Holyoke Public Schools

Middle School Science

Curriculum Map
Grade 8

Energy

Unit #4

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Holyoke Public Schools

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Overview of Curriculum Maps

Goals:

1. To ensure that students are exposed to a rigorous curriculum in every school and every grade
2. To have consistent instruction and assessment district wide
3. To prepare students for the MCAS test
4. to explain what is expected to be covered in each Science unit of study

Expectations:

The district's expectation is for students to successfully meet the Massachusetts Science and Technology/Engineering Standards, and the English Language Proficiency Benchmarks and Outcomes (ELPBO). In order to help facilitate this teachers are required to follow the curriculum maps.

Accountable Talk:

To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the science discipline, and to rigorous thinking.

Feedback to Students:

Feedback needs to happen daily in the classroom. There are many ways to give feedback. Conferencing, observations, questions asked during the workshop, and written responses to students' work and notebook entries.

Formative Assessments are embedded throughout the unit to provide diagnostic information, which teachers can use to inform their decisions about instruction for individual students and for the class. In general Formative Assessment should not be graded. They are intended to help teachers have greater insight into students' thinking.

Summative Assessments are used for evaluation purposes. Summative Assessments are graded. Assessments that are graded should occur at the end of an investigation.

NAEP Science Assessment sample questions
http://nces.ed.gov/nationsreportcard/science/

FIVE ESSENTIAL PRACTICES FOR TEACHING ENGLISH LANGUAGE LEARNERS

The five essential practices for teaching English language learners are practices developed by America's Choice to support the literacy needs of ELL students. These practices are a result of current second language acquisition research, literacy development, and effective classroom practices. *(America's Choice: Teaching English Language Learners: Literacy)*

Essential Practice 1	**Classroom Applications**
Develop Oral Language through Meaningful Conversation and Context. Oral language is the foundation of literacy and a main tool for learning and interacting in both academic and social settings. Natural exposure and planned experiences with oral language facilitates increases expression and understanding of the second language. Oral language also supports vocabulary development in context, paving the way for better comprehension and production. Exposure to rich oral and written language environments is vital for developing literacy and language skills.	• Develop oral language through meaningful conversation by planning language experiences and building consistent time to engage conversation. • Enunciate and rephrase difficult works allow extra time for practice and repetition. • Demonstrate and orally explain activities step-by step. Rephrase difficult instructions • Use think-alouds. Verbally share the comprehension thought process. • Provide opportunity for practice: allow extra time for practice and repetition in oral, reading, and writing activities with appropriate feedback. • Allow students to respond through Turn and Talk activities, oral, choral reading and re-reading. • Use audio recording of a text to provide extended to provide extended literacy opportunities where students listen to the reading of a text independently while developing fluency, accuracy, and language acquisition. • Plan daily read-alouds to model literacy strategies and to scaffold fluency, accuracy, and independent reading.

Essential Practice 2	Classroom Applications
Teach Targeted Skills through Contextualized and Explicit Instruction Full literacy is a fluid combination of oral, reading, and writing skills. These skills must be taught through explicit and contextualized instruction that scaffolds learning. Contextualized instruction provides students with extra linguistic clues that support understanding not only of the content but also of the language being used in the lesson. Combining contextualized practices with the knowledge of phonemic awareness, phonics skills, language structures and functions, text patterns, and literary devices such as metaphors, analogies, figurative language, and unfamiliar cultural concepts, will aid students in achieving stronger literacy skills. Explicit skills give the students the tools they need to comprehend increasingly complex literacy demands.	• Use clues of context to make instruction meaningful. Teach skills and strategies ;using materials, books or writing that students know and understand • Use Big Books or shared reading to teach phonics, vocabulary and language features. • Use student or teacher writing models to teach craft, spelling, and language use conventions. • Teach phonemic awareness within a context. ELL children must attach meaning and experience to phonemes they may never have heard before. Teach phonemic awareness while explicitly teaching vocabulary, meaning, or within-a-story context. • Understand the linguistic background native language and address these issues specifically. • Pay special attention to sounds of letters. Languages have different linguistic features. For example, while the vowel sounds in English vary, Spanish vowel sounds are consistent. Students will transfer what they know about one language and automatically, and sometimes incorrectly, apply it to English. • Use meaningful activities to teach phonemic awareness, such as language games, Word Walls, word banks, songs, poems, and rhymes that focus on particular sounds or letters.

Essential Practice 3	Classroom Applications
Build Vocabulary through Authentic and Meaningful Experiences with Words Developing and deepening a student's understanding of new words is essential for English language learners. Building vocabulary in the context of literature, experiences, and modeled writing ensures that students will own the new words they encounter. Vocabulary building is a lifelong process and students must learn ways to integrate and approach new and challenging words. Discussing, playing with, and using new words allows students to gain new vocabulary through meaningful, and therefore memorable, experiences.	• Vocabulary development must be taught intentionally. Since word knowledge correlates with reading comprehension and meaning-making strategies used in decoding, it must be a focus for instruction. • Vocabulary development must be taught in context. Connect word knowledge with background knowledge and instructional context. ELL students need both meaning and context to acquire new vocabulary. • Facilitate and plan activities that support the three main ways vocabulary is learned: 1. Through meaningful conversations with adults and other students. 2. Listening to adults read at slightly higher levels than the student's independent level. 3. Read extensively on their own at their reading level. • Pre-teach vocabulary words, prefixes/suffix, context clues, and cognates. Build students' skill box with vocabulary and give them tools to understand and connect new vocabulary. • Use content Word Walls or word webs. Support cognitive structuring for ELLs by connecting new vocabulary to themes, ideas, or generalizations. • Explicitly focus on and teach academic language. Students need to be consistently exposed to formal or content specific language and vocabulary. • Explicitly teach the building blocks of language. Students need to learn the connecting and transition words of the English language ("however," "in conclusion", etc.)Teach them in context and teach them explicitly. • Focus teaching Tier 2 words, as well as essential Tier 1 words. Although most explicit vocabulary instruction should focus on Tier 2 words (words with a high frequency in the written language, example: examine), ELLs need instruction around Tier 1, or basic spoken words as well.

