Holyoke Public Schools

Science Curriculum Map
Grade 4

Magnetism & Electricity Unit

August 2010

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, through the use of the English Language Proficiency Benchmarks and Outcomes (ELPBO) to support instruction for English Language Learners (ELLs). Strategies for teaching ELLs are good teaching practice for all learners. In order to help facilitate this teachers are required to follow 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.

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:

Seeds of Science Roots of Reading: Gravity and Magnetism kit

FOSS kit: Magnetism & Electricity

All students should have a science journal and a 3 ring binder or a pocket folder to keep all their science work organized. This should be kept in the classroom so that visitors (such as the principal, vice principal, Leadership team, Curriculum team etc.) can view student work when they do walk throughs.

Big Idea: Magnetic attraction is a force/ Atracción magnética es una fuerza

Massachusetts Science and Technology/Engineering Standards
PS # 9. Recognize that magnets have poles that repel and attract each other.
MCAS item analysis (What do students need to be able to do?)

- ✓ Be able to explain that magnets have poles that attract and repel each other

PS # 10. Identify and classify objects and materials that a magnet will attract and objects and materials that a magnet will not attract.
MCAS item analysis (What do students need to be able to do?)

- ✓ Recognize that iron or steel (because steel is mostly made up of iron) is attracted to magnets

Guiding Questions: What kinds of materials are attracted to magnets?/ ¿Qué tipo de materiales son atraídos por los imanes? What happens when you bring two or more magnets together?/¿Qué sucede cuando usted trae dos o más imanes juntos?

Vocabulary terms: (use word walls, word rings and/or word splash)

Engage:

- o Students work in small groups and complete the Getting Ready to Read, (an Anticipation Guide): Forces, page 4 in the *Gravity and Magnetism Investigation Notebook*: Anticipation guides encourage students to activate their prior knowledge in preparation for reading and encourage students to monitor their understanding while they read.
  *Employ vocabulary essential for grade-level content learning. (S.1.5)
  ***From the Massachusetts English Language Proficiency Benchmarks and Outcomes for English Language Learners (ELPBO) June 2003**

- o Students are introduced to the book Forces and to the genre of informational text. See Session 1.2: Forces in *Gravity and Magnetism Teacher's Guide:* Seeds of Science Roots of Reading, pages 32 to 52. Informational texts are written to explain something. It

gives us information, or facts, about a topic. Tell students that scientist often read to find out more about a topic. Have students read the book, independently or in pairs, looking for evidence that forces are acting.

*Summarize data gathered through research. (R.6.2)

Explore:

- Students work collaboratively with peers to sort objects into two groups: things that are attracted to magnets and things that are not attracted to magnets. (Seeds of Science, Roots of Reading: *Gravity and Magnetism Teacher's Guide,* Investigation #1.3: Investigating Magnetic Attraction, pages 54 to 71). Students learn that magnets attract some metals but not all metals. Students record their observations on a T-chart.

  *Employ words, phrases, and sentences in social interactions in everyday topics. (S.2.10)
  *Support a conclusion or finding by stating facts or logical reasons. (S.3.64)

- Students add the following vocabulary terms to their glossaries: **force/ la fuerza, magnet/ imán, magnetic force/ la fuerza magnética, attract/ se atraen,** and **repel/ repelen**.

  *Identify words in English that are frequently used in the student's first language. (S.1.8)
  *Clarify meanings of words, using dictionaries, glossaries, and other resources. (S.1.24)

- Students participate in generating the key concepts, (from Investigation #1.3: Investigating Magnetic Attraction), on sentence strips and post them on the concept wall.

  *Recount prior experiences and events of interest, using familiar sentences. (S.2.9)

- Students revisit the concept of evidence and search for plausible evidence of a force from the book *Forces.* See Session 1.4: Searching for Evidence, Seeds of Science, Roots of Reading: *Gravity and Magnetism Teacher's Guide,* pages 72 to 83. Students write a paragraph explaining that all forces are pushes or pulls.

