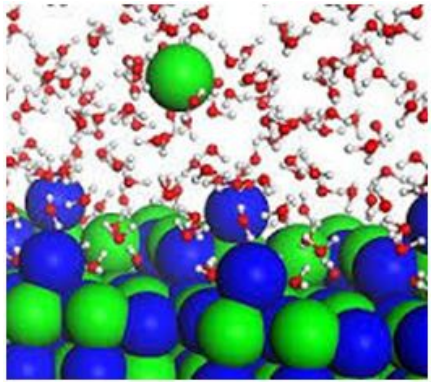
5th Grade Unit 1
9 weeks

Structure and Properties of Matter



Unit Planning Team:
Matthew Garrett (OW), Candace Pierce (ET), Brooke Price (NS), Kasey Benson (OW), Jenny Humble (GH)

Essential Questions

How does matter change?

When matter changes, does its weight change?

How can properties be used to identify materials?

How do substances combine or change to make new substances?

Structure and Properties of Matter

Students who demonstrate understanding can:

5-PS1-1 **Develop a model to describe that matter is made of particles too small to be seen.** [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

5-PS1-2 **Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.** [AR Clarification Statement: Examples could include chemical reactions that form new substances or physical changes including phase changes, dissolving, and mixing.] [AR Assessment Boundary: Assessment does not include distinguishing mass from weight or reactions that involve gases.]

5-PS1-3 **Make observations and measurements to identify materials based on their properties.** [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass from weight.]

5-PS1-4 **Conduct an investigation to determine whether the mixing of two or more substances results in new substances.** [AR Clarification Statement: Examples of qualitative evidence could include temperature change, color change, odor change, and the formation of a gas to determine if a new substance has formed.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*.

Science and Engineering Practices

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model to describe phenomena. (5-PS1-1)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4)
- Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1-1)
- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)
- Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)

PS1.B: Chemical Reactions

- When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)
- No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4)

Scale, Proportion, and Quantity

- Natural objects exist from the very small to the immensely large. (5-PS1-1)
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2, 5-PS1-3)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems. (5-PS1-2)

Structure and Properties of Matter

Background knowledge videos:

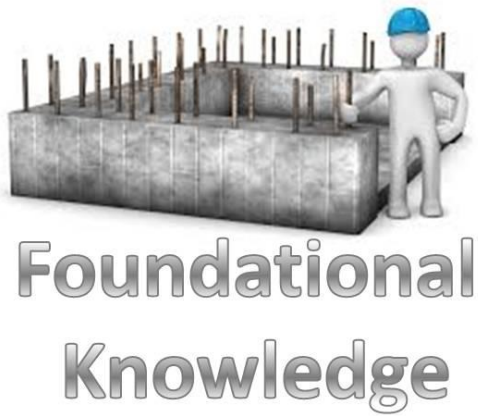
PS1A - Structure and Properties of Matter

PS1B - Chemical Reactions

These videos are designed to assist in providing background knowledge with the associated DCI. The information in the videos follows the progression through high school.

Prior to 5th grade, students should have knowledge, understanding of, and experiences with the following ideas:

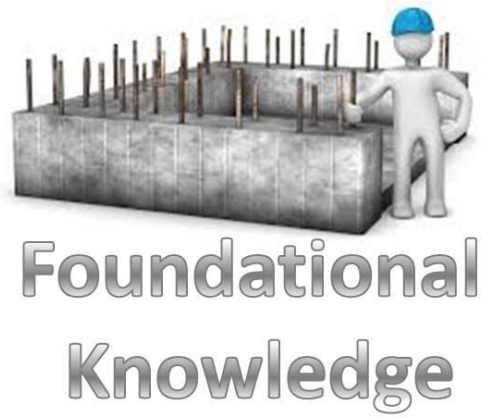
- ★ Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.
- ★ Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature.
- ★ Matter can be described and classified by its observable properties.
- ★ Different properties are suited to different purposes.



With the implementation of new standards, students may not have had opportunities to engage in these foundational understandings and ideas before 5th grade. You may need to provide opportunities for students to experience these ideas as you move forward.

