

Bridge · Requirements and predictions

A performance criterion states what a design must achieve. A constraint limits resources, size or procedure. A prediction is a testable expectation, not a measured outcome. We evaluate complete sleeves here; changing two sleeve features does not isolate the effect of one.

100 g, start 10°C, room 22°C, 15 min. Final ≤16°C in EVERY trial; ≤4 tokens; ≤15 mm added thickness. Covered liquid water; cups/lids, mass, starting temperature, duration, exposure and reading procedure match within and across trials. Surroundings stay at the stated room temperature. No ice, phase change, active heating/cooling, direct sunlight or meaningful evaporative cooling. Each trial uses fresh samples. Accuracy is not supplied.

K6-D-P · Supplied design record

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Design	Tokens	Added mm	Trial 1 final °C	Trial 2 final °C	Trial 3 final °C
H	3	12	16	16	16

K6-P1. Identify the performance criterion and the two resource/size constraints. Does H meet every nominal requirement? Show each check.

K6-P2. H warms from 10°C to 16°C. Does it cool the water or stop all transfer? Classify “sealing its gap may reduce warming” as a prediction or an observed result. What matched test would investigate that prediction?

Grade 6 provisional target; NGSS Grades 6–8 band. Prerequisites: read °C/time, compare changes, consider trials and conditions. Paper and pencil only. Tokens are fictional resource units. Respond in connected prose, orally while pointing to data, or with a labeled representation. Clarify the question, table access, vocabulary and response mode before choosing a reteach. Sparse language can express adequate reasoning.

Model · Check the complete brief

Question: Which designs meet the brief, and how could a teacher choose between feasible designs? A nominal pass concerns these supplied records, not a guarantee.

100 g, start 10°C, room 22°C, 20 min. Final ≤15.5°C in EVERY trial; ≤8 tokens; ≤20 mm added thickness. Covered liquid water; cups/lids, mass, starting temperature, duration, exposure and reading procedure match within and across trials. Surroundings stay at the stated room temperature. No ice, phase change, active heating/cooling, direct sunlight or meaningful evaporative cooling. Each trial uses fresh samples. Accuracy is not supplied.

K6-D-M · Supplied design record

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Design	Tokens	Added mm	Trial 1 final °C	Trial 2 final °C	Trial 3 final °C
A	5	18	15	15.5	15
B	8	20	14	14.5	14
C	9	18	13.5	14	13.5
D	6	24	14.5	15	14.5

K6-M1. For each design, check all three final readings, tokens and thickness. List every feasible design; record why each other design fails.

K6-M2. Choose a feasible design and name a priority that makes your choice reasonable. Compare its resource use and thermal result with the other feasible design. State one limitation.

Practice · A decision needs a priority

100 g, start 12°C, room 24°C, 18 min. Final ≤17°C in EVERY trial; ≤6 tokens; ≤18 mm added thickness. Covered liquid water; cups/lids, mass, starting temperature, duration, exposure and reading procedure match within and across trials. Surroundings stay at the stated room temperature. No ice, phase change, active heating/cooling, direct sunlight or meaningful evaporative cooling. Each trial uses fresh samples. Accuracy is not supplied.

K6-D-G · Supplied design record

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Design	Tokens	Added mm	Trial 1 final °C	Trial 2 final °C	Trial 3 final °C
E	4	12	16	16.5	16
F	6	18	15	15.5	15
G	5	15	16	17.5	16

K6-G1. Identify all feasible designs. A fictional response says “G is fine because its average is under 17°C.” Evaluate that response against the actual all-trials rule.

K6-G2. Choose between feasible designs. Explain a genuine tradeoff using at least two matched comparisons. What scientific idea helps explain why all these samples warm?

A lower final reading can be relevant when starts and intervals match; it is not a universal decision rule. A difference in displayed readings is not proof of a reliable advantage.

Independent challenge · Record a proposal first

Quick Check disclosure: this is the same independent challenge used in Teach the Design Challenge. It is not fresh after you have seen or attempted it. Keep the next page out of view until you finish this page.

80 g, start 11°C, room 23°C, 16 min. Final ≤16.5°C in EVERY trial; ≤5 tokens; ≤19 mm added thickness. Covered liquid water; cups/lids, mass, starting temperature, duration, exposure and reading procedure match within and across trials. Surroundings stay at the stated room temperature. No ice, phase change, active heating/cooling, direct sunlight or meaningful evaporative cooling. Each trial uses fresh samples. Accuracy is not supplied.

K6-D-I · Supplied design record

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Design	Tokens	Added mm	Trial 1 final °C	Trial 2 final °C	Trial 3 final °C
J	3	14	16	16	16.5
K	5	19	15	15.5	15
L	4	16	15	17	15
N	6	18	14	14.5	14

K6-I1. Check every requirement. Which designs are feasible? Select one and justify your priority with relevant comparisons across trials.

K6-I2. Propose a specific modification to your chosen design. State a testable prediction and describe a matched repeated comparison against the unchanged design. Include starting conditions, duration, what to record, and what would count against the prediction.

Independent challenge · Separate redesign evidence

Reveal only after I0. These are specified fictional prototypes, not results for your own unbuilt proposal: J-sealed closes a gap in J with one extra token; K-thin uses a thinner wrap with the same token allowance. Changes are already included in the table. Do not invent a successful result for your proposal.

80 g, start 11°C, room 23°C, 16 min. Final ≤16.5°C in EVERY trial; ≤5 tokens; ≤19 mm added thickness. Covered liquid water; cups/lids, mass, starting temperature, duration, exposure and reading procedure match within and across trials. Surroundings stay at the stated room temperature. No ice, phase change, active heating/cooling, direct sunlight or meaningful evaporative cooling. Each trial uses fresh samples. Accuracy is not supplied.

K6-D-R · Supplied design record

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Design	Tokens	Added mm	Trial 1 final °C	Trial 2 final °C	Trial 3 final °C
J-sealed	4	14	15.5	16	17
K-thin	5	17	15.5	16	16

K6-I3. Reassess these prototypes against the original brief. Compare each with its original record on I0; what must be revised? Is either a demonstrated universal improvement?

K6-I4. Retain your original proposal as a hypothesis, or revise it. Explain the evidence needed before claiming its success. Name one conclusion the supplied records cannot establish.