Essential Practice 4	**Classroom Applications**
Build and Activate Background Knowledge Learning is based on establishing neural connections in the brain, drawing on previous experience, background knowledge, and prior and current environments. It is both the teacher's and the student's job to facilitate these connections in order to construct meaning and understand new ideas and concepts while expanding on their own world knowledge. Actively fostering these connections will enable students to more easily interpret their surroundings and assign meaning to new concepts while expanding their own	• Elicit student's experience and comments. Connect school, literary and personal events through talking, writing, and reading. • Consider the cultural background of students when selecting literacy materials such as books and poems. Support language development of Ell students by giving them new English words for experiences that are close to home. Using materials that represent their cultural background increases motivation and supports participation. • Discuss and build language around universal themes. Connect new language to universal experiences. • Build content-based word banks and webs. Connect new language to other known words, experiences, and ideas to support cognitive structuring. • Use native language and value home culture. View home cultures as a resource, rather then a liability. • Use hands-on experience based instruction in all academic areas. Language can be built upon common classroom experiences. • Encourage students to make connections before, during and after reading. • Find out what students know, and build on their experience.

Essential Practice 5	Classroom Applications
Teach and Use Meaning-Making Strategies Intentionally teaching meaning-making strategies provides students with a toolbox to approach future learning challenges. Meaning-making strategies vary from helping students comprehend text to various strategies students can use to understand English-dependent lessons. Modeling appropriate behaviors to students gives them the tools to be autonomous learners and supplies them with options they can use to interpret environmental input, both academically and socially.	• Explicitly teach student meaning-making strategies. Model for students how to visualize, make connections, monitor for meaning, determine importance, etc. • Provide opportunities for practice. Sustain daily work periods in reading and writing for students to practice these strategies. • Systematically assess students and adjust instruction. Monitor progress and use data to adjust the focus of mini-lessons, conferences and small-group instruction. • Model activities and thinking for certain skills. Students need to see and experience what is expected of them before they perform a task. • Beginning ELLs need more than just phonics and English Language Development instruction. EXPOSE STUDENTS RIGHT AWAY TO COMPREHENSION STRATEGIES. Waiting to address skills in chronological order hinders academic growth and English proficiency. • Teach students how to help themselves in English-dependent lessons. Model your thinking and how you approach problems. Build students cognitive toolbox by explicitly teaching the ways to help themselves during difficult language situations.

Resources:

- Ice Cream Making and Cake Baking: Investigating Heat Transfer by Bernie Zubrowski

- Prentice Hall Science Explorer 2005 edition: *Motion, Forces, and Energy*
  - Student Text, Student Edition on Audio CD, Teacher's Edition, Color Transparencies
  - All-in-One Teaching Resources: Black-line masters, teaching support, and answer keys are organized by chapter.
  - Differentiated Instruction: Guided Reading and Study Workbook, Adapted Reading Study Workbook, Adapted Tests

Common Misconceptions about Energy

1. Energy is a thing. This is a fuzzy notion, probably because of the way we talk about Newton-meters or Joules. It is difficult to imagine an amount of an abstraction.
2. The terms "energy" and "force" are interchangeable.
3. An object at rest has no energy.
4. The only type of potential energy is gravitational.
5. Gravitational potential energy depends only on the height of an object.
6. Doubling the speed of a moving object doubles the kinetic energy.
7. Energy can be changed completely from one form to another without energy loss.
8. Things "use up" energy.
9. Energy is confined to some particular origin, such as what we get from food or what the electric company sells.
10. Energy is truly lost in many energy transformations.
11. There is no relationship between matter and energy.
12. If energy is conserved, why are we running out of it?

Unit Project

Students will design a skit, or physical demonstration in which energy transformations occur (potential energy changed into kinetic energy or kinetic energy changed into potential energy). They will use available materials and set up their demonstrations. Materials may include : a yo-yo, bouncy balls, wind-up toys, sling shots, a slinky, a spinning top, catapult, rubber bands, springs, balloons, pipe cleaners, paper cups, string, tape, straws, cardboard, paper, tinker toys, etc. As they carry out their demonstrations, they will explain which type of energy transformations are taking place. After, students will evaluate how effectively their project demonstrated their knowledge and understanding of energy transformations.

Big Idea: The ability to do work or cause change is called energy/ La capacidad de hacer el trabajo o causan el cambio se llama energía

Massachusetts Science and Technology/Engineering Standards

PSS #13. Differentiate between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.

MCAS item analysis (what do students need to be able to do)

- ✓ Know the difference between potential and kinetic energy
- ✓ Recognize situations where kinetic energy is transformed into potential energy
- ✓ Recognize situations where potential energy is transformed into kinetic energy

Guiding Questions: What is energy?/ ¿Qué es energía? **What is the difference between potential energy and kinetic energy?/** ¿Cuál es la diferencia entre la energía potencial y energía cinética?

Engage:

- o Ask students if they have you ever ridden a roller coaster. If yes, please have them describe their experience as the roller coaster rushed downhill, climbed up a hill, and went around corners. *(elicit prior knowledge)*

- o Hold up a ball and ask: Do you think this ball has energy? Tally the answers on the board. Why or why not? What if I drop it or throw it? Do you think it has energy now? Tally the answers on the board. Have students explain their answers. Do you think that the energy the ball has when I am holding it is the same as when I throw it or drop it? Tally the answers on the board. Explain. Have students create theories about the ball's energy. Write theories on the board to come back to later.