Prior to 5th grade, students should have knowledge, understanding of, and experiences with the following ideas:

- ★ Objects or samples of a substance can be weighed, and their size can be described and measured.
- ★ Objects can be built up from a small set of pieces; objects may break into smaller pieces and be put together into larger pieces, or change shapes.
- ★ Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.



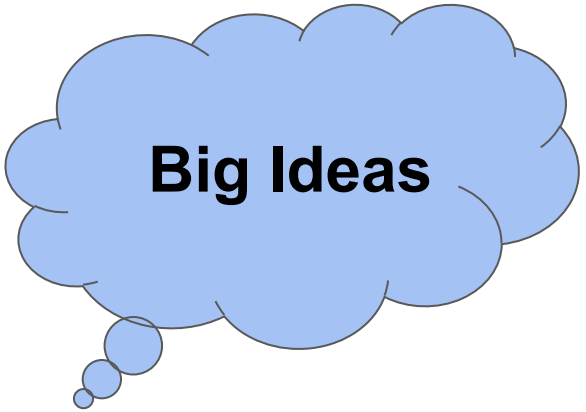
With the implementation of new standards, students may not have had opportunities to engage in these foundational understandings and ideas before 5th grade. You may need to provide opportunities for students to experience these ideas as you move forward.

How does matter change?

When matter changes, does its weight change?

How can properties be used to identify materials?

How do substances combine or change to make new substances?



★ Matter of any type can be subdivided into particles that are too small to see. The matter still exists and can be detected by other means.

★ Gases are made from matter particles too small to see and are moving freely around in space.

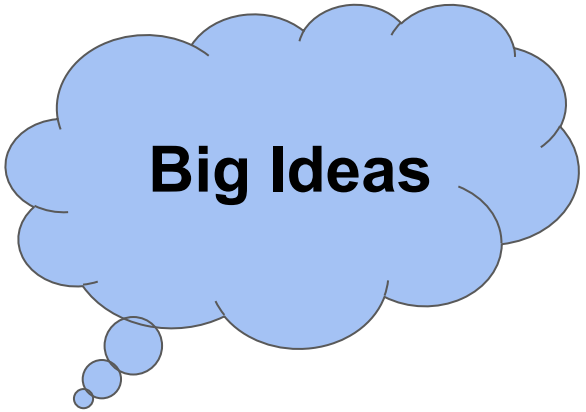
★ Models can be used to explain observations about matter.

How does matter change?

When matter changes, does its weight change?

How can properties be used to identify materials?

How do substances combine or change to make new substances?



★ Matter can change form and the amount (weight) of matter is conserved when it changes.

★ Observations and measurements of a variety of properties can be used to identify materials.

★ New substances may be formed when two or more different substances are mixed.

Structure and Properties of Matter

Students who demonstrate understanding can:

5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen.

[Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1-1)

Clarifications:

Models: include drawings, diagrams, pictures, computer simulations, and physical models.

Identify and CLARIFY the STANDARDS

Structure and Properties of Matter

Students who demonstrate understanding can:

5-PS1-2 Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. [**AR** Clarification Statement: Examples could include chemical reactions that form new substances or physical changes including phase changes, dissolving, and mixing.] [**AR** Assessment Boundary: Assessment does not include distinguishing mass from weight or reactions that involve gases.]

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)

PS1.B: Chemical Reactions

- No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)

Clarifications:

Conservation of Matter: a fundamental principle of science stating that matter cannot be created or destroyed in a closed system

Identify and CLARIFY the STANDARDS

Structure and Properties of Matter

Students who demonstrate understanding can:

5-PS1-3 Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass from weight.]

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)

Clarifications:

Reflectivity: the property of reflecting light or radiation

Electrical conductivity: the measure of a material's ability to allow the transport of an electrical charge

Thermal conductivity: the property of a material to conduct heat

Solubility: a chemical property referring to the ability for a given substance, the solute, to dissolve in a solvent.

Identify and CLARIFY the STANDARDS

Structure and Properties of Matter

Students who demonstrate understanding can:

5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances. [AR Clarification Statement: Examples of qualitative evidence could include temperature change, color change, odor change, and the formation of a gas to determine if a new substance has formed.]

