

One-page teaching card

Target/prerequisites: compare temperature rises, keep conditions matched, retain anomalies and revise a design claim. Learners need subtraction with decimals, °C/mL/min units, and distinction between temperature and energy. P1 can be opened alone; P1-B supplies its bridge.

Print: practical first comparison = P1-S-QS/BRIEF/ASSEMBLY/METHOD/CHECK/DEVICE/F1–F3/CASE1/A1. Redesign = QS/BRIEF/ASSEMBLY/METHOD/CHECK/DEVICE/REDESIGN/R1–R3/CASE2/A2. Reflect = QS/BRIEF/METHOD/CHECK/CASE1/CASE2/A1/REDESIGN/A2/REFLECT. Use-a-Later-Reasoning-Check is the separate P1-S-LATER print. Answer keys are separate.

Teach: model assembly and a consistency check; rehearse one paired reading; check each group before water use. Notice: mismatched starts, moving probes, confusing endpoints with rises, counting timepoints as trials or discarding surprising values. Next: P1-L1 is a fresh short reasoning check after reflection; if already exposed, use it as practice and record the exposure rather than calling it a fresh check.

Timing estimate per phase: 15 min setup/plan + three 13 min fill/settle/run cycles + two 5 min resets + 10 min comparison = 74 min. These are planning estimates, not measured classroom timings. In a 60 min session, stop after two trials; store dry labeled assemblies, retain records, and run trial 3 in a supervised 20–30 min continuation with a new instrument check. Keep first and retest phases separate. No equipment homework.

Content/methods review and physical execution are different. No actual run was performed during authorship. School procedures and ordinary adult supervision apply; content review does not certify every classroom or instrument. Supplied data is immediately usable if equipment/conditions are unsuitable.

Operational setup and quantities

For G groups of 3–4: 3 G identical rigid stable plastic cups with matching loose covers and pre-existing probe openings; 2 G suitable non-glass probes; G dry spill trays; G measures marked at least every 2 mL; G timers; G probe holders; 3 G clean pre-cut felt sheets $26 \times 6 \text{ cm} \leq 3 \text{ mm}$; 40 G cm pre-cut tape (10 cm initial P1 + $\leq 30 \text{ cm}$ P2). Keep spare dry sleeves and cups available. Supply enough printed forms for each fresh replacement. P0 and P1 remain labeled; P2 is a third cup.

Water allocation for both phases: at least 2.1 G L common cool water (1.8 G L for six pairs + reserve) and 1.5 G L room-temperature conditioning/check water; provide extra for replacements/cleanup. Example 6 groups: 18 cups, 12 probes, 6 trays/measures/timers, 18 felt sheets, 240 cm tape, 12.6 L cool water and 9 L room water. One classroom air thermometer at cup height serves all groups; record its ID/location and each run's room readings.

Adult prepares common 12–14 °C water from clean cool liquid water, mixing with room water if necessary; no student heating or ice in test cups. Use level tray surfaces, well away from power outlets/electronics, direct sun and drafts. Verify measured 150 mL produces sufficient depth for the entire sensing region at the stated 1.5 cm tip clearance. If geometry/probe cannot fit, obtain suitable matched equipment or use fallback.

Instrument requirements: check maker instructions for immersed portion, immersion depth, water suitability, safe range, minimum response and cleaning. Battery displays stay dry unless explicitly rated otherwise. No glass thermometers. Do not invent accuracy. 0.1 °C displays make the matching/check criteria readable; other instruments require an explicitly adapted protocol/re-audit or supplied data.

Allowed material substitution: teacher-supplied dry craft foam sheets with the same dimensions and $\leq 3 \text{ mm}$ thickness may replace felt for the whole series. Label material/version and any change; do not compare a foam series as if it were the felt case. No allergen-prone loose fibers, sharp-edged sheet material, student cutting or hot glue.

Supervision, participation and cleanup

Follow applicable school-use rules and required protective arrangements. Adult checks stability, covered slots, probe holders, measurement depth and dry working area before release to groups. Water is nonconsumable. No heating, flames, dry ice, heat/cold packs, pressure devices, mains heating or food/medicine applications. Covers remain loose and unsealed.

Demonstrate carrying empty cups and pouring over the tray. Keep bags, books and electrical devices clear. For a spill: stop handling, notify adult, keep others away from wet floor, adult isolates nearby electrical equipment according to school procedure, absorb water and dry the surface. Never ask a student to handle a wet electrical device. A leaking/damaged cup leaves service; retain the run as flagged and replace with a matching stable cup before a fresh run.