  *Organize information to be expressed in writing in a way that makes sense for the purpose and audience. (W.1.3)

- Students work in pairs to observe the Earth's magnetic field by constructing their own compasses using a ring magnet suspended on a piece of dental floss. See Session 1.6: Investigating Magnetic Poles, Seeds of Science, Roots of Reading: *Gravity and Magnetism Teacher's Guide,* pages 100 to 117. After identifying the North Pole and South Pole of the magnet, students work in pairs to create various "magnetic tricks". Sharing these tricks is an opportunity for students to discuss how like poles repel and opposite poles attract.

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

- Read Aloud and discuss*: What My Sister Taught Me About Magnets,* a fictional narrative that provides true information about magnets. See session 1.7 in the Seeds of Science Roots of Reading: *Gravity and Magnetism Teacher's Guide*, pages 118 to133. Set

reading goals with students. Discuss how setting reading goals help students better understand what they read.

*Demonstrate comprehension of vocabulary essential for grade-level content learning using pictures, actions and/or objects. (S.1.3)

*Demonstrate comprehension of main points of a discussion. (S.3.32)

- Students investigate the specific types of metal that are attracted to magnets, using evidence from the book *What My Sister Taught Me About Magnets,* and their own firsthand investigations. See session 1.8: What Attracts, in the Seeds of Science Roots of Reading: *Gravity and Magnetism Teacher's Guide*, pages 134 to 147. Students work in pairs to create a table to help them answer the question, "What kinds of metal do magnets attract?"

  *Organize information to be expressed in writing in a way that makes sense for the purpose and audience. (W.1.3)

Explain:

- ✓ Students write a paragraph about magnetic force, see Session 1.9: Writing about Magnetic Force, in Seeds of Science Roots of Reading: *Gravity and Magnetism Teacher's Guide*, pages 148 to 159. Students write a scientific explanation using evidence gathered about magnets.

  *After writing or dictating a composition, identify words and phrases that could be added to make the thought clearer (W.3.4)

  *Organize information to be expressed in writing in a way that makes sense for the purpose and audience. (W.1.3)

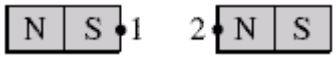
Evaluate: (MCAS released questions)

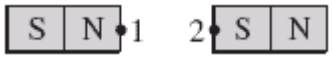
- The questions may be used as a pre/post test, to help students practice MCAS questions, to help students learn how to answer multiple choice questions and/or open-response questions.

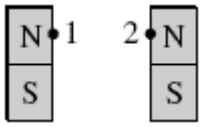
  *Respond to factual and inferential questions that are based on academic content. (S.3.39)

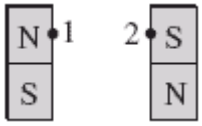
  *After writing or dictating a composition, identify words and phrases that could be added to make the thought clearer (W.3.4)

Q. In which case would it take the **most** effort to make points 1 and 2 on the magnets touch each other? (PS # 9)

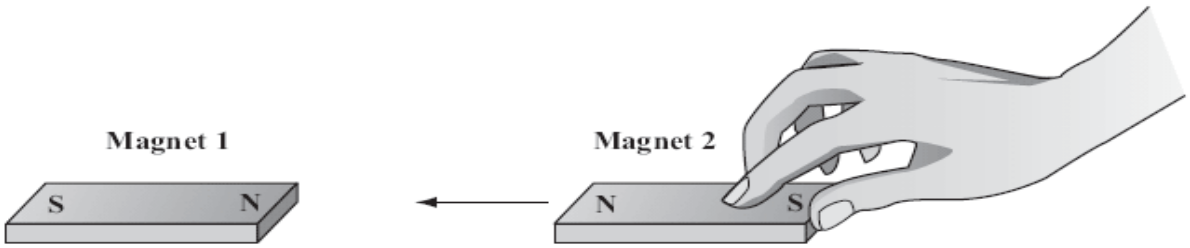
A. 

B. 

C. 

D. 

Q. The picture below shows magnet 2 being pushed toward magnet 1. (PS #9)



Which of the following will **most likely** happen to magnet 1 as magnet 2 is moved closer?