Disciplinary Core Ideas

PS1.B: Chemical Reactions

- When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)

Clarifications:

Mixture: a substance made by mixing other substances together; the individual molecules enjoy being near each other, but their fundamental chemical structure does not change when they enter the mixture.

Solution: is basically two substances that are evenly mixed together by dissolving; groups of molecules that are mixed and evenly distributed in a system

Molecule: every combination of atoms

Compound: a molecule made of atoms from different elements.

Identify and CLARIFY the STANDARDS

PHYSICAL SCIENCE

UNIT:
The Building Blocks of Matter

UNIT:
Combining Matter

UNIT:
Changes in Matter

Discovery Education
Science Techbook Units

UNIT:
The Building Blocks of Matter

View Unit

CONCEPT:

Review of Matter

Atoms

UNIT:
Combining Matter

View Unit

CONCEPT:

Types of Mixtures

Solutions

Compounds

Building with Materials

UNIT:
Changes in Matter

View Unit

CONCEPT:

Changing States

Chemical Changes

Gather and study the RESOURCES

Week	Performance Expectation & 5E Engage, Explore, Explain, Elaborate, Evaluate	Resource
1	**5-PS1-1 Particles of Matter** Review Phases of Matter: DE Techbook (Video) and BBC Link **Engage/Explore**: Is it Matter (p.79) **Explain:** Matter is Everywhere (article) **Extend:** Sailboats, Parachutes, or Oriental Fans **Evaluate:** Particles of Matter Assessment	Phases of Matter (DE Techbook) Phases of Matter (BBC) Is it Matter? Assessment Probe -intranet password protected Matter is Everywhere Article Sailboats, Parachutes, or Oriental Fan Particles of Matter Assessment

Week	Performance Expectation & 5E Engage, Explore, Explain, Elaborate, Evaluate	Resource
2-3	**5-PS1-3 Properties of Matter** (color, hardness, reflectivity, electrical conductivity, thermal conductivity,response to magnetic forces, solubility) **Engage:** DE Techbook - Review of Matter - What do you know about the properties of matter? **Explore:** **Not all resources listed need to be used. Choose a variety that work in your classroom.* Color- DE Techbook Video: Using Our 5 Senses to Determine Properties of Matter Hardness- Use your Rocks and Minerals kit & materials from the old sci. standards to identify hardness. Reflectivity- Mirror in the Wall, Mirror Challenge, Does it Reflect, I can summarize how light interacts with matter Magnetism- Am I Magnetic?, Magnets in Water Solubility- Drops of Water Electrical Conductivity- Batteries, bulbs, Wires; Brainpop Electric Circuits video & activity worksheet, Electric Circuits PBS	Structures of Property of Matter Background Knowledge for Teachers (not to show students) Review of Matter DE Techbook Color Video DE Techbook Reflectivity: Mirror on the Wall Assessment Probe -intranet password protected Mirror Challenge Does it Reflect Light? I can summarize how light interacts with matter Magnetism: Am I Magnetic? Student page Station Instructions Magnets in Water Assessment Probe -intranet password protected Drops of Water Activity Instructions Student Page Batteries, Bulbs, and Wires Assessment Probe -intranet password protected Electric Circuits PBS

Week	Performance Expectation & 5E Engage, Explore, Explain, Elaborate, Evaluate	Resource
2-3	**Explore Continued:** Thermal Conductivity - Black and White Station **Explain:** DE Techbook - Review of Matter and BiteSize Website- Material Properties **Elaborate:** DE Techbook - Review of Matter- Elaborate with STEM **Evaluate:** DE Techbook - Water Balloons Image/question with Properties of Matter Assessment	Black and White Station Review of Matter - Explain DE Techbook **Material Properties Article** **Material Properties Quiz** **Material Properties Interactive** Review of Matter - Elaborate with STEM DE Techbook Water Balloons DE Techbook Properties of Matter Assessment DE Techbook