Roles: timer/reader, recorder/checker, materials coordinator, evidence explainer. Rotate or pair roles; students can read a large display, dictate records, use accessible tables, or analyze supplied data without pouring/handling. Adult/peer can manipulate under learner direction. Equivalent reasoning does not require manual dexterity or graph drawing.

Cleanup: adult drains water into an appropriate sink under school procedures; no drinking or reuse as drinking water. Rinse/clean probes as instructed by maker, keep electronics dry, dry cups/trays, remove damaged/wet materials, wash hands and leave the floor dry. Store labeled dry assemblies between sessions; recheck stability, sleeve condition and instruments at the next session.

Retain empirical records including flags. Replacement trials get suffix IDs (for example F2a) and fresh samples. Never insert constructed readings into empirical sheets to finish an investigation.

Why these controls and limits matter

Protocol choices are author design choices, not validated optima. Matching geometry/150 mL limits amount and area differences. Covered cups reduce evaporation and keep exposed surfaces comparable; they do not eliminate transfer or evaporation. Do not interpret rises as total energy, calorimetry or instantaneous rates. Cup-reset water approximates common initial wall conditions; wall temperature is not directly verified.

The start gap ≤ 0.5 °C, volume allowance ± 2 mL, room shift flag > 1 °C and reading window ± 15 s are operational tolerances for this lesson, not statistical uncertainty estimates or certified accuracy. Reject failed starts before timing; retain them separately. Small differences are interpreted cautiously even within tolerances. Prefer reporting each paired rise over a mean that hides procedural flags.

Minimum 60 s plus maker response interval is followed by two common-water reads 30 s apart. $\Delta \leq 0.2$ °C change and ≤ 0.5 °C pair agreement screens inconsistent/slow probes but cannot establish calibration. If maker response interval exceeds the practical schedule, lengthen supervised timing or use fallback; do not shorten it. Repeat checks after each phase; record any drift.

Swapping A/B and left/right after draining provides a partial balance. Odd three trials do not cancel every offset. Endpoint-minus-start subtraction reduces a constant offset's effect but changing offset/response can still bias rises. Comparing concurrent pairs helps with room changes; distinguish runs made on different days. Three fresh pairs are an instructional choice to discuss variation, not a statistical reliability guarantee.

A dry redesign versus P1 is a system-level evaluation. If multiple features change, do not credit one alone. Keep assembled dry sleeves between runs; log/rebuild if wet/damaged. Interpret any rebuild as a procedural change. Any condition outside the specified range needs an explicit adapted record or supplied-data route, never a promised ranking.

Troubleshooting without manufacturing success

Negligible warming: check actual room/water gap, elapsed times, probe immersion/response and units. Retain valid small changes. Use supplied data for reasoning, or plan a new explicitly labeled longer-duration series (with fresh pairs and stated schedule); do not append it as the original 10 min result.

Indistinguishable designs: state that this setup did not establish a useful difference. Differences ≤ 0.5 °C deserve particular caution because accepted checks/start gaps are of that scale; this is a teaching caution, not an uncertainty interval. Do not certify larger differences either. Check the full pattern and documented instrument information.

Inconsistent trials: inspect starts, volume, covers, timing, placement, sun/drafts, sleeve moisture and resets. Keep all data. Flag specific procedural concerns and obtain fresh replacements as time allows; mixed usable trials support an inconclusive claim, not selective deletion.

Drift/slow probe: repeat both common-water checks with equal depths, sufficient maker response and stable stirring. Record the disagreement. Replace/check the affected instrument; restart fresh pairs. Do not claim calibration or infer an accuracy specification.

Leaks/spills/wet sleeve: stop, apply spill procedures, remove damaged cup, log wetness/time. Replace with matching dry components, reset and use a new run ID. R2 in the fictional case models retaining this defect, not a clean redesign trial.

Missing/unavailable equipment: use the full constructed case plus questions; no learner must invent readings. One probe alone cannot do the concurrent method; do not silently substitute sequential readings. Equipment/room unavailable at school is a practical route constraint, not a content-review gate.

Redesign performs worse: check constraints and conditions, report the worse/mixed outcome, seek a plausible next modification and test. Treat a feasible but ineffective design as useful evidence; do not force success.

