Physical Science: Chemistry

Original exam A, full-length form B and three-week preparation

Why these demands were selected

The two available forms had 11 clusters each. June contexts included beverages, blood equilibria and fabric. August included semiconductors, pool water and catalytic converters. Practice relating a macroscopic observation to a particle model and a data trend.

First January for the new exam. The 14 legacy chemistry forms measure a different design; older reference-table frequency cannot estimate the new cluster mix.

Released forecast example **State design / administration guidance**

Original exam A

Four sets, 8 multiple-choice and 4 written responses. Suggested time: 35–50 min; adjust to local conditions. Each selected response earns one local point. Each written response earns one point when the required components are present. Maximum 12 local points. Accept defensible alternative reasoning. Allow consistent follow-through where the local criterion assesses a new operation; annotate the originating error.

Full-length form B

Use the intact linked 2026-06 official booklet except 28. The insert preserves one response position and its maximum credit. Report the original-component subtotal and replacement result separately. State conversion charts are specific to the unmodified state form. Record prior exposure if students have used the released booklet in preparation.

Preparation and feedback

Use the six Studio sessions, then one new retrieval check per week. Use Form A as an independent transfer check after preparation. Form B is optional for full-length rehearsal. On return after absence, students can start with the re-entry line on the current week’s sheet. After testing, return to the first unsupported step in the student’s reasoning.

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Questions 1–6 • One point per selected response.

1 B • CO
Six CO require three O_2, leaving one O_2.

2 D • Number of oxygen atoms
Chemical rearrangement preserves atoms by element but can change the total number of molecules.

3 Written response / 1 local point
• The final model contains six CO_2 and one O_2 with no CO remaining.
• Initially there are 6 + 8 = 14 O atoms. Finally there are 12 + 2 = 14.

4 A • Energy moved from surrounding water into the pack.
The surrounding water cooled, consistent with supplying energy to the process.

5 D • Temperature readings at regular intervals for 45 minutes
A time series measures how long cooling is sustained.

6 Written response / 1 local point
• X produces a 7 °C drop compared with 3 °C for Y under matched conditions.
• These endpoint data support X for this criterion but cannot establish duration, cost or performance at another pack mass.

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Questions 7–12 • One point per selected response.

7 B • 310 K
The same progress takes the least time at 310 K.

8 C • It makes elapsed times comparable for the same amount of progress.
Time is a valid rate proxy here only because the progress criterion is held fixed.

9 Written response / 1 local point
• Refute: the time decreases, for example from 140 s at 290 K to 65 s at 310 K for the same endpoint.
• At higher temperature a larger fraction of collisions can overcome the activation-energy barrier, consistent with a faster process.

10 C • Ions fixed in a solid lattice that become mobile when molten
Conductivity turning on upon melting is consistent with mobile ions in the liquid phase.

11 A • Its solid state conducts.
The wire must carry current in the intended solid state.

12 Written response / 1 local point
• Choose N because its solid conducts and it can change shape without the stated loss of integrity.
• A metallic model has mobile electrons and layers of positive cores that can shift while metallic attraction persists.

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Replacement scoring and retrieval-check keys

Form B replacement / 28 / 1 credits maximum

Award one local point for refuting with appropriate comparative evidence: the same progress took 62 rather than 104 seconds at the higher temperature, indicating a faster average rate.

Public scoring materials for base form

Week 1 / retrieval check

In a closed model, $2H_2$ combines with $1O_2$. How many H and O atoms must appear among the products?
Four H atoms and two O atoms, rearranged into two water molecules if reaction is complete.

Week 2 / retrieval check

Equal amounts react in 80 s or 50 s to the same endpoint. Why does the shorter time indicate a higher average rate?
Same progress per smaller time gives greater average progress per second.

Week 3 / retrieval check

A solid conducts and bends easily. Give a particle model consistent with each observation.
Mobile electrons account for current; layers of positive cores can shift while attraction persists.

Department follow-up

CHEM_NEW-C1 Conserve atoms using coefficients
Count atoms on both sides. Which change alters the number of particles without changing their identities?

CHEM_NEW-C2 Use comparative evidence for a rate claim
At the higher temperature, what happened to the time for the same endpoint? Which numbers show it?

CHEM_NEW-C3 Compare measured values with a threshold
What limit did the prompt give, and on which side of it does each sample fall?

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Use the independent exam only after practice, or document the order if using it diagnostically.

Which preparation sessions lead into each exam set?

A1 · What the particles can make / Studio session(s) 1

A2 · Two cooling sleeves / Studio session(s) 2

A3 · Reaction time across temperatures / Studio session(s) 4

A4 · Identifying a material / Studio session(s) 3

Likely reading of a partial response to investigate

A trend is correct but the student compares different endpoints. Ask which quantities were held fixed.

Bridge rehearsal / worked feedback

Two materials each absorb 100 J but provide different temperature drops in different water masses. Can drop alone reveal the better material?

No. Control water mass, starting conditions and exposure time before comparing cooling performance.

How to choose the next round

If the model or source was misread, return to the matching prep set and ask for a new representation. If the computation or claim is correct but support is missing, request one neutral explanation and give a parallel independent check. Keep the independent result separate from prompted work.