Week	Performance Expectation & 5E Engage, Explore, Explain, Elaborate, Evaluate	Resource
4	**5-PS1-4 Conducting Investigations** Engage: TechBook -Types of mixtures Explore: Sugar and Water Explain: TechBook -Explaining types of Mixtures Extend/Elaborate: DE Tech Book STEM in Action Evaluate: Constructed Response Solutions	Types of Mixtures DE Techbook Sugar Water Assessment Probe -intranet password protected Sugar Water Adapted Probe and Student Exploration Explaining types of mixtures DE Techbook STEM in Action DE Techbook Video Quiz and Constructed Response DE Techbook
5	**5-PS1-2 Conservation of Matter** Engage: Hot and Cold Balloons Probe Explore: Hot and Cold Balloons & Create Graph Explain: Reading and discussing findings & video segment (When matter changes, does its weight change?) & Video Segment Elaborate: Burning Paper Probe (Does conservation of matter apply to chemical changes?) Evaluate: Journal Entry - What is conservation of matter and why is it important for scientists to understand?	Hot and Cold Balloons Assessment Probe -intranet password protected Use to measure weight of balloon DE Techbook Heat and Matter DE Techbook Burning Paper Assessment Probe -intranet password protected

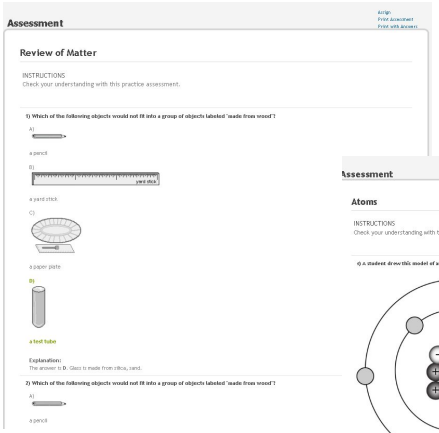
Week	Performance Expectation & 5E Engage, Explore, Explain, Elaborate, Evaluate	Resource
6	**5-PS1-1 Particles of Matter** Engage/Explore: The Wind Blew Explain: What's in the Bubbles, Strange Matter Zoom Extend: DE Techbook "Changing Phases of Matter", Build a model showing the movement of atoms. Evaluate: DE Techbook "Assessment Video"	The Wind Blew What's in the Bubbles? Assessment Probe - intranet password protected Strange Matter Zoom Changing Phases of Matter DE Techbook Assessment Video DE Techbook
7	**5-PS1-4 Conducting Investigations** Engage: Tech Book Compounds Explore:Tech Book Explain:Tech Book Extend/Elaborate: Tech Book(recommend project 3) Evaluate:Tech Book	It's Chemistry Review Tech Book DE Techbook

Week	Performance Expectation & 5E Engage, Explore, Explain, Elaborate, Evaluate	Resource
8	**5-PS1-2 Conservation of Matter** Engage: KWL Conservation of Matter – Video Segment Explore: Mixture Probe (Does conservation of matter apply to mixtures?) Explain: Reading graphs and discussing findings (When matter changes, does its weight change?) Elaborate: Lemonade (Does conservation of matter apply to solutions?) & graph findings Evaluate: Journal Entry - Seedlings in a Jar Probe explanation	Video Segment DE Techbook Mixture Probe: Make predictions about conservation of matter when items are separated and items are combined (i.e. different types of beans, nuts, noodles, etc.) Data/Graph Tool DE Techbook – Use to measure separate and combined items Lemonade Assessment Probe Data/Graph Tool DE Techbook – Use to measure weight of lemonade ingredients separately and then as a solution Student recording page Seedlings in a Jar Assessment Probe
9	**Writing/STEM Week** Potential STEM problems for which the students can develop solutions: **Particles of Matter**: Beat the Heat - Develop a device that cools a person down by moving air molecules. **Properties of Matter**: Reflector - Develop a device that can reflect light into a dark room/corner of a room, Comparing Cubes, The Mad Hatter STEM Challenge **Conservation of Matter**: Fire Extinguisher - Build a device that can extinguish a flame.	Comparing Cubes Assessment Probe Mad Hatter Engineering Challenge Engineering Activities Engineering Lesson Plans 5th Grade STEM Ideas

Make or locate
SUMMATIVE
and
PERFORMANCE
ASSESSMENTS

Assessments from Science Techbook Unit Concept: Review of Matter & Atoms

Assessment (online)


Assessment

Review of Matter

INSTRUCTIONS
Check your understanding with this practice assessment.