Explore:

- Use Smart board or computer projector: The interactive roller coaster ride produced for Teachers' Domain illustrates the relationship between potential and kinetic energy. As the coaster cars go up and down the hills and around the loop of the track, a pie chart shows how energy is transformed back and forth between gravitational potential energy and kinetic energy. Students copy down the shape of the roller coaster in their science notebooks and label direction of path. Have students predict where the roller coater will have potential and kinetic energy, before they view the pie chart in the video clip.
  http://www.teachersdomain.org/resource/hew06.sci.phys.maf.rollercoaster/

  *S.3.43. Participate in classroom discussions and activities, when frequent clarification is given.
  *W.2.2.e. Write brief summaries of information gathered through research.
  ***From the Massachusetts English Language Proficiency and Outcomes for English Language Learners (ELPBO)**

- Use Smart board: In this video segment adapted from *ZOOM*, two cast members demonstrate how to build a spool racer, a tabletop vehicle that stores energy -- its source of power -- in the elasticity of a rubber band. The rubber band that powers the spool racer used in this *ZOOM* video segment stores the energy required to stretch it or wind it up. This is called elastic potential energy. When the rubber band is released, it returns to its natural state, and its stored energy is converted into kinetic energy, the movement of the mechanism that drives the vehicle forward.
  http://www.teachersdomain.org/resource/phy03.sci.phys.mfe.zsplcar/

Discussion Questions

- In the video segment, what is the role of the rubber band? Why does it help make the spool racer go?
- Use the terms *kinetic energy* and *potential energy* to describe the spool racer.
- How would the spool racer's performance change if you put a pencil on each side?
- Can you suggest ways to make sure the race is fair?
- How might you redesign the spool racer if you were to build one? Why would you do that? What could you do to make the spool racer go faster?

  *S.3.43. Participate in classroom discussions and activities, when frequent clarification is given.
  *W.2.2.e. Write brief summaries of information gathered through research.

Explain:

- Students cut out pictures of objects at rest & the same objects in motion and sort the pictures by whether it is an example of kinetic energy or potential energy
  http://www.teachervision.fen.com/tv/printables/PotentialKinetic.pdf

  *Participate in small-group activities, playing a specified role. (S.3.44; link to ELA 1.3)

*Use appropriate words, phrases, and expressions to interact with peers and adults. (S.3.24)

Explore:

- Students read and discuss: What is Energy? Pages 146 to 150 in Prentice Hall Science Explorer: *Motion, Forces, and Energy.*

  Pre-Reading ELL Strategy:
  - ✓ *Before and After Vocabulary Grid*: Students attempt to define vocabulary words prior to looking up definitions.

  During Reading ELL Strategy:
  - ✓ *Word Sort* (see appendix): Students in mixed ELL and English-speaker groups, sort key vocabulary from the reading into categories. Groups share out.

  Post Reading ELL Strategy:
  - ✓ *3-2-1:* 3 facts learned in the reading, 2 connections to the reading, and 1 question.

- Students add the following vocabulary terms to their glossaries: **energy/** la energía**, kinetic energy/** la energía cinética**, potential energy/** energía potencial**, energy transformation/**la transformación de energía.
  Students should write the word and its definition. Also, they should add examples or drawings that help to explain the meaning of the word.

  *S.1.5. Employ vocabulary essential for grade-level content learning.

  *S.12.a. Identify **cognates** in printed, grade-level, academic content vocabulary terms.

Explain: Students label the following as examples of potential or kinetic energy:

1. Stretching a rubber band
2. Shooting a rubber band
3. Water at the top of a waterfall
4. Water falling over the top of the waterfall
5. YO-YO in motion
6. YO-YO held in your hand
7. Releasing the arrow from a bow and arrow
8. Pulling back the string on a bow and arrow
9. Stretching a spring
10. Letting go of a stretched spring
11. Holding a ball in your hands
12. Throwing a ball up in the air
13. A snow ball at the top of a hill
14. A snow fall rolling down a hill
15. Have students create more examples of their own to demonstrate their understanding of kinetic and potential energy

    *W.5.a. Use reference list of words in English to edit spelling

- Have students make a collage of pictures of objects from magazines that have both potential and kinetic energy.

Explore:

- Students read and discuss: Transformations between Potential and Kinetic Energy? Pages 160 to 161 in Prentice Hall Science Explorer: *Motion, Forces, and Energy.*
  - *S.3.42. States a position and supports/justifies it.

Explain:

1. Which ride is your favorite at an amusement park?
   - Where on this ride is there a lot of potential energy?
   - Where on this ride is there a lot of kinetic energy?
   - Where on this ride did you feel a conversion between potential and kinetic energy?

- Have students compare and contrast potential and kinetic energy using a graphic organizer

Extend:

- Have students create a "Come Back Can" http://www.eduref.org/Virtual/Lessons/Science/Physics/PHS0067.html

- You are an energy engineer employed by Energy Quest Incorporated. Your job is to research the different energies that exist that are related to kinetic and potential energy. You will encounter several links that are provided for research, quizzes, real-life experiments, and online activities. Theses links will help development an understanding of what Potential and Kinetic energy are and how they can be found in the world around you. http://www.stmary.k12.la.us/fhs/kinetic_and_potential_energy_web.htm

- Interactive website where students can investigate the energy of moving objects http://sunshine.chpc.utah.edu/labs/kinetic_energy/