A. Magnet 1 will move under magnet 2.

B. Magnet 1 will move toward magnet 2.

C. Magnet 1 will move on top of magnet 2.

D. Magnet 1 will move away from magnet 2.

Q. Which of the following statements **best** explains why magnets usually stick to a refrigerator door? (PS # 10)

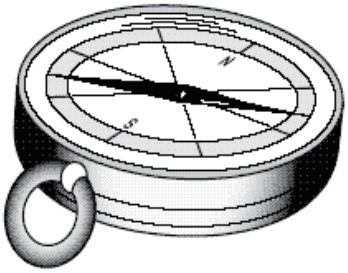
A. The refrigerator door is smooth.

B. The refrigerator door contains iron.

C. The refrigerator door is a good conductor.

D. The refrigerator door has electric wires in it.

Q. The picture below shows a compass. (PS #10)



Which type of energy causes the needle on this compass to move?

A. heat

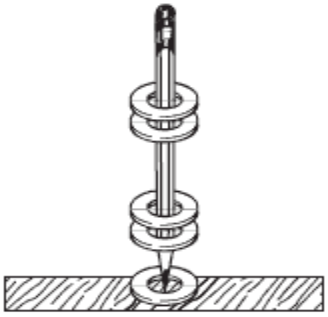
B. light

C. magnetic

D. sound

Open-Response Question (see appendix for samples of students work with rubric). This question should be used to help students learn how to answer open-response questions. First, give the question to students and let them answer the question. Next, remove the scores on the samples of student work and give your students the samples of student work with the rubric and have them score the samples. After they score the work and the class discusses the correct scores, have you students go back to their original answers and revise their answers. The goal is for all students to get a perfect score!

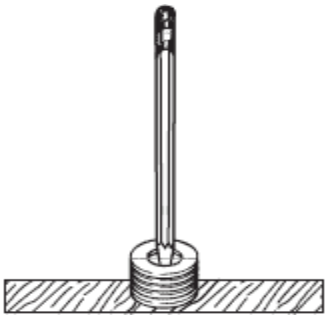
Q. The picture below shows five ring magnets that are stacked around a pencil. (PS # 9)



When the pencil is held upright, the magnets do not touch, but appear to be suspended in the air. When the magnets are pushed closer together, they quickly return to their original positions.

a. Explain why the magnets are not touching each other and appear to be suspended in air.
b. Describe what would happen if the pencil were taken away.

The magnets were then rearranged so they stacked around the pencil as shown below.



b. Explain how the magnets were rearranged on the pencil so that they stacked directly on top of each other as shown.
c. Describe what would happen if the pencil were taken away.

Scoring Guide and Sample Student Work

Score	Description
4	The response demonstrates a thorough understanding that magnets have poles that attract and repel each other. The response correctly explains why the magnets appear to be suspended in the air and describes what would happen if the pencil were taken away. The response also correctly explains how the magnets were rearranged to stack on top of each other and describes what would happen if the pencil were taken away.
3	The response demonstrates a general understanding that magnets have poles that attract and repel each other.
2	The response demonstrates a limited understanding that magnets have poles that attract and repel each other.
1	The response demonstrates a minimal understanding that magnets have poles that attract and repel each other.
0	The response is incorrect or contains correct work that is irrelevant to the skill or concept being measured.

2006 MCAS

Grade 5 Science and Technology/Engineering

Question 18 - Score Point 4

A. The magnets will not touch because the same ends are facing eachother. This is because if a North and a North meet they will repel. if a North and South met thiey would attrack.

B. If the pencil was taken away the magnets would all fall downward. This is because when the pencil is taken away the magnets would have nothing to keep from falling.

C The magnets were rearanged so that the North and South met so they would attract eachother.

D If the pencil was taken away the magnets would still be the saml. This is because as long as the opposites are together they wont move.

2006 MCAS
Grade 5 Science and Technology/Engineering
Question 18 - Score Point 3

A The magnets are not toching because thes are all going the same way. The north at the top and the south at the botem.

B. The magnits would fall because they would have nothing to ceep them in place.

C. The magnets were aranged so that the north and south were facing eachothe Opesits atract.

D. If the pencil was taken away nothing would happen. Thats because the all are in a staki

2006 MCAS
Grade 5 Science and Technology/Engineering
Question 18 - Score Point 2

A. Magnets have north and south poles. The poles only atract the opposite kind of pole. If you put a north pole to a north pole the magnets would repel against the other.

