switch and two globes joined one after the other in a single loop. Name this arrangement.

B9(c) *(1 mark · VC2S8U17)* One globe fails. State what happens to the other globe, and why.

B9(d) *(1 mark · VC2S8U17)* A student wants to measure the voltage across one globe. State how the voltmeter must be connected.

Safety at point of use: circuit work stays on low-voltage cells or a school power pack on a low setting — never the mains (subtopic 17A's standing control).

Marking B9

- **(a)** 1 mark — any conduction example, for example: a metal spoon warming in a hot drink. 1 mark — any radiation example, for example: heat from the Sun, or from a fire, reaching you across space (subtopic 16B).
- **(b)** A series circuit (subtopic 17A).
- **(c)** It goes out: a series circuit has only one path, and the failed globe breaks the loop.
- **(d)** In parallel — across the globe (subtopic 17B: voltmeter across, ammeter in line).

Solutions — Section C (10 marks)

Section C is one extended response on a socio-scientific issue — VC2S8H03 (5 marks) and VC2S8H04 (1 mark) — carrying an inquiry limb on VC2S8I07 and VC2S8I06 (4 marks). The stimulus reuses the sourced Victorian energy facts the book teaches in subtopic 13D.

Stimulus — Victoria's electricity

Australia's main electricity grid — the network that supplies the eastern and southern states, including Victoria — is the National Electricity Market. In 2022 it generated **208.4 TWh** of electricity. A TWh (terawatt-hour) is a unit for very large amounts of energy: 1 TWh is one million million watt-hours [S1]. Black coal and brown coal together supplied **121.5 TWh** — more than all the other sources combined; wind supplied 25.9 TWh and solar 30.1 TWh [S1].

Victoria's own story is built on brown coal. Huge deposits of it sit in the **Latrobe Valley**, about 150 km east of Melbourne, and the state's biggest power stations burn it. **Loy Yang A (2 210 MW)** and **Loy Yang B (953 MW)**, counted together, are the largest power station in Australia; the owner of Loy Yang A has announced it will close in 2035 [S2]. New sources are being built too: the **Macarthur Wind Farm**, near Hamilton in western Victoria, was completed in January 2013 with 140 turbines and a combined capacity of 420 MW, reported at the time as Australia's biggest wind farm [S3].

A proposed response: *Victoria should build more large-scale wind and solar farms, and phase down its coal-fired power stations.*

At a community meeting, one resident says: *"Wind farms produce almost no electricity on hot days."*

Questions

C(a) *(1 mark · VC2S8H03)* Identify the proposed scientific response to the socio-scientific issue.

C(b) *(4 marks · VC2S8H03)* State one consideration under each lens — ethical, environmental, social and economic — for the proposed response, each with its reason. A consideration filed under the wrong lens earns no mark.

C(c) *(1 mark · VC2S8H04)* Explain how science communication about electricity generation can shape an individual viewpoint, a community policy or a regulation.

C(d) — inquiry limb *(4 marks)*

(i) *(2 marks · VC2S8I07)* State what evidence would be needed to test the resident's claim, and name the kind of source you would trust for it.

(ii) *(2 marks · VC2S8I06)* Evaluate the claim as it stands.

Marking Section C

- **(a)** Build more large-scale wind and solar farms and phase down coal-fired power stations. Accept any paraphrase carrying both halves of the response; one half alone does not earn the mark.
- **(b)** 1 mark per lens, consideration plus reason, stated at full strength and sitting under the right lens (4 marks). Marks are for the quality of the reasoning, not for the conclusion reached. Accept, from subtopic 13D's steelman table and 18A's lens framework:
    - *ethical* — for example: it is not fair to future generations to keep releasing carbon dioxide when workable alternatives exist; the benefits (cleaner air) and harms (lost jobs) of the change should not fall on different people; Latrobe Valley workers deserve a planned transition, not a sudden closure.
    - *environmental* — for example: wind and solar release no carbon dioxide while generating, lightening the greenhouse load; but building turbines and panels takes steel, concrete and energy, large solar farms take land, and turbine blades can strike birds and bats.
    - *social* — for example: Latrobe Valley towns and jobs depend on the stations, and a fast phase-down could take a region's main income; on the other side, cleaner air means better health, and the land under wind turbines can still be farmed — at Macarthur, sheep graze between the turbines [S3].
    - *economic* — for example: brown coal is local and cheap and the stations run day and night, keeping supply steady; but wind and solar have no fuel to buy, running costs fall once they are built, and their

output varies with the weather, so the grid needs storage or quick-start back-up. A consideration may run in either direction; what is marked is the fit to the lens and the strength of the statement.