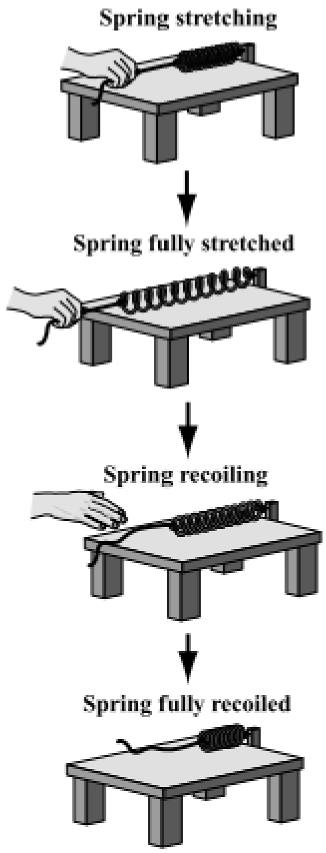
- Students observe Rube Goldberg videos, and then write a brief summary about what they have learned in their notebooks. This collection of videos shows selected teams from the 2004 Argonne Rube Goldberg machine contest. http://www.anl.gov/Careers/Education/rube/rubevideos.htm

- Divide the class into groups of 3 to 5 students. Assign the groups to design a roller coaster with the first hill at a height of 4 feet and two more hills following. The group that is able to design a roller coaster with the most total inches in the height of the three hills wins the class contest. http://www.eduref.org/Virtual/Lessons/Science/Physics/PHS0041.html

- Students learn about three types of heat transfer: Radiation, convection and conduction http://www.wisc-online.com/Objects/ViewObject.aspx?ID=SCE304

Evaluate: (released MCAS questions)

Q. A student is investigating potential and kinetic energy by stretching a spring across a table. When the student lets go, the spring recoils.



At which time is potential energy in the spring being converted into kinetic energy in this system?

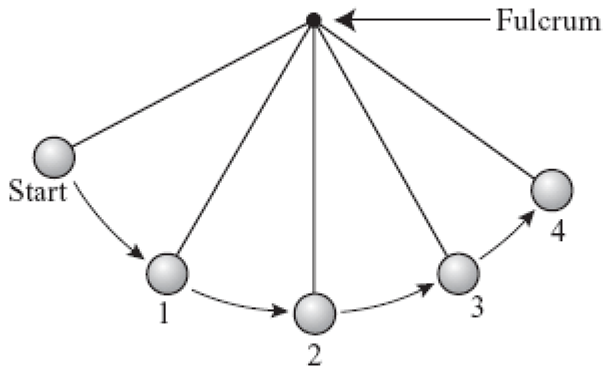
A. when the spring is stretching

B. when the spring is fully stretched

C. when the spring is recoiling

D. when the spring is fully recoiled

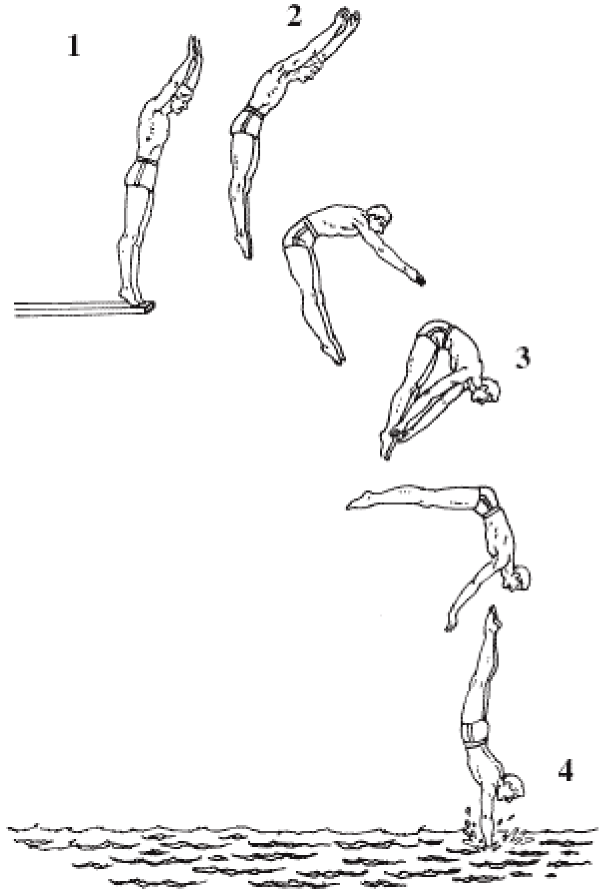
Q. The diagram below shows some positions in the path of a pendulum swinging from a fixed point called a fulcrum.



The pendulum is raised to the start position and released. At which two numbered positions is the potential energy of the pendulum **most likely** the same?

A. position 1 and position 3
B. position 1 and position 4
C. position 2 and position 3
D. position 2 and position 4

Q. The diagram below represents a diver's motion from the top of a high diving board into a pool of water.



At which labeled point does the diver have the **least** potential energy?

A. 1

B. 2

C. 3

D. 4

Big Idea: Heat is a form of energy/ El calor es una forma de energía

Massachusetts Science and Technology/Engineering Standards

PSS #14. Recognize that heat is a form of energy and that temperature change results from adding or taking away heat from the system.

MCAS item analysis (what do students need to be able to do)

- ✓ Know that when heat is added to a system the temperature of the system increases
- ✓ Know that when a system loses heat the temperature of the system decreases

PSS #15. Explain the effect of heat on particle motion through a description of what happens to particles during a change in phase.

MCAS item analysis (what do students need to be able to do)

- ✓ Understand that adding heat to particles results in particles moving faster because they have more energy
- ✓ Know that when water goes from a liquid to a gas that the particles move further apart because they have more energy
- ✓ Know that when water is boiled the water evaporates but anything that was dissolved in the water remains behind

PSS #16. Give examples of how heat moves in predictable ways, moving from warmer objects to cooler ones until they reach equilibrium.

MCAS item analysis (what do students need to be able to do)

- ✓ Know that heat always moves from warmer objects to cooler objects.
- ✓ Know what temperature versus time graphs represent

Guiding Question: What does temperature measure?/ ¿Qué mide la temperatura? **What causes the temperature of an object to change (to increase or to decrease)?/**¿Qué hace que la temperatura de un objeto a cambio (para aumentar o disminuir a)?