Supplied-data teaching model

All six completed trials are explicitly fictional constructed records; they are not observations, experiments or computational simulations. Give P1-S-CASE1 only for first analysis. Have learners commit to P1-R-PLAN before revealing CASE2. State that CASE2 describes author-specified P2 and does not test their own proposal.

Model F1: P0 rise $16.0 - 13.0 = 3.0$ °C; P1 rise $15.3 - 13.1 = 2.2$ °C; difference $3.0 - 2.2 = 0.8$ °C. All first pairs give 0.8 °C. Say “less warming in these constructed comparisons,” not “felt cools water” or “no energy enters.” Starts match within 0.5 °C but are not identical; rises are preferable to bare endpoints.

Retest: R1 rises 2.3 versus 1.9 °C; R2 2.4 versus 2.7 °C with wet-sleeve flag; R3 2.3 versus 2.0 °C after logged rebuild. Do not erase R2. Two dry differences 0.4/0.3 °C are small and fewer than the intended three clean trials. Conclude improvement remains unestablished, then specify fresh dry matched retesting. R2 does not prove wet felt is worse: spill/changed conditions were not isolated.

Sparse valid response: “P1 warmed less, 0.8 each time. Only this setup.” This shows evidence and scope even without polished prose. Ask for unit/run labels if unclear. A drawing/table/oral explanation can carry the same reasoning.

This fallback covers planning, evidence interpretation and claim revision. It does not demonstrate that learners actually constructed, measured or tested a device. Do not report empirical learning outcomes from completing it.

Methods, standards and source scope

No physical run was performed by the author. Numeric completed records are authored fictional cases; raw forms are blank for local measurements. The specified method has finite operational assumptions and must be used with suitable instruments and ordinary school procedures. Content review is distinct from physical execution; no classroom effectiveness, product certification or universal safe-use claim is made.

Official source checked 30 September 2026: <https://www.nextgenscience.org/pe/ms-ps3-3-energy> informs P1-B/P/E: engineering a thermal protector, directional transfer and temperature/energy distinction. P1 offers construction/testing opportunities only when actually carried out; no total transferred-energy calculation or blanket standards coverage is claimed.

Official source: <https://www.nextgenscience.org/pe/ms-ets1-3-engineering-design> informs P1-A/R: compare designs using criteria/constraints and recognize useful redesign evidence. Source elements are paraphrased; original tasks/tables/setup text are not copied lessons or diagrams. P1 alone does not establish full band mastery or endorsement.

Official source: <https://www.nsta.org/nstas-official-positions/safety-and-school-science-instruction> informs P1-T-SAFETY: science activity requires school safety arrangements, training/procedures and attention to hazards. These classroom-use directions are not an external human content-approval requirement.

No device-specific maker accuracy is asserted. Teacher records selected device and checks its official immersion/response/cleaning instructions. Operational matching, stability, timing and repeat criteria are declared author choices; they have not been empirically validated. No manufacturer endorsement or accuracy estimate is inferred.

Rights: all P1 prose, tasks, forms and constructed values are original author-created project content. Retain the project's actual resource-license notice supplied by the release build. Links identify limited source claims; no organization endorses the resource.

Answers and accepted alternatives

P1-B1

Aim: less temperature rise over 10 minutes than the identified reference under matched conditions. Constraints: at most two 26 × 6 cm sheets, each ≤3 mm; ≤30 cm tape; footprint ≤12 cm diameter; height ≤9 cm; base/top/probe slot remain exposed (any three). Inconclusive: missing/comparably flawed trials, differences small relative to instrument/condition concerns, mixed directions or negligible warming. No fixed achieved temperature is promised.

P1-B2

Accept a testable prediction such as P1 will have a smaller 10-minute rise than P0, with dry felt possibly slowing transfer through the sides. Other predictions are accepted with reasons and later evidence review. Room surroundings are warmer than the water, so net energy can enter; exposed base, cover, slot and other paths remain. Insulation is not an active cooler or a guarantee of no transfer.

P1-P1

Accept an accurate labeled description or sketch of P0/P1 with dry side sleeve only, identical loose covers, equal 150 mL water, central immersed sensing region and tip 1.5 cm above base without contact. Match cup geometry, water amount/start, cover/slot, probe placement, timing, tray/environment; explain how differences could affect comparison.

Answers and accepted alternatives

P1-C1

Do not start using this pair: 0.7 °C exceeds the 0.5 °C consistency limit. Record, check positioning/response, replace/check instrument or use fallback. 0.1 °C is display resolution, not demonstrated accuracy or calibration.