1) Which of the following objects would not fit into a group of objects labeled 'made from wood'?

A)

a pencil

B)

a yard stick

C)

a paper plate

D)

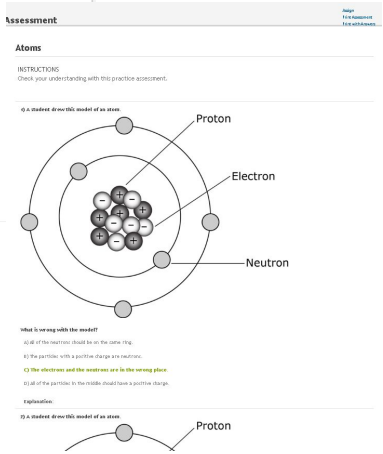
a test tube

Explanation:
The answer is D. Glass is made from silica, sand.

2) Which of the following objects would not fit into a group of objects labeled 'made from wood'?

A)

a pencil


Assessment

Atoms

INSTRUCTIONS
Check your understanding with this practice assessment.

6) A student drew this model of an atom.

What is wrong with the model?

a) All of the neutrons should be on the same ring.

b) The particles with a positive charge are neutrons.

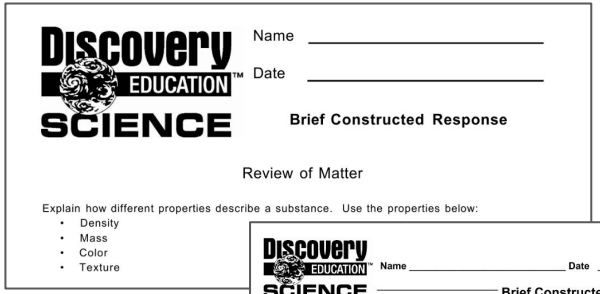
c) The electrons and the neutrons are in the wrong place.

d) All of the particles in the middle should have a positive charge.

Explanation:

7) A student drew this model of an atom.

Constructed Response


Discovery EDUCATION SCIENCE

Name _____

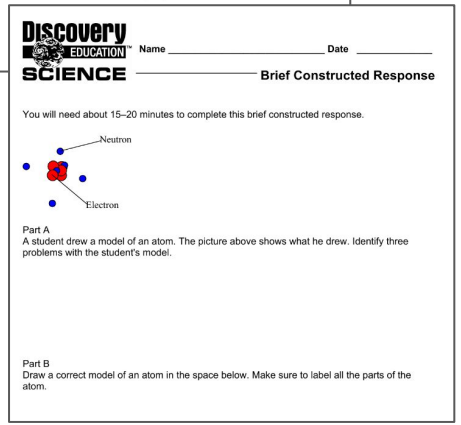
Date _____

Brief Constructed Response

Review of Matter

Explain how different properties describe a substance. Use the properties below:

- Density
- Mass
- Color
- Texture


Discovery EDUCATION SCIENCE

Name _____ Date _____

Brief Constructed Response

You will need about 15–20 minutes to complete this brief constructed response.

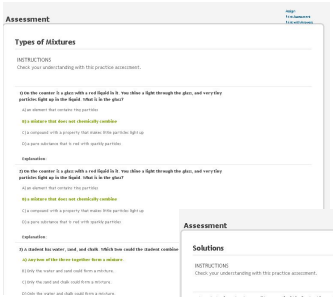
Part A
A student drew a model of an atom. The picture above shows what he drew. Identify three problems with the student's model.

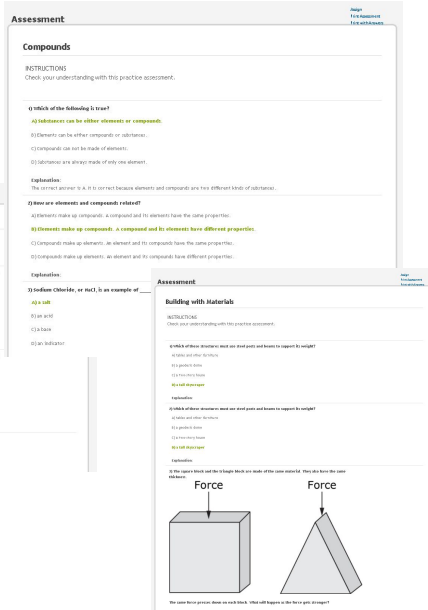
Part B
Draw a correct model of an atom in the space below. Make sure to label all the parts of the atom.