- **(c)** Credible, clearly communicated findings — what each source emits, what it costs, how reliably it generates — shape what individuals believe and what a community supports; that support shapes what regulations a government can adopt, such as renewable targets or closure dates for coal-fired stations. Accept any version carrying communication → viewpoints/policy/regulation.
- **(d)(i)** 1 mark — the evidence: generation records from wind farms over many hot days, compared with cool days — a pattern over time, not a single day. 1 mark — a credible source for it, for example: the grid operator's (AEMO's) published market data, a government energy report, or a named scientific body with its method shown.
- **(d)(ii)** 1 mark — the claim rests on one observation, which is not enough: it needs a pattern — repeated measurements and a comparison — before it can be judged. 1 mark — a wind farm's output depends on wind speed, not on temperature alone; a hot day can be windy or calm, so the claim must be checked against actual generation data before it is accepted or rejected.

Mark summary, sources and teacher-facing note

Mark summary and curriculum map

Strand	Section A	Section B	Section C	Total
Science as a human endeavour	Q1, Q2 (2)	—	C(a), C(b), C(c) (6)	**8**
Science inquiry	Q3–Q11 (9)	B1 (7)	C(d) (4)	**20**
Biological sciences	Q12–Q15 (4)	B2 (4), B3 (5)	—	**13**
Chemical sciences	Q16–Q19 (4)	B4 (4), B5 (5)	—	**13**
Earth and space sciences	Q20–Q22 (3)	B6 (5), B7 (5)	—	**13**
Physical sciences	Q23–Q25 (3)	B8 (5), B9 (5)	—	**13**
Total	**25**	**45**	**10**	**80**

All eleven strand groupings of the band are assessed: both sub-strands of Science as a human endeavour, all five inquiry sub-strands, and all four Science Understanding sub-strands.

Evidence towards the achievement standard: the extracts served by each subtopic are quoted in that subtopic's header (D13), and the codes above attach to those extracts. Two extracts already printed in this tree's instrument guides are repeated here because Section C is built on them:

Items	Code	Achievement-standard extract
C(a), C(b)	`VC2S8H03`	"They discuss the relevant ethical, environmental, social and economic considerations associated with a proposed scientific response to a selected socio-scientific issue."
C(c)	`VC2S8H04`	"They analyse the importance of science communication in shaping viewpoints, policies and regulations."

Where the multiple-choice items come from

The band's question bank (`mcq-system/data/output/questions/L7-8_Science.csv`) supplies 21 of the 25 Section A items. The bank stores every item with its correct option in a fixed position; the option texts are printed unchanged except for the recorded repairs below, and the options are redistributed across the letters so the key is not uniform — the answer letters in this guide are the letters as printed. Four items are authored for this paper,

against their own codes and never against a neighbouring code (§7): Q3 and Q4 (VC2S8I01) and Q12 and Q13 (VC2S8U01, VC2S8U02), because the bank holds no unused item at the required difficulty for those codes.

Recorded repairs (4 items, 5 places):

- Q16, VC2S8U05.E02.S01.D2.V01 — bank's "Particles vibrate fixed" printed as "Particles vibrate in fixed positions" (grammar).
- Q20, VC2S8U09.E02.S01.D3.V01 — bank's shorthand "regen" printed as "regeneration" in two places (word-level gate).
- Q23, VC2S8U14.E02.S01.D2.V01 — bank's "(acceleration)" dropped from the correct option (D9 scope ceiling: acceleration is not taught in this book).
- Q25, VC2S8U17.E01.S01.D1.V01 — bank's "depending on its resistance" dropped from option B (D9: resistance is not a taught concept in this book).

Sources

Web sources below were retrieved 2026-08-22.