Engage:

- o Ask students to describe the hottest and coldest **temperatures/** temperaturas they have ever experienced? *(elicit prior knowledge)*

  *Ask and answer concrete questions about familiar content. (S.2.5)

- o Make a KWL chart with students about temperature. K: What do they know about temperature? W: What do they want to know about temperature? And later after doing activities…add: L: What did they learn about temperature?

  *Use appropriate words, phrases, and expressions to interact with peers and adults.(S.3.24)

Explore:

- o Students choose a paper, plastic, glass or metal container to compare how quickly **heat/** el calor escapes from each. Have students discuss which kind of container (paper, plastic, glass or metal) they think would be best for making ice cream. Students complete Activity Four: How quickly does hot water cool with a cold water coolant? page 45-46 in the Ice Cream Making and Cake Baking: Investigating Heat Transfer by Bernie Zubrowski. Students record temperature readings every 30 seconds until the temp of the two liquids remains the same for 3 to 4 readings. Students plot the data on a line graph.

*R.5.12.a. Identify and represent graphically main ideas, supporting ideas, and supporting details in text.

- Students learn about heat transfer and how to keep things warm by testing the characteristics of different materials with this fun activity for kids. http://www.sciencekids.co.nz/gamesactivities/keepingwarm.html

  *Use appropriate words, phrases, and expressions to interact with peers and adults. (S.3.24)

Explain:

- Formative Assessment. Students answer the following questions in their notebooks:

  1. Which has more **energy/** la energía: Hot or cold water? Explain your reasoning.

  2. A student in a laboratory transfers a beaker containing a hot solution from the lab table to a cool water bath. (MCAS released question, PSS #14)

  Which of the following parts of the system experiences an increase in heat energy?

  A. beaker

  B. lab table

  C. solution

  D. water bath

Explore:

- Again, students choose a paper, plastic, glass or metal container to compare how quickly **heat** escapes from each, this time, using an ice-water solution rather than cold tap water to cool hot water (like we did in Activity 4). Students complete Activity Five: Cooling hot water with ice, from Bernie Zubrowski's unit: Ice Cream Making and Cake Baking. *Remind students to measure the temperature of both the hot water and the ice-water solution.* Students observe that the hot water never forms ice, and they observe that the ice water doesn't change temperature. Students record temperature readings every 30 seconds until the temp of the two liquids remains the same for 3 to 4 readings. Students plot the data on a line graph.

  *Use appropriate words, phrases, and expressions to interact with peers and adults. (S.3.24)

  *R.5.12.a. Identify and represent graphically main ideas, supporting ideas, and supporting details in text.

Explain:

- <u>Formative Assessment.</u> Students answer the following question in their notebooks: Why does the temperature of the ice water remain the same?

  *W.2.7.a. Write short accounts of personal or familiar experiences, including academic topics.

Explore:

- Again, students choose a paper, plastic, glass or metal container to compare how quickly **heat** escapes from each, this time, using an ice-salt-water solution rather than ice-water to cool hot water (like we did in Activity 5). <u>Ask students to predict what effect they think this will have on the cooling curve.</u> Students *work in small groups* to complete Activity Six: Cooling hot water with ice and salt, from Bernie Zubrowski's unit: Ice Cream Making and Cake Baking. <u>Students observe the temperature of the hot water dropping quickly. They may observe ice forming.</u> Students record temperature readings every 30 seconds until the temp of the two liquids remains the same for 3 to 4 readings. Students plot the data on a line graph.

  *R.5.12.a. Identify and represent graphically main ideas, supporting ideas, and supporting details in text.

  * S.3.29. Demonstrate comprehension of oral, multiple-step directions.

Explain:

- <u>Formative Assessment.</u> Students answer the following questions in their notebooks:

  1. Why do people use salt on icy sidewalks and roads in the winter? (salt works by lowering the freezing point of water.)

  2. Using evidence from the above experiments which container do you think would be best to make ice cream in? Please explain.

Extend:

- Students read about and discuss the EFFECTS OF DE-ICERS ON TREES & SHRUBS http://chemistry.about.com/gi/o.htm?zi=1/XJ&zTi=1&sdn=chemistry&cdn=education&tm=516&gps=200_221_796_357&f=00&tt=2&bt=0&bts=1&zu=http%3A//www3.extension.umn.edu/projects/yardandgarden/ygbriefs/h456de-icer.html

  *S.3.43. Participate in classroom discussions and activities, when frequent clarification is given.

Explore:

- Students read and discuss: Temperature, Thermal Energy, and Heat, pages 176 to 179 in Prentice Hall Science Explorer: *Motion, Forces, and Energy.* Students do a **Quick Write** (see appendix). A Quick Write is a literacy strategy that is designed to give students the opportunity to reflect on their learning. This writing assignment can be used at the beginning, middle, or end of a lesson and takes only about thirty seconds to several minutes.

  *Apply knowledge of word context to gain meaning from text (R.2.8)

  *W.2.7.a. Write short accounts of personal or familiar experiences, including academic topics.

- Students add the following vocabulary terms to their glossaries: **temperature/** la temperatura**,** **thermal energy/** la energía térmica**,** and **heat/** el calor**.** *Students should write the word and its definition. Also, they should add examples or drawings that help to explain the meaning of the word.*

  *Clarify meanings of words, using beginning and bilingual dictionaries. (S.1.11; link to ELA 4.8)

  *S.12.a. Identify cognates in printed, grade-level, academic content vocabulary terms.

