

Grade 8 Thermal Energy and Chemistry



Review + Hands-On Lessons + Test Prep

A connected teaching sequence

Five Grade 8 targets connect composition, manufactured insulation, chemical energy and thermal design. Explicit teacher plans include expected evidence, misconceptions and reteach/recheck actions. A related motion investigation supports conservation reasoning.

The five-step teacher model is central

Two detailed pages show Read, Annotate, Find evidence, Analyze, and Eliminate and justify, with what to mark/say, distractor explanations and guided transfer.

Review lessons and investigations

Five visual lessons/ten checks precede test prep. Five linked investigations include composition modeling, material-source evaluation, chemical-device construction/testing/modification, insulating-sleeve construction/retesting and motion arguments.

Inside the 47-page PDF

Shared sources/data; six MC, select-two, dependent/independent pairs, two-point writing and original six-point synthesis; eight task/answer cards; optional six-point digital quiz setup. Teacher references and chemistry-scope guidance included.

Louisiana and NGSS scope

Targets LA 8-MS-PS1-1, PS1-3, PS1-6, PS3-3 and PS3-5 with corresponding NGSS. Independent supplement, not a full adopted curriculum or official LEAP test. Free one-page study guide available separately at crackthetestco.com.

Actual sample pages follow

Both teacher-model pages, composition and chemical-energy lessons, and four task cards. Teacher answers intentionally shown. Purchased format PDF only; no editable template or premade live Form. Hands-on construction needs teacher preparation/materials/supervision.



Teacher Worked Example Read Annotate Find

I do | A chemical cooling source and an insulating structure have different jobs

Question and controlled evidence

A classroom model device uses a tested endothermic process to cool a sample. The process brings both prototypes to 8°C . The same reacting amount, container, protected contact window, surrounding room and measurement method are used. Only the outer side/bottom sleeve differs. After 5 minutes, no sleeve: 17°C ; sleeve: 12°C . Criterion: stay at or below 13°C at 5 minutes without leaking. Both prototypes pass the leak check. Which design meets the criterion and explanation?

Design	After activation	After 5 minutes	Leak check
No sleeve	8°C	17°C	Pass
Outer sleeve	8°C	12°C	Pass

Choices

- A. No sleeve, because greater warming means more cooling.
- B. Outer sleeve: the process provides cooling; the sleeve reduces unwanted energy entering from the room.
- C. Outer sleeve, because insulation creates cold.
- D. Either one, because both started at 8°C .

1 Read the clues

Say: I must choose a design meeting BOTH the temperature criterion and leak constraint. Circle at or below 13°C , at 5 minutes and no leaking. Note that the same chemical process provides the initial cooling.

2 Annotate

Write: compare final performance; distinguish energy source from transfer control. Mark the boundary: outer side/bottom sleeve, contact window unchanged. This avoids assuming that blocking all transfer would best cool the intended object.

3 Find evidence

Underline 12°C versus 17°C and both pass. Mark the controlled starting point 8°C . Calculate warming only if helpful: sleeve $+4^{\circ}\text{C}$; no sleeve $+9^{\circ}\text{C}$. These changes indicate comparative performance, not measured heat quantities.



Teacher Worked Example Analyze Eliminate Justify

I do continued | Guided transfer links composition and manufactured materials

4 Analyze

Say: 12 is at or below 13, while 17 is above 13. The sleeve device meets the criterion and leak constraint. The endothermic process absorbs energy and provides cooling; warmer surroundings can transfer energy toward it. The sleeve slows unwanted transfer from the room. It does not create cold or cause the chemical reaction by itself.

5 Eliminate and justify

Choose B and cite 12°C at 5 minutes with a passing leak check. Reject A: more warming conflicts with the goal. Reject C: insulation does not create cold. Reject D: equal starting temperatures do not guarantee equal later performance. Students explain the cause-and-evidence distinction rather than copy a letter.

We do transfer to chemistry and materials

Show the supplied foam-manufacture diagram and H₂O model. Ask: Which explains where the insulation came from? Which describes a substance's composition? Which test shows the device worked? Expected: resource/chemical-manufacture information, an atomic model, and controlled temperature/time data answer different questions. None replaces the others.

We do a changed goal

A different device must absorb as much sunlight as possible. Supplied controlled data show matte black +24°C, white +10°C and shiny foil +8°C in 20 minutes. Students choose matte black for this tested surface, justify the larger rise and explain why smallest change is not always the goal. Other cooker parts can still use reflective surfaces to direct sunlight.