P1-C2

Swap to examine/reduce consistent position and sensor effects. Three timepoints follow the same water/cup run; they are repeated readings, not independent fresh trials. Three fresh paired fills provide repeated runs; they do not establish statistical reliability.

P1-C3

Actual equipment facts vary. Identify both exact probes and phase/date/check ID, supported immersion and response conditions, air instrument/location and maker information if available. “Accuracy not available” is acceptable and limits claims. Do not make a device-specific specification up or call this calibration. Record first and second readings of both probes in each common-water condition before/after phase; flag failure to settle, >0.5 °C disagreement, >0.2 °C change or new drift.

Answers and accepted alternatives

P1-F1-SET

Empirical values vary. A complete record identifies group/date/time, reference/prototype and cup/sensor positions, volume 150 mL within 2 mL each, dry sleeves/unchanged assembly and identical covers, batch/start/room conditions, response interval, and a linked completed P1-S-DEVICE instrument check record. Use class shared check record if clearly linked by ID. Do not invent missing checks. A failed check is retained and marks the evidence limited/inconclusive.

P1-F1-LOG

Accept factual logged anomalies or explicitly “none noticed”; classify usable only when matched start, appropriate instruments, full endpoint readings and consistent procedure/room conditions are documented. Flag/missing conditions limit comparison. Retain anomalous rows; add a separately identified fresh replacement run without erasing or changing originals. No universal numeric expected measurements.

P1-F2-SET

Empirical values vary. A complete record identifies group/date/time, reference/prototype and cup/sensor positions, volume 150 mL within 2 mL each, dry sleeves/unchanged assembly and identical covers, batch/start/room conditions, response interval, and a linked completed P1-S-DEVICE instrument check record. Use class shared check record if clearly linked by ID. Do not invent missing checks. A failed check is retained and marks the evidence limited/inconclusive.

Answers and accepted alternatives

P1-F2-LOG

Accept factual logged anomalies or explicitly “none noticed”; classify usable only when matched start, appropriate instruments, full endpoint readings and consistent procedure/room conditions are documented. Flag/missing conditions limit comparison. Retain anomalous rows; add a separately identified fresh replacement run without erasing or changing originals. No universal numeric expected measurements.

P1-F3-SET

Empirical values vary. A complete record identifies group/date/time, reference/prototype and cup/sensor positions, volume 150 mL within 2 mL each, dry sleeves/unchanged assembly and identical covers, batch/start/room conditions, response interval, and a linked completed P1-S-DEVICE instrument check record. Use class shared check record if clearly linked by ID. Do not invent missing checks. A failed check is retained and marks the evidence limited/inconclusive.

P1-F3-LOG

Accept factual logged anomalies or explicitly “none noticed”; classify usable only when matched start, appropriate instruments, full endpoint readings and consistent procedure/room conditions are documented. Flag/missing conditions limit comparison. Retain anomalous rows; add a separately identified fresh replacement run without erasing or changing originals. No universal numeric expected measurements.

Answers and accepted alternatives

P1-R1-SET

Empirical values vary. A complete record identifies group/date/time, reference/prototype and cup/sensor positions, volume 150 mL within 2 mL each, dry sleeves/unchanged assembly and identical covers, batch/start/room conditions, response interval, and a linked completed P1-S-DEVICE instrument check record. Use class shared check record if clearly linked by ID. Do not invent missing checks. A failed check is retained and marks the evidence limited/inconclusive.

P1-R1-LOG

Accept factual logged anomalies or explicitly “none noticed”; classify usable only when matched start, appropriate instruments, full endpoint readings and consistent procedure/room conditions are documented. Flag/missing conditions limit comparison. Retain anomalous rows; add a separately identified fresh replacement run without erasing or changing originals. No universal numeric expected measurements.

P1-R2-SET

Empirical values vary. A complete record identifies group/date/time, reference/prototype and cup/sensor positions, volume 150 mL within 2 mL each, dry sleeves/unchanged assembly and identical covers, batch/start/room conditions, response interval, and a linked completed P1-S-DEVICE instrument check record. Use class shared check record if clearly linked by ID. Do not invent missing checks. A failed check is retained and marks the evidence limited/inconclusive.

Answers and accepted alternatives

P1-R2-LOG

Accept factual logged anomalies or explicitly “none noticed”; classify usable only when matched start, appropriate instruments, full endpoint readings and consistent procedure/room conditions are documented. Flag/missing conditions limit comparison. Retain anomalous rows; add a separately identified fresh replacement run without erasing or changing originals. No universal numeric expected measurements.