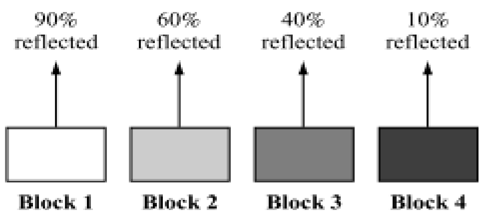
Extend:

- Make ice cream with students. Make ice cream in a baggie. http://chemistry.about.com/cs/howtos/a/aa020404a.htm

- Play "Beat the Heat!" Match scrambled up words with real words before the thermometer tops out. http://spaceplace.nasa.gov/en/kids/st8/thermal_loop/#

Evaluate: MCAS released questions

Q. Four different-colored blocks are placed outside in bright sunlight. The blocks are identical except for color. The diagram below shows the amount of light reflected from each block. (PSS # 14)



Which block will increase in temperature **most** rapidly?

A. block 1

B. block 2

C. block 3

D. block 4

Q. A pot of cold water was heated on a stove until the water boiled. Which of the following **best** explains why the water was able to boil? (PSS #14)

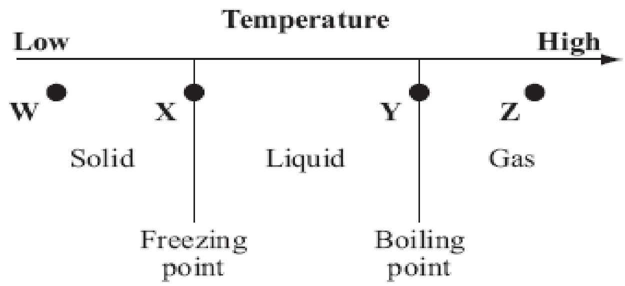
A. The hot stove absorbed cold from the pot.

B. The cold water absorbed heat from the pot.

C. The hot stove gave off heat to the surrounding air.

D. The cold water gave off cold to the surrounding air.

Q. The diagram below shows how a change in temperature affects the physical state of a substance. Each of the labeled points represents the same substance at a different temperature. (PSS # 15)



Which point represents the substance in the physical state with the particles moving the **least**?

A. point W

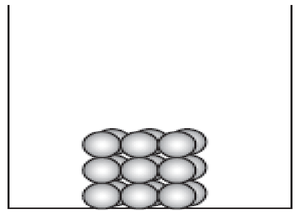
B. point X

C. point Y

D. point Z

Open-Response Question. Have students score their own answers using the released rubric. Then, have students score the samples of student work released (white out the score points) using the rubric. This activity will help students understand what is required to get a 4 on this type of question. Have students retake the MCAS question to find out how many are now able to get a perfect score.

Q. The diagram below shows a model in an open container. The model represents the arrangement of particles of matter in a solid phase. (PSS # 15)



Solid

a. Draw a diagram showing the arrangement of these particles in a liquid phase. Explain why the particles have this arrangement. Be sure to describe the energy of the particles.

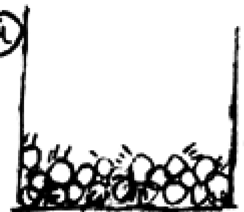
b. Draw a diagram showing the arrangement of these particles in a gas phase. Explain why the particles have this arrangement. Be sure to describe the energy of the particles.

Scoring Guide and Sample Student Work

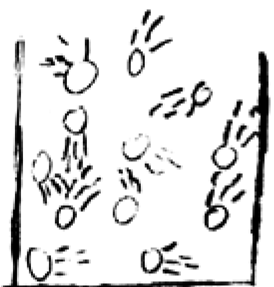
Score	Description
<u>4</u> <u>4</u>	The response demonstrates a thorough understanding of the effect of heat on particle motion. The response draws an accurate diagram showing the arrangement of the particles in a liquid phase and correctly explains why the particles have this arrangement. The response also draws an accurate diagram showing the arrangement of the particles in a gas phase and correctly explains why the particles have this arrangement.
<u>3</u>	The response demonstrates a general understanding of the effect of heat on particle motion.
<u>2</u>	The response demonstrates a limited understanding of the effect of heat on particle motion.
<u>1</u>	The response demonstrates a minimal understanding of the effect of heat on particle motion.
<u>0</u>	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Note: There are 2 sample student responses for Score Point 4.

2007 MCAS
Grade 8 Science and Technology/Engineering
Question 38 - Score Point 4

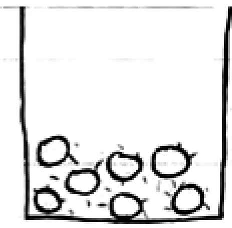
(a) 

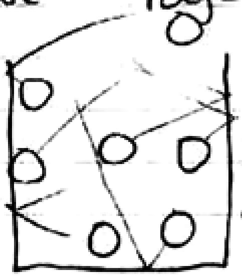
If the particles of matter were changed into a liquid phase they would assume the shape of their container. The particles would begin moving faster, increasing their energy. The particles would stay together but not be as tightly packed as when they were a solid.

(b.) 

If the particles of matter in the container were changed from a liquid state to that of a gas there would be some drastic changes. The particles would start moving alot faster, They would be warmer and have alot more energy. The particles would try to spread out and fill up as much space as possible. Because of this the particles would not be as close and not colliding as often. when cooled they would change back into a liquid state (condensation). when they are formed into a gas they tend to rise when warmed and sink when cooled.