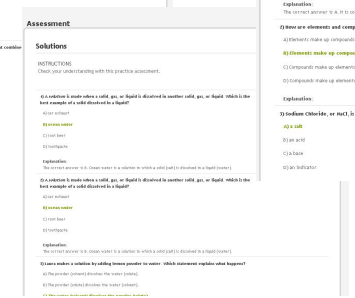
Make or locate
SUMMATIVE
and
PERFORMANCE
ASSESSMENTS

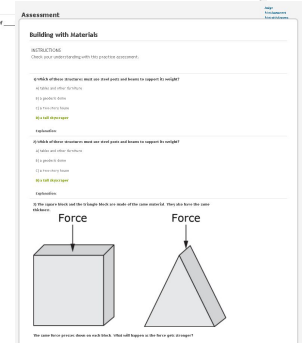
Assessments from Science Techbook Unit Concept: Combining Matter

Assessment (online)

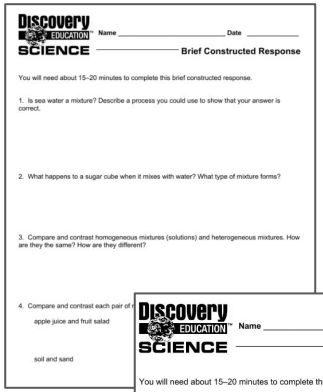


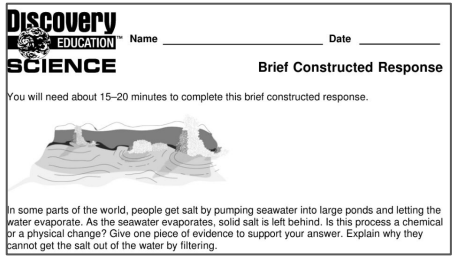


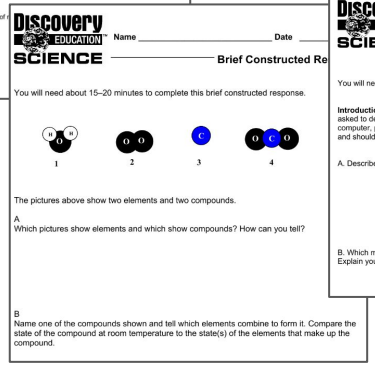


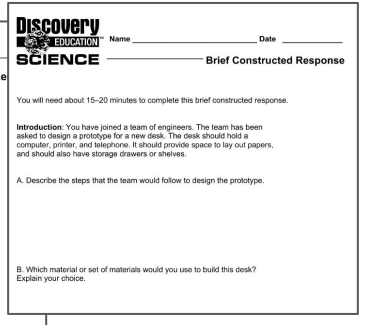


Constructed Response





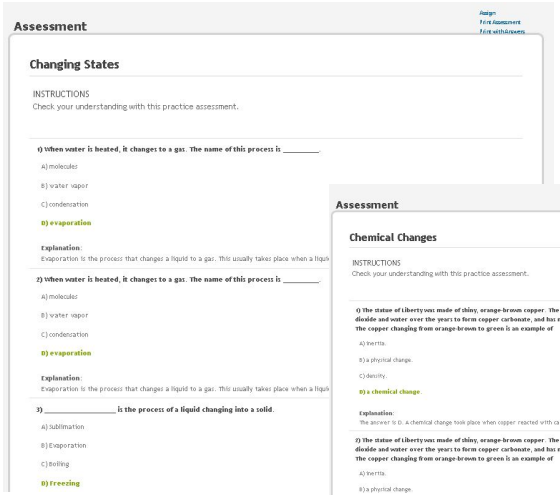




Make or locate SUMMATIVE and PERFORMANCE ASSESSMENTS

Assessments from Science Techbook Unit Concept: Changes in Matter

Assessment (online)