P1-R3-SET

Empirical values vary. A complete record identifies group/date/time, reference/prototype and cup/sensor positions, volume 150 mL within 2 mL each, dry sleeves/unchanged assembly and identical covers, batch/start/room conditions, response interval, and a linked completed P1-S-DEVICE instrument check record. Use class shared check record if clearly linked by ID. Do not invent missing checks. A failed check is retained and marks the evidence limited/inconclusive.

P1-R3-LOG

Accept factual logged anomalies or explicitly “none noticed”; classify usable only when matched start, appropriate instruments, full endpoint readings and consistent procedure/room conditions are documented. Flag/missing conditions limit comparison. Retain anomalous rows; add a separately identified fresh replacement run without erasing or changing originals. No universal numeric expected measurements.

Answers and accepted alternatives

P1-A1

Empirical answer follows retained records and correct subtraction in °C, with flags. Constructed F1/F2/F3: P0 rises 3.0, 3.2, 3.1 °C; P1 rises 2.2, 2.4, 2.3 °C; paired differences each +0.8 °C. Units and run IDs required. A difference of rises, not just endpoints, is used because starts differ slightly.

P1-A2

Constructed answer: P1 warmed 0.8 °C less than P0 in each of three matched constructed pairs; evidence is consistent with less warming for this setup. Limits: fictional values, small number of runs, instrument accuracy not supplied, imperfect sensor/position balance, finite interval/room conditions, other heat paths. Do not claim no transfer, universal best material, statistical significance or cooling. Empirical mixed/small/flagged results warrant inconclusive wording.

P1-A3

The comparison evaluates these assembled whole designs in the stated conditions. Side sleeve changes coverage/contact and possibly surface interactions; evidence does not uniquely prove a mechanism or isolate a material property. Accept a matched further comparison of sleeves with the same size/thickness/attachment but different material, or one feature changed with all other conditions maintained; even then bound causal claims to controlled conditions.

Answers and accepted alternatives

P1-R-PLAN

Accept any feasible removable dry sleeve with stated quantities/dimensions and tape ≤ 30 cm, ≤ 2 supplied 26×6 cm sheets ≤ 3 mm each, footprint ≤ 12 cm and height ≤ 9 cm, exposed base/top/slot, stable cup. Prediction states less/similar/more warming than concurrent P1 with a reason. Controls: geometry, water volume/start, room/timing, cover/probe position, surface and systematic sensor/position swaps. No promise of improved performance. Multi-feature redesign can fairly compare whole designs but cannot assign the effect to one feature alone.

P1-R-REF

Different start temperature, water amount, room/drift and timing could explain an endpoint difference. Compare each fresh concurrent matched pair's rises; the historical first series is useful context but not a substitute for today's reference.

P1-A4

Constructed R1: P1 $+2.3$ °C, P2 $+1.9$ °C, difference $+0.4$ °C, dry; R2: $+2.4$, $+2.7$, difference -0.3 °C, wet-sleeve flag; R3: $+2.3$, $+2.0$, difference $+0.3$ °C, rebuilt dry. Retain R2 and explain that it differs procedurally; do not average all three without qualification or remove it because it conflicts. Dry differences are small and there are only two dry retests, one rebuilt: improvement is not established. Empirical answer depends on all records/conditions; accept worse, inconclusive or improved only with bounded evidence.

Answers and accepted alternatives

P1-A5

Constructed P2 meets ≤ 2 sheets, ≤ 30 cm tape (20), footprint ≤ 12 cm (9), height ≤ 9 cm (8), exposed surfaces. Meeting resources does not establish thermal improvement. Revised claim: specified P2 gave slightly smaller rises in two dry constructed pairs; flagged wet trial warmed more; evidence insufficient to establish improvement. Next: repeat three fresh matched concurrent P1/P2 pairs with fully dry intact sleeves, same assembly/volume/starts/room/timing/probe placement and sensor/position swaps; retain all outcomes. Accept a different declared modification and comparison if feasible and justified.

P1-E1

Warmer surroundings can transfer energy into cooler water. A sleeve may reduce net transfer through some pathways, while uncovered paths and imperfect insulation remain. Positive rise means warming, not cooling. Readings compare temperature changes for equal water/cup conditions, not total energy directly or instantaneous rates. Endpoints cannot uniquely prove a particular transfer mechanism.