2007 MCAS
Grade 8 Science and Technology/Engineering
Question 38 - Score Point 4

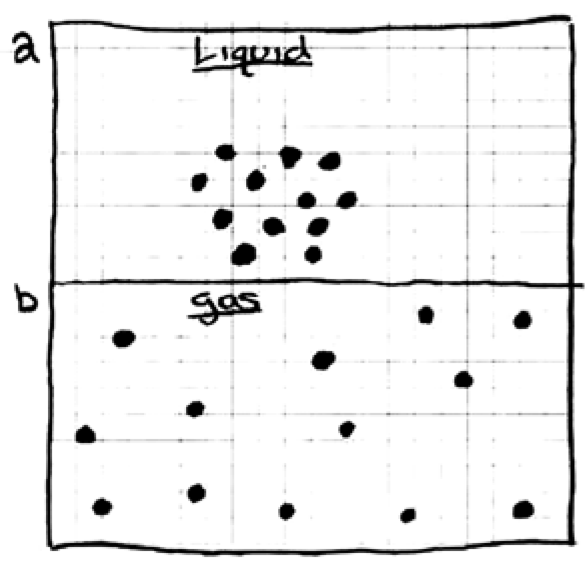
a  The particles are in this arrangement because in a liquid, the particles are loose enough to move around but still stay in the container close together. This is because they have more energy.

b.  The particles are in this arrangement because in a gas, the particles are in such a loose arrangement and they have so much energy, that if they are not in a closed off space, they will escape.

2007 MCAS
Grade 8 Science and Technology/Engineering
Question 38 - Score Point 3

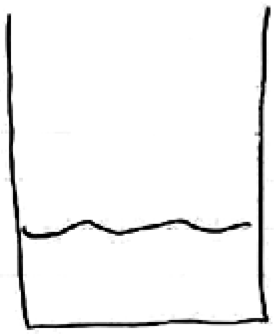
a. The particles are arranged like this in a liquid state because they are more free to move around then solids. Also they are higher in enery than Solids because the particles are boucing around where as in a Solid they are Just sitting there.

b. The particles are arranged like this in a gas state because they are even more able to move around than liqurds. The energy of the particles is very higher, higher than in liqurds because these particles are frantically bouncing around constantly.



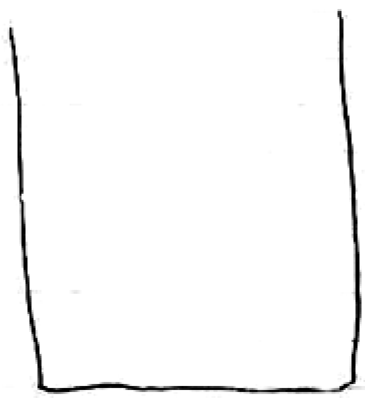
2007 MCAS
Grade 8 Science and Technology/Engineering
Question 38 - Score Point 2

a



The energy is high, it would have to have been heated to turn into a liquid

b

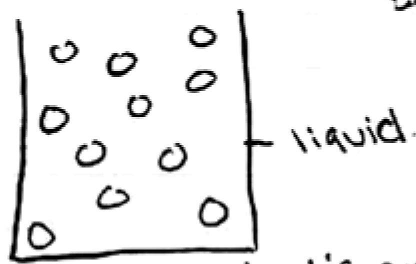


The energy is real high the liquid must have been heated a lot to turn it into a gas.

2007 MCAS
Grade 8 Science and Technology/Engineering
Question 38 - Score Point 1

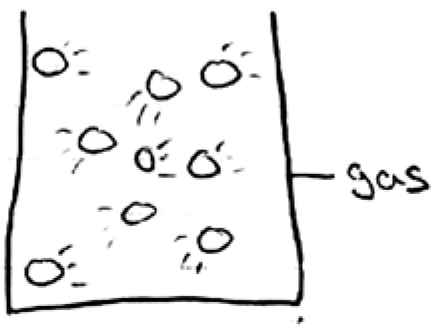
A.

The particles have kinetic energy cause there bouncing all over the place because there in liquid which Seperates the particles.



kinetic energy

B.

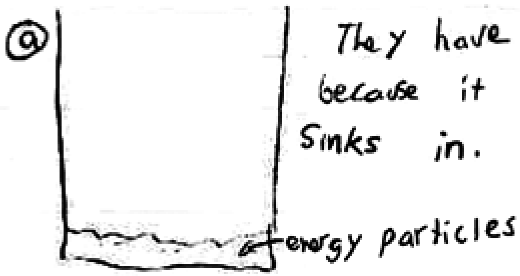


Kinetic energy

They have kinetic energy because there is no matter in the gas to hold them in Place so there bouncing rapidly back and forth.

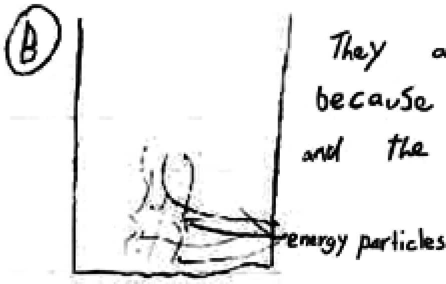
2007 MCAS
Grade 8 Science and Technology/Engineering
Question 38 - Score Point 0

(a)



They have these arrongement because it like water so it just Sinks in.

(B)



They are in the arrangement because that is where the Solids where and the gases are moving up.

Q. Which of the following is an example of heat transfer by conduction? (PSS #16)

A. a whole metal spoon getting hot when one end is in hot soup

B. the inside of a car in the sun getting very hot

C. a tar road getting hotter in the sun than a concrete sidewalk

D. a fireplace fire heating a room on a cold day

Q. The surface of a heated metal object measures 120°C. It is dropped into a bucket filled with water measuring 10°C. (PSS # 16)

Which of the following is **most likely** to occur?

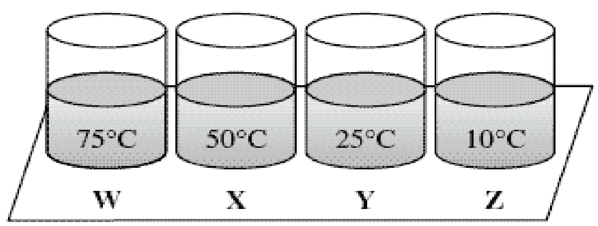
A. Both the water and metal will adjust to the same temperature below 10°C.