Teacher accuracy note

A formula alone cannot tell whether an overall chemical process releases or absorbs energy. Breaking bonds requires energy; forming bonds releases energy. The net balance matters. This qualitative background prevents a misconception; numerical bond-energy calculations are not required. Temperature is evidence related to average particle kinetic energy, not a measure of all energy in every system.

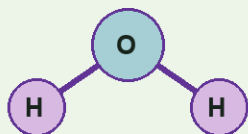
Review Lesson Model the Substances

LA 8-MS-PS1-1 | NGSS MS-PS1-1 | Activity 1

Name _____ Date _____

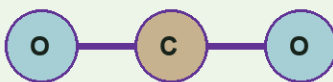
COMPOSITION MODELS: MOLECULES AND A REPEATING STRUCTURE

WATER: H₂O



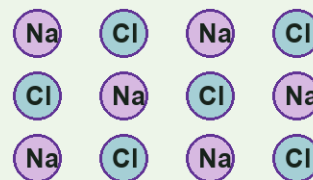
2 H atoms + 1 O atom
One bent water molecule.

CARBON DIOXIDE: CO₂



1 C atom + 2 O atoms
One linear CO₂ molecule.

SALT: NaCl STRUCTURE



Na/Cl ions repeat in 3-D, 1:1.
Not separate NaCl molecules.

Letters identify element types; colors are only a key. Models omit sizes/electrons; salt shows a 2-D slice.
Water and CO₂ occur in the cooling investigation. Salt is a comparison model, not an added reactant.

Learn

H₂O contains 2 hydrogen atoms and 1 oxygen atom per molecule. CO₂ contains 1 carbon and 2 oxygen atoms. A salt lattice has a repeating 1:1 sodium/chloride ratio; it is not separate NaCl molecules. Develop models with element letters, correct counts and a key. Water/CO₂ connect to the cooling investigation; salt is a comparison, not a reactant.

Quick checks

1. Draw H₂O and CO₂, label atom types and count them.
2. How does a repeating salt structure differ from one water molecule?



Review Lesson Use a Chemical Energy Process

LA 8-MS-PS1-6 | NGSS MS-PS1-6 | Activity 3

Name _____ Date _____

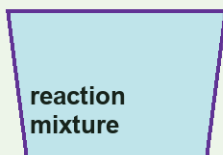
CHEMICAL PROCESSES CAN ABSORB OR RELEASE ENERGY

ENDOTHERMIC

surroundings



energy

reaction
mixture

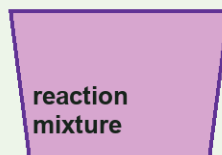
Energy absorbed; mixture can cool.
Warmer surroundings transfer energy in.

EXOTHERMIC

surroundings



energy

reaction
mixture

Energy released; mixture can warm.
Energy can transfer to cooler surroundings.

Arrows show net energy flow associated with the reaction. Conditions and system boundaries matter.

Learn

A reaction may absorb energy overall (endothermic) or release it (exothermic). A cooling mixture can absorb energy from warmer surroundings. Construct a device, test a criterion and modify it using actual evidence. Temperature change must be interpreted with reaction information and controlled conditions. A device is more than a label saying endothermic.

Quick checks

5. Explain the energy direction for an endothermic cooling process.
6. What data would justify modifying the concentration or design?



Task Cards 1 to 4

Use the five steps | Print keys separately

CARD 1 Composition

One CO₂ molecule has which atoms?

- A. 2 C/1 O.
- B. 1 C/2 O.
- C. 1 Na/1 Cl.
- D. Only oxygen.

CARD 2 Synthetic origin

Which correctly describes foam manufacture?

- A. Natural resource inputs are unnecessary.
- B. Raw oil is only cut.
- C. Resource-derived feedstocks undergo chemical processing into polymer, then foaming/shaping.
- D. Any cut paper is a synthetic polymer.

CARD 3 Chemical energy

Tested X absorbs energy and cools 22°C to 8°C. Which fits?

- A. Endothermic.
- B. Exothermic.
- C. No energy transfer.
- D. Energy destroyed.

CARD 4 Cooler performance

Controlled warming: cardboard+14°C, plastic+9°C, foam+3°C. Best minimize warming?

- A. Cardboard always.
- B. Plastic because synthetic always wins.
- C. Any one.
- D. Foam in this controlled test.