P1-E2

Trial variation is changes among fresh runs; display resolution is shown increment (0.1 °C); accuracy is how close a reading is to a defensible reference and needs maker information/checking, not inferred from resolution. Limits may include small trial count, matching tolerance, probe response/offset/drift, wet/rebuilt sleeve, ambient/position differences, short duration, approximate cup reset or constructed-data provenance. A consistency check is not calibration; there is no statistical reliability/guaranteed ranking claim.

Answers and accepted alternatives

P1-E3

Accept correct tabulation or graph with time in min, temperature °C, reference/prototype labels, all three readings and run ID/provenance; annotate anomaly if relevant. Constructed F1 shows both warm; P0 rise 3.0 vs P1 2.2 °C. Other record patterns accepted. Do not demand a graph or claim an instantaneous rate from endpoints.

P1-L1

Y rises 3.0 °C; Z rises 2.0 °C. Start gap 2.0 °C exceeds 0.5 °C and gives different thermal driving conditions; neither rise comparison nor final reading establishes better protection. The readings at 10/15/20 follow one sample, not three fresh trials. Keep record flagged; start fresh concurrent 150 mL pairs, both 12–14 °C within 0.5 °C, room 20–24 °C at least 6 °C warmer, same geometry/covers/probe placement and timing; obtain three fresh matched trials with swaps and all readings.

Generated print references

Prepare-and-Run-the-First-Comparison: selection p1 = full p1 (P1-S-QS; setup/data), selection p2 = full p2 (P1-S-BRIEF; P1-B1/P1-B2), selection p3 = full p3 (P1-S-ASSEMBLY; P1-P1), selection p4 = full p4 (P1-S-METHOD; setup/data), selection p5 = full p5 (P1-S-CHECK; P1-C1/P1-C2), selection p6 = full p6 (P1-S-DEVICE; P1-C3), selection p7 = full p7 (P1-S-F1; P1-F1-SET/P1-F1-LOG), selection p8 = full p8 (P1-S-F2; P1-F2-SET/P1-F2-LOG), selection p9 = full p9 (P1-S-F3; P1-F3-SET/P1-F3-LOG), selection p10 = full p15 (P1-S-CASE1; setup/data), selection p11 = full p13 (P1-S-A1; P1-A1/P1-A2/P1-A3)

Redesign-and-Retest: selection p1 = full p1 (P1-S-QS; setup/data), selection p2 = full p2 (P1-S-BRIEF; P1-B1/P1-B2), selection p3 = full p3 (P1-S-ASSEMBLY; P1-P1), selection p4 = full p4 (P1-S-METHOD; setup/data), selection p5 = full p5 (P1-S-CHECK; P1-C1/P1-C2), selection p6 = full p6 (P1-S-DEVICE; P1-C3), selection p7 = full p14 (P1-S-REDESIGN; P1-R-PLAN/P1-R-REF), selection p8 = full p10 (P1-S-R1; P1-R1-SET/P1-R1-LOG), selection p9 = full p11 (P1-S-R2; P1-R2-SET/P1-R2-LOG), selection p10 = full p12 (P1-S-R3; P1-R3-SET/P1-R3-LOG), selection p11 = full p16 (P1-S-CASE2; setup/data), selection p12 = full p17 (P1-S-A2; P1-A4/P1-A5)

Compare-the-Results-and-Reflect: selection p1 = full p1 (P1-S-QS; setup/data), selection p2 = full p2 (P1-S-BRIEF; P1-B1/P1-B2), selection p3 = full p4 (P1-S-METHOD; setup/data), selection p4 = full p5 (P1-S-CHECK; P1-C1/P1-C2), selection p5 = full p15 (P1-S-CASE1; setup/data), selection p6 = full p13 (P1-S-A1; P1-A1/P1-A2/P1-A3), selection p7 = full p14 (P1-S-REDESIGN; P1-R-PLAN/P1-R-REF), selection p8 = full p16 (P1-S-CASE2; setup/data), selection p9 = full p17 (P1-S-A2; P1-A4/P1-A5), selection p10 = full p18 (P1-S-REFLECT; P1-E1/P1-E2/P1-E3)

Teacher answers: locate the identical task ID under its matching key heading. These page references describe this version only; do not mix versions.

Generated print references

Use-a-Later-Reasoning-Check: selection p1 = full p19 (P1-S-LATER; P1-L1)

Teacher answers: locate the identical task ID under its matching key heading. These page references describe this version only; do not mix versions.