B. If the pencil was removed, (showing how the magnets repel) the magnets would fall and flpover to the opposite side to be atracted to each other.

2006 MCAS
Grade 5 Science and Technology/Engineering
Question 18 - Score Point 1

A. The magnets don't touch because force is pushing them apart

B. The magnets will fall if the pencil were moved.

C. The pencil must be moved to make the magnets to be together.

D. The magnets will seperate if the pencil was moved.

2006 MCAS
Grade 5 Science and Technology/Engineering
Question 18 - Score Point 0

When the magnets are in the air gravity has <u>not</u> pushed on them yet. Then it just goes down because gravity apird on it so there not apart. Then it falls to the bottom and if there was no bottom it would just fall.

Big Idea: A circuit is a pathway through which electricity flows./ Un circuito es un camino por el que fluye la electricidad.

Massachusetts Science and Technology/Engineering Standards
PS #6. Recognize that electricity in circuits requires a complete loop through which an electrical current can pass, and that electricity can produce light, heat, and sound.
MCAS item analysis (What do students need to be able to do?)

- Recognize a diagram that shows a complete circuit
- Know what materials conduct electricity

PS # 7. Identify and classify objects and materials that conduct electricity and objects and materials that are insulators of electricity.
MCAS item analysis (What do students need to be able to do?)

- ✓ Recognize materials that are conductors
- ✓ Recognize materials that are insulators

Guiding Questions:
What is a complete circuit?/ ¿Qué es un circuito completo?
What materials conduct electricity?/ ¿Qué materiales conducen la electricidad?
What materials do not conduct electricity?/¿Qué materiales no conductores de electricidad?

Engage & Explore:

- Challenge students to make a light bulb light using a battery, a bulb and 2 pieces of wire. Investigation #2, Part 1: Lighting a Bulb, *FOSS Magnetism & Electricity Teacher Guide,* pages 8 to 13. Students develop concepts about how connections are made and how electricity flows through a circuit.
  *Participate in small group activities, playing a specified role. (S.3.44)
  *Summarize data gathered through research. (R.6.2)

Explain:

- Students draw a diagram and write an explanation of how electricity flows from a D-cell to a light bulb.
  *Identify and use words and phrases to make ideas clearer or more logical. (W.3.2)
  *Select and use words to increase detail in writing. (W.3.3)

- Students add the following vocabulary terms to their glossaries: **D-cell/ D-cell, battery/ batería, source/ fuente, receiver/ receptor,** and **circuit/ circuito**.
  *Demonstrate comprehension of vocabulary essential for grade-level content learning using pictures, actions and/or objects. (S.1.3)
  *Clarify meanings of words, using dictionaries, glossaries, and other resources. (S.1.24)

Explore:

- Students work collaboratively with peers to use a circuit with a D-cell and a motor. Investigation #2, Part 2: Making a Motor Run, *FOSS Magnetism & Electricity Teacher Guide,* pages 14 to 19. Students learn the conventions for drawing schematic diagrams of circuits. Students make schematic diagrams of their circuits.
  - *Participate in small group activities, playing a specified role. (S.3.44)
  - *Summarize data gathered through research. (R.6.2)

- Students add the following vocabulary terms to their glossaries: **switch/ interruptor, open circuit/ de circuito abierto, closed circuit/ circuito cerrado** and **schematic diagram/ diagrama esquemático.**
  - *Identify words in English that are frequently used in the student's first language. (S.1.8)
  - *Clarify meanings of words, using dictionaries, glossaries, and other resources. (S.1.24)

Explain:

- Students analyze another student's drawing of a battery and bulb circuit to explain why it will or will not light. Use Response Sheet: Bulbs, *FOSS Magnetism & Electricity Teacher Guide* Duplication Masters.
  - *Explain the thinking processes used in academic content areas. (S.3.51)

- Students write a well developed composition (an essay) about what life would be like without electricity and about how people without electricity could solve problems that require a power source.
  - *Identify and use words and phrases to make ideas clearer or more logical. (W.3.2)

Explore:

- Students work collaboratively with peers to build a circuit to test whether objects are conductors or insulators. Investigation #2, Part 3: Finding Insulators and Conductors, *FOSS Magnetism & Electricity Teacher Guide,* pages 14 to 19. Students search the classroom for insulators and conductors.
  - *Participate in small group activities, playing a specified role. (S.3.44)
  - *Demonstrate comprehension of oral, multiple-step directions. (S.3.29)

- Read Aloud and discuss: Making Static and A Fictional Interview with Benjamin Franklin, *FOSS Science Stories: Magnetism and Electricity,* pages 7 to 9.
  - *Identify and apply strategies to enhance comprehension of texts. (R.3.6)

Explain:

- **Assessment:** Students work with mystery boards to reinforce the concept of conductor and check their understanding of how electricity flows through a circuit. Investigation #2, Part 4: Investigating Mystery Circuits, *FOSS Magnetism & Electricity Teacher Guide,* pages 26 to 29.
  - *Identify and use words and phrases to make ideas clearer or more logical. (W.3.2)
  - *Explain the thinking processes used in academic content areas. (S.3.51)

Evaluate: (MCAS Released questions)

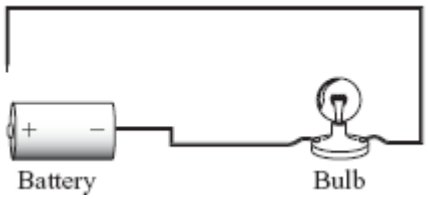
- The MCAS questions may be used as a pre/post test, to help students practice MCAS questions, to help students learn how to answer multiple choice questions and/or open-response questions.

  *Respond to factual and inferential questions that are based on academic content. (S.3.39)

  *After writing or dictating a composition, identify words and phrases that could be added to make the thought clearer (W.3.4)

Q. Which diagram below shows a circuit that will cause the bulb to light? (PS #6)

A.



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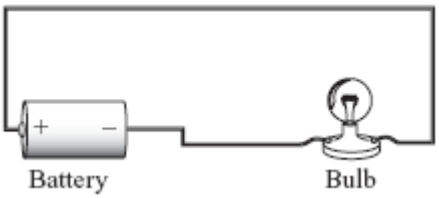

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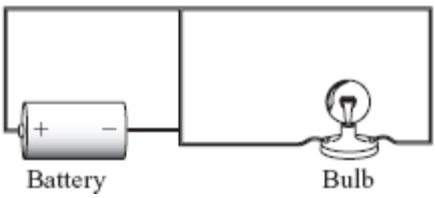
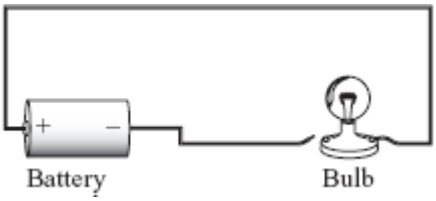
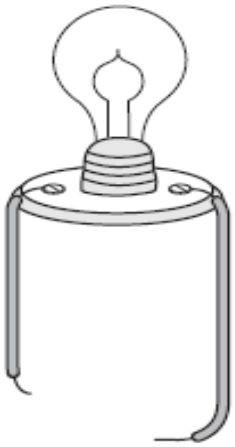


D.



Q. The picture below shows an incomplete electrical circuit. (PS #6)



Which of the following objects can be connected to the ends of the two wires to make the circuit complete and light the bulb?

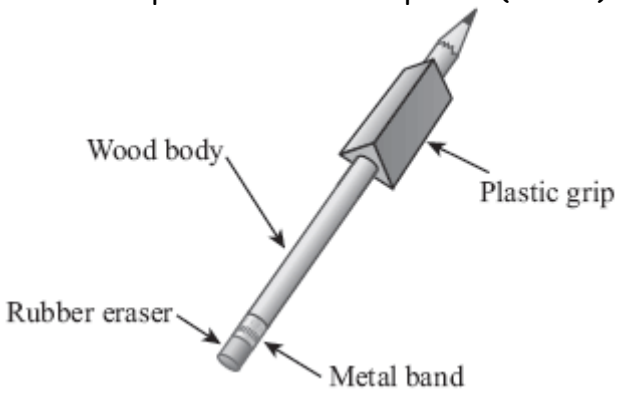
A. a battery
B. a switch
C. another bulb
D. another wire

Q. A piece of bread is stuck in the toaster pictured below. (PS #7)

Which of the following explains why it is unsafe to use a metal fork to remove the piece of bread from the toaster?