Assessment

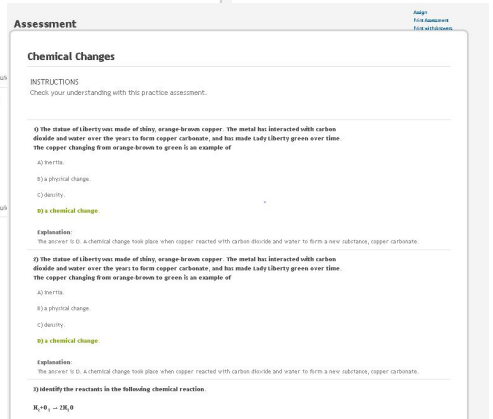
Changing States

INSTRUCTIONS
Check your understanding with this practice assessment.

1) When water is heated, it changes to a gas. The name of this process is _____.
A) molecules
B) water vapor
C) condensation
D) evaporation
Explanation:
Evaporation is the process that changes a liquid to a gas. This usually takes place when a liqui

2) When water is heated, it changes to a gas. The name of this process is _____.
A) molecules
B) water vapor
C) condensation
D) evaporation
Explanation:
Evaporation is the process that changes a liquid to a gas. This usually takes place when a liqui

3) _____ is the process of a liquid changing into a solid.
A) Sublimation
B) Evaporation
C) Boiling
D) Freezing


Assessment

Chemical Changes

INSTRUCTIONS
Check your understanding with this practice assessment.

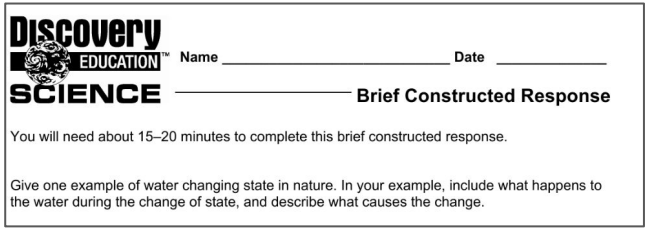
1) The statue of liberty was made of shiny, orange-brown copper. The metal has interacted with carbon dioxide and water over the years to form copper carbonate, and has made Lady Liberty green over time. The copper changing from orange-brown to green is an example of
A) inertia.
B) a physical change.
C) density.
D) a chemical change.
Explanation:
The answer is D. A chemical change took place when copper reacted with carbon dioxide and water to form a new substance, copper carbonate.

2) The statue of liberty was made of shiny, orange-brown copper. The metal has interacted with carbon dioxide and water over the years to form copper carbonate, and has made Lady Liberty green over time. The copper changing from orange-brown to green is an example of
A) inertia.
B) a physical change.
C) density.
D) a chemical change.
Explanation:
The answer is D. A chemical change took place when copper reacted with carbon dioxide and water to form a new substance, copper carbonate.

3) Identify the reactants in the following chemical reaction.

$H_2 + O_2 \rightarrow 2H_2O$

Constructed Response

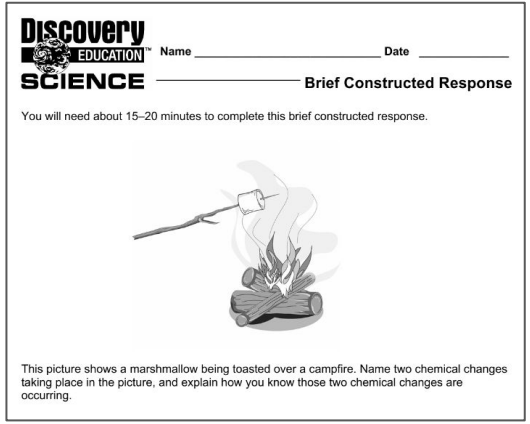

Discovery EDUCATION™ SCIENCE

Name _____ Date _____

_____ Brief Constructed Response

You will need about 15–20 minutes to complete this brief constructed response.

Give one example of water changing state in nature. In your example, include what happens to the water during the change of state, and describe what causes the change.


Discovery EDUCATION™ SCIENCE

Name _____ Date _____

_____ Brief Constructed Response

You will need about 15–20 minutes to complete this brief constructed response.

This picture shows a marshmallow being toasted over a campfire. Name two chemical changes taking place in the picture, and explain how you know those two chemical changes are occurring.