B. The water and metal will adjust to different temperatures above 120°C.

C. The water will remain the same temperature, but the metal will cool to 10°C.

D. The water and metal will adjust to the same temperature between 10°C and 120°C.

Q. Four containers of water with different temperatures are placed on a table as shown below. The temperature of the room is 25°C. (PSS # 16)



After four hours, which beaker of water will have exchanged the **most** heat energy with the environment?

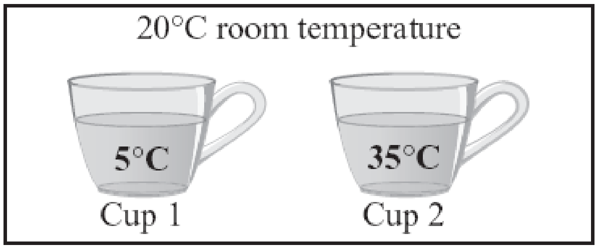
A. W

B. X

C. Y

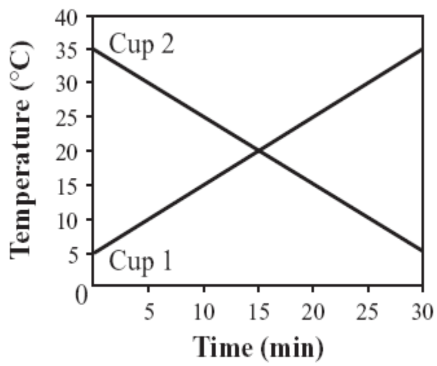
D. Z

Q. During an investigation, Steven filled two cups with the same amount of water and placed them in a 20°C room for 30 minutes. Cup 1 was filled with 5°C water. Cup 2 was filled with 35°C water. The diagram below shows the temperatures of the cups at the beginning of the investigation. (PSS #16)

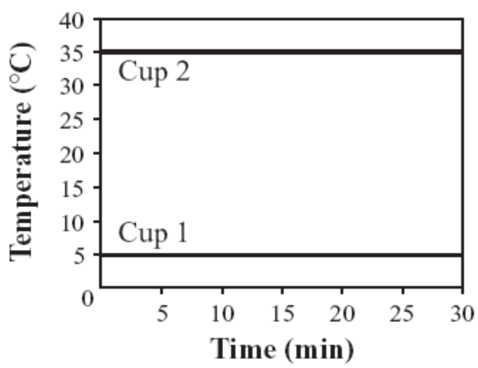


Which of the following graphs shows how the temperatures of the two cups of water **most likely** changed over 30 minutes?

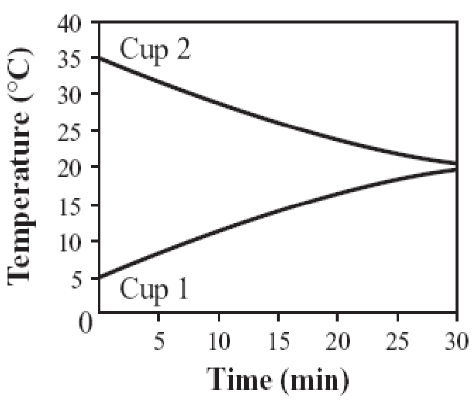
A.



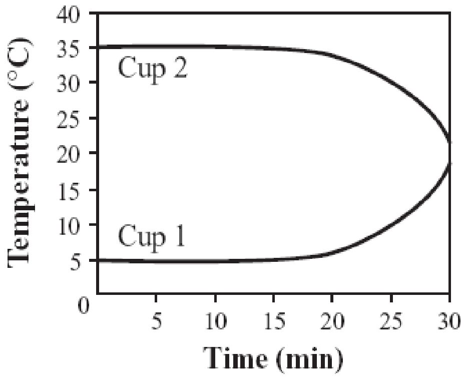
B.



C.



D.



Temperature (°C)
40
35
30
25
20
15
10
5
0
Cup 2
Cup 1
5
10
15
20
25
30
Time (min)

APPENDIX

Quick Write

Before, during or after reading

The **Quick Write** is a literacy strategy that is designed to give students the opportunity to reflect on their learning. This writing assignment can be used at the beginning, middle, or end of a lesson and takes only about thirty seconds to several minutes.

Students are supposed to let their thoughts flow without mechanics or revisions. Short, open-ended statements are usually given.

For example, students are asked to write about what they learned, to activate background knowledge, to define or explain a word, about a favorite character, problems they encountered, what they liked (or did not like) about the lesson, and about how well they understood the concepts.

WORD SORT

Pre-Reading Activity

A Word Sort is a simple small group activity. Students list key words from a reading selection. (Alternatively, the teacher may provide a list of terms prior to the reading activity.) Students identify the meaning and properties of each word and then "sort" the list into collections of words with similar features. This "sorting" process links students' prior knowledge to the basic vocabulary of a reading selection.

- **Closed Word Sort**–The teacher provides the categories (and the specific features of each) to the students. The students then match the words with the features to create the word collections.

- **Open Word Sort**–The teacher provides only the list of words. Students work together to discern the common features and to describe the categories for collecting the word groups.

Steps to a Word Sort:

1. List between 10 and 20 key vocabulary words from a reading selection on the chalkboard or on index cards.
2. Divide the class into small groups of 4 or 5 students. (Distribute the index cards if this method is used.)
3. For a Closed Word Sort, provide students with the categories into which they will sort the vocabulary words. For an Open Word Sort, instruct the student teams to suggest categories for organizing the words.
4. Allow 10 to 15 minutes for the student teams to assign the words to the appropriate categories.
5. Conduct a class discussion with each group presenting their word list for one of the categories. Require the students to defend their sorting of terms by asking about the common features of the categories and how each specific word meets these criteria.