A. The fork will catch on fire.
B. The fork will melt in the toaster.
C. The fork will conduct electricity.
D. The fork will damage the toaster.

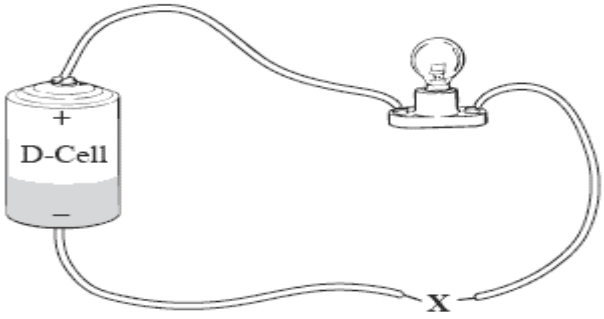
Q. The picture below shows four parts of a wooden pencil. (PS #7)



Which part of the pencil is the **best** conductor of electricity?

A. metal band
B. plastic grip
C. rubber eraser
D. wood body

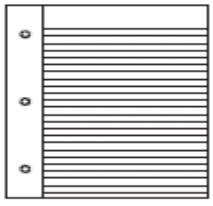
Q. The diagram below shows an incomplete circuit due to a break in the wire at point X. (PS #7)



A student is testing materials to see if they conduct electricity. The student places each item shown at position X, making sure the object is in contact with the loose end of each wire. Which item will electricity flow through, causing the bulb to light?

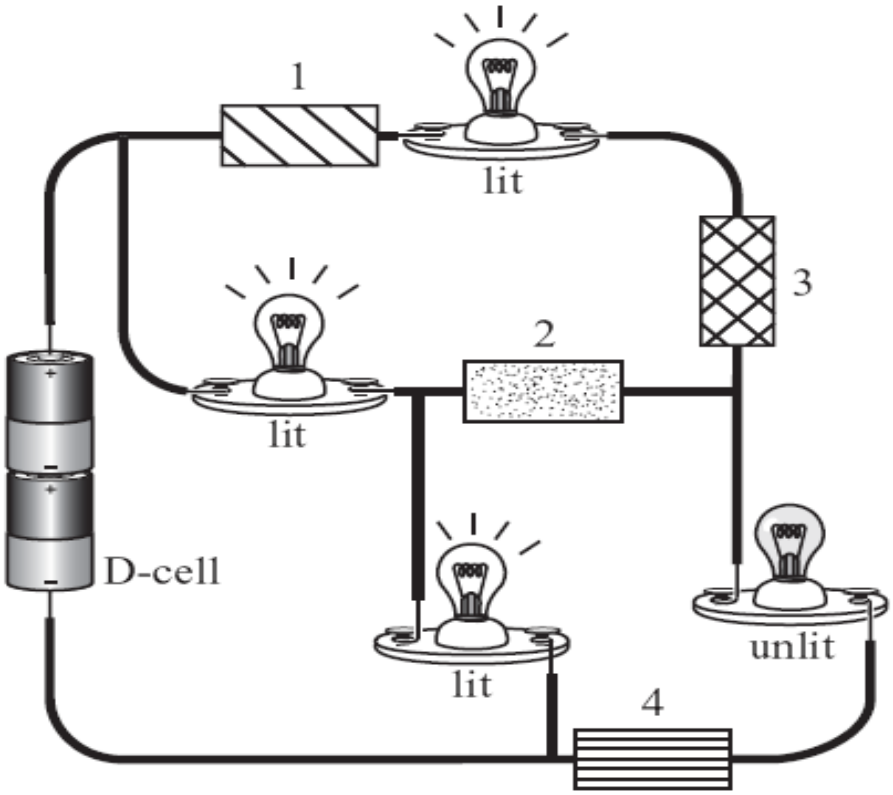
A. 
Crayon

B. 
Plastic comb

C. 
Notebook paper

D. 
Penny

Q. The circuit diagram below shows D-cells connected to four light bulbs and four different materials labeled 1, 2, 3, and 4. (PS #7)



Which of the four materials is acting as an insulator rather than a conductor?