- **[S1]** Wikipedia, "Electricity sector in Australia", 2026. https://en.wikipedia.org/wiki/Electricity_sector_in_Australia — the 2022 National Electricity Market total (208.4 TWh) and its breakdown by source, as used in subtopic 13D.
- **[S2]** Wikipedia, "Loy Yang Power Station" and "Loy Yang A Power Station", 2026. https://en.wikipedia.org/wiki/Loy_Yang_Power_Station and https://en.wikipedia.org/wiki/Loy_Yang_A_Power_Station — capacities, the Latrobe Valley location and the announced 2035 closure, as used in subtopic 13D.
- **[S3]** Wikipedia, "Macarthur Wind Farm", 2026. https://en.wikipedia.org/wiki/Macarthur_Wind_Farm — completion in January 2013, 140 turbines, 420 MW, and sheep grazing between the turbines, as used in subtopic 13D.
- **[S4]** Wikipedia, "Climate of Melbourne", 2026. https://en.wikipedia.org/wiki/Climate_of_Melbourne — mean daily maximum temperatures at Melbourne Airport, 1991–2020 averages (January 27.0 °C, April 20.6 °C, July 13.4 °C, October 20.0 °C); the table cites the Bureau of Meteorology. The Bureau of Meteorology's averages pages (bom.gov.au) were attempted on 2026-08-22 and returned access errors; the figures were verified against this table, in line with house practice for unreachable primary sources.
- **[S5]** Wikipedia, "Tide", 2026. https://en.wikipedia.org/wiki/Tide — the 12 h 25 min spacing between high tides, the source subtopic 14B uses.
- **[S6]** Geoscience Australia, "Volcano", n.d. https://www.ga.gov.au/education/natural-hazards/volcano — the Newer Volcanics Province and Victoria's basalt plains, as used in subtopic 12B.
- Atlas of Living Australia, Biodiversity Information Explorer — the accepted taxonomy of *Macropus giganteus* (genus *Macropus*), and of the four animals of Question B2. https://bie.ala.org.au — the source subtopic 7A uses for the kangaroo.
- Victorian Curriculum and Assessment Authority, *Victorian Curriculum F–10 Version 2.0, Science, Levels 7 and 8*, the content descriptions and elaborations assessed on this paper and the achievement standard, 2026. https://www.vcaa.vic.edu.au/curriculum/victorian-curriculum-f-10-version-2-0/
- Multiple-choice items: the band's question bank, mcq-system/data/output/questions/L7-8_Science.csv, items VC2S8H01.E05.S01.D2.V01, VC2S8H04.E02.S01.D2.V01, VC2S8I02.E01.S01.D3.V01, VC2S8I03.E02.S01.D2.V01, VC2S8I04.E01.S01.D2.V01, VC2S8I05.E02.S01.D2.V01, VC2S8I06.E01.S01.D2.V01, VC2S8I07.E01.S01.D2.V01, VC2S8I08.E02.S01.D3.V01, VC2S8U03.E02.S01.D2.V01, VC2S8U04.E01.S01.D2.V01, VC2S8U05.E02.S01.D2.V01, VC2S8U06.E02.S01.D2.V01, VC2S8U07.E01.S01.D3.V01, VC2S8U08.E01.S01.D3.V01, VC2S8U09.E02.S01.D3.V01, VC2S8U10.E02.S01.D2.V01, VC2S8U12.E01.S01.D2.V01, VC2S8U14.E02.S01.D2.V01, VC2S8U15.E02.S01.D2.V01 and VC2S8U17.E01.S01.D1.V01.

The real data on this paper are the figures listed in S1–S6 above, each used with its source line. Everything else — the cans-in-the-Sun data table of B1, the wetland food web of B3, the cart of B8, and the resident's remark in Section C — is an original teaching scenario of this book's own design, labelled as simulated data for practice where it appears.

Teacher-facing note

This note is written for an adult professional and is not student-facing text.

- **A school instrument, not a VCAA exam (D14).** Levels 7 and 8 carry no VCAA examination and no external assessment. This paper is a school-based assessment instrument of this book's own design, graded against the achievement-standard extracts the subtopics carry, and its marks are one source of evidence towards the on-balance teacher judgement. It must not be retitled or reformatted as a mock examination.
- **Administration.** Completion is untimed despite the 90-minute planned time; a scientific calculator is permitted; reading support is whatever the classroom normally provides. Award the marks exactly as set out in this guide — point-based, no holistic rubric, no half-marks; spelling and handwriting do not lose marks; shared-error marking applies to carried values (B2(c), B5(a)).
- **Inquiry coverage (D7).** 20 of the 80 marks are inquiry-strand marks — Section A Q3–Q11 (9), Question B1 (7) and Section C(d) (4) — the largest single block and one quarter of the paper. D10's protocol limb is assessed only in SIT-2, whose guide sits in `wb_sit2.md`; nothing in this paper duplicates it.
- **First Nations content (CONTENT_POLICY Rule 1).** This paper draws no Aboriginal or Torres Strait Islander content. The bank's items on First Nations elaborations — including `VC2S8H01.E02` and `VC2S8H01.E04` — are reserved under CONTENT_POLICY Rule 1 and are not drawn on; that is why Section A's `VC2S8H01` slot uses the plate-tectonics item at `VC2S8H01.E05`.
- **Relationship to the other instruments.** The topic tests carry their own guides in their own files, and the SITs carry theirs in `wb_sit1.md` and `wb_sit2.md`. This file covers the review only. The assessed total across the book remains 285 (topic tests) + 60 (SITs) + 80 (this paper) = 425 marks.