Plan
DAILY
LESSONS

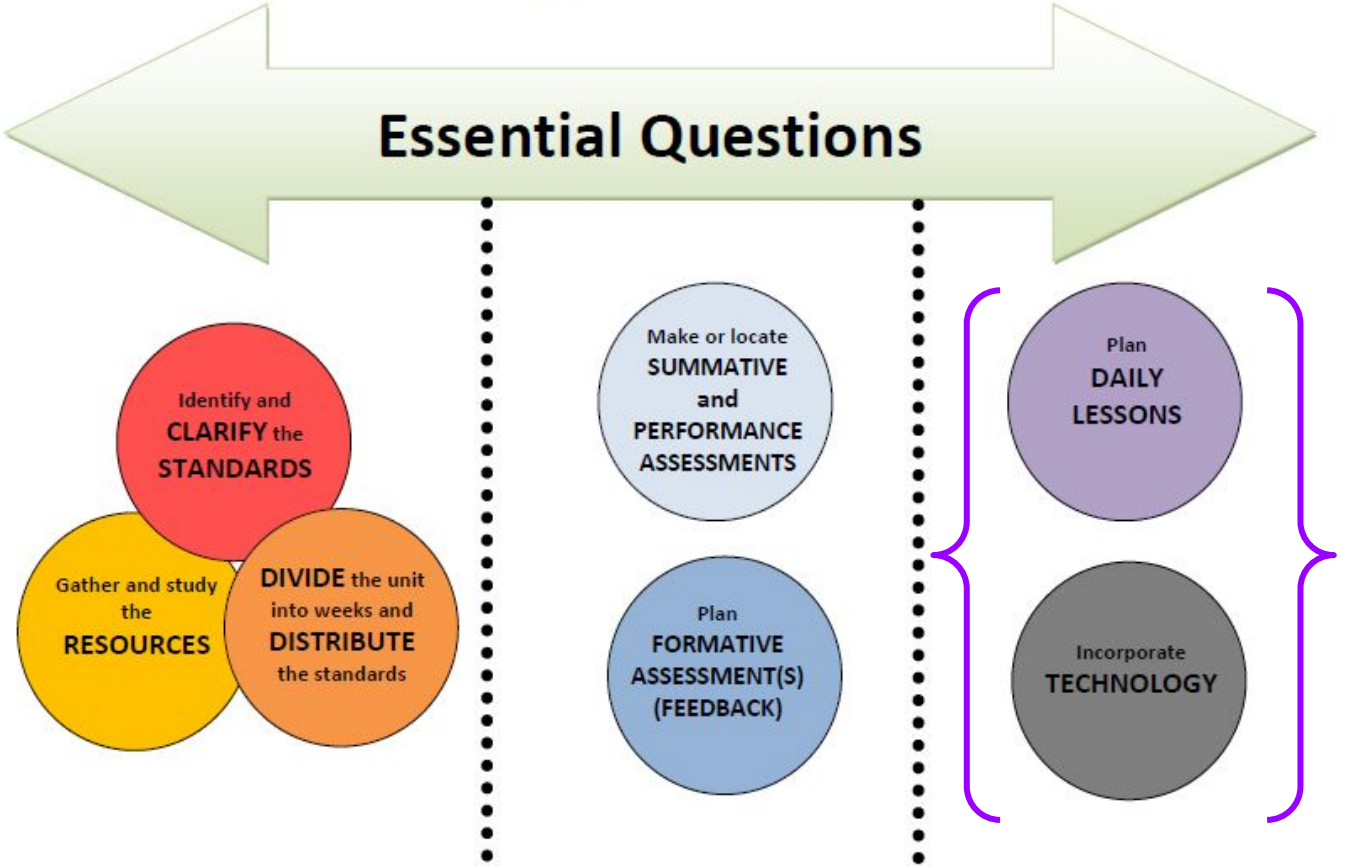
Incorporate
TECHNOLOGY

Additional Resources:

Uncovering Student Ideas in Science
Assessment probes

*any assessment probes mentioned in plan are available on our website through the intranet (password required)

Backward Unit Planning 1.0



Now you're ready to plan your daily lessons!