A. 1

B. 2

C. 3

D. 4

Big Idea: Electricity can be used to create an electromagnet./ La electricidad puede ser usado para crear un electroimán. Magnetism and electricity are different forms of energy./ El magnetismo y la electricidad son formas diferentes de energía.

Massachusetts Science and Technology/Engineering Standard
PS #8. Explain electromagnets can be made, and give examples of how they can be used.
MCAS item analysis (What do students need to be able to do?)

- ✓ Recognize that electricity can be used to create an electromagnet

PS # 4. Identify the basic forms of energy (light, sound, heat, electrical, and magnetic). Recognize that energy is the ability to cause motion or create change.
MCAS item analysis (What do students need to be able to do?)

- ✓ Recognize examples of different types of energy (light, sound, heat, electrical, and magnetic)

Guiding question: How are electromagnets made?/ ¿Cómo son los electroimanes hecho?

Engage:

- o Ask students if they have ever seen a large junkyard crane move large amounts of metal, like cars. If possible, show students pictures of junkyard cranes. Talk about movies that have scenes of junkyard cranes moving cars around. Tell them that the crane uses a large magnet that can be turned on and off. Ask students to turn to a partner and discuss how a magnet might be turned on and off.
  *Employ words, phrases, and sentences in social interactions in everyday topics. (S.2.10)

Explore:

- o Students work collaboratively with peers to discover that when current flows through an insulated wire wound around a steel core, the steel core becomes a magnet. Investigation #4: Current Attractions, Part 1: Build an Electromagnet, *FOSS Magnetism and Electricity Teacher Guide,* pages 8 to 13. Students find out where to wind on the core to produce the strongest magnet.
  *Employ words, phrases, and sentences in social interactions in everyday topics. (S.2.10)
  *Support a conclusion or finding by stating facts or logical reasons. (S.3.64)

- o Students add the following vocabulary terms to their glossaries: **electromagnet/ electroimán, core/ núcleo,** and **coil/ bobina**
  *Identify words in English that are frequently used in the student's first language. (S.1.8)
  *Clarify meanings of words, using dictionaries, glossaries, and other resources. (S.1.24)

- o Read Aloud and discuss*:* From Rags to Science: A Story of Michael Faraday? pages

17 to 19, in *Magnetism and Electricity: FOSS Science Stories*. The story provides a historical perspective that relates magnetism and electricity and gives information about an important figure. After reading the story have students turn to a partner and discuss what Faraday discovered.

*Identify main event from story that is heard. (S.3.5)

- Students work collaboratively with peers to find out how the number of winds of wire affects the strength of magnetism. Investigation #4: Current Attractions, Part 2: Changing the Number of Winds, *FOSS Magnetism and Electricity Teacher Guide,* pages 14 to 18. After collecting data for 20-wind, 30-wind, and 40-wind electromagnet, students graph their results. They predict the strength of magnetism based on the graph.

  *Employ words, phrases, and sentences in social interactions in everyday topics. (S.2.10)

  *Support a conclusion or finding by stating facts or logical reasons. (S.3.64)

- Students add the following vocabulary terms to their glossaries: **prediction/ predicción** and **graph/ gráfico**.

  *Identify words in English that are frequently used in the student's first language. (S.1.8)

  *Clarify meanings of words, using dictionaries, glossaries, and other resources. (S.1.24)

Explain:

- Read Aloud and discuss*:* How Electromagnets Stopped a War, 20 to 23, in *Magnetism and Electricity: FOSS Science Stories*. Ask students to write a paragraph about how the magician Robert-Houdin used an electromagnet to make a light weight wooden box impossible to move.

  *Identify and use words and phrases to make ideas clearer or more logical. (W.3.2)

Evaluate: (MCAS Released questions)

- The MCAS questions may be used as a pre/post test, to help students practice MCAS questions, to help students learn how to answer multiple choice questions and/or open-response questions.

  *Respond to factual and inferential questions that are based on academic content. (S.3.39)

  *After writing or dictating a composition, identify words and phrases that could be added to make the thought clearer (W.3.4)

Q. Steel cans are separated from aluminum cans in a recycling center. Which of the following is the **best** way the recycling center can separate the steel cans from the aluminum cans? (PS #8)

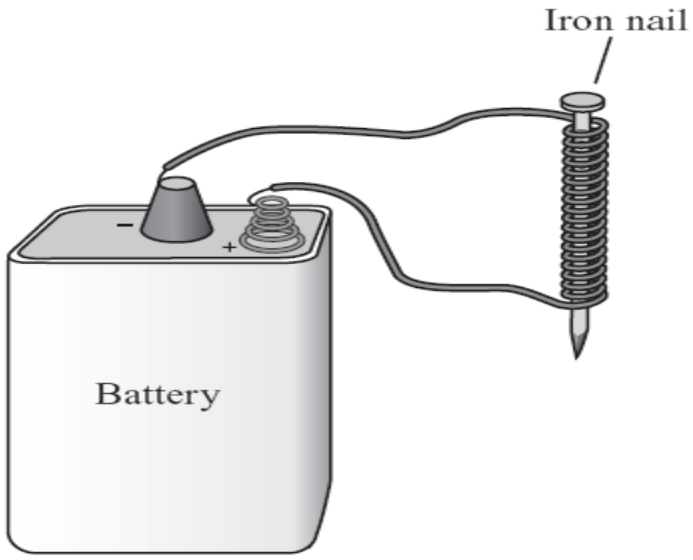
A. sort the cans by size

B. put the cans in water

C. cool the cans to a low temperature

D. put the cans under an electromagnet

Q. During a science investigation, a student made the device shown below. (PS #8)



This device can **best** be used as a

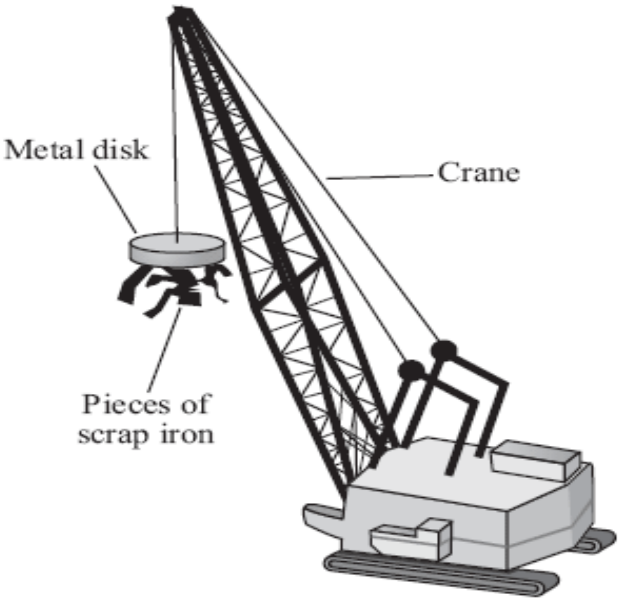
A. heater.

B. magnet.

C. light source.

D. simple radio.

Q. The diagram below shows pieces of scrap iron being picked up by a metal disk hanging from a crane. (PS #8)



The pieces of scrap iron are attracted to the metal disk. The metal disk is **most likely** functioning as which of the following?

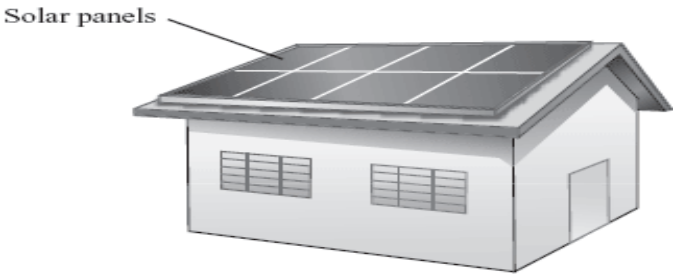
A. a battery

B. an engine

C. an insulator

D. an electromagnet

Q. A solar panel is used to collect energy from the Sun and change it into other forms of energy. The picture below shows some solar panels on the roof of a building. (PS #4)



Which form of energy is collected by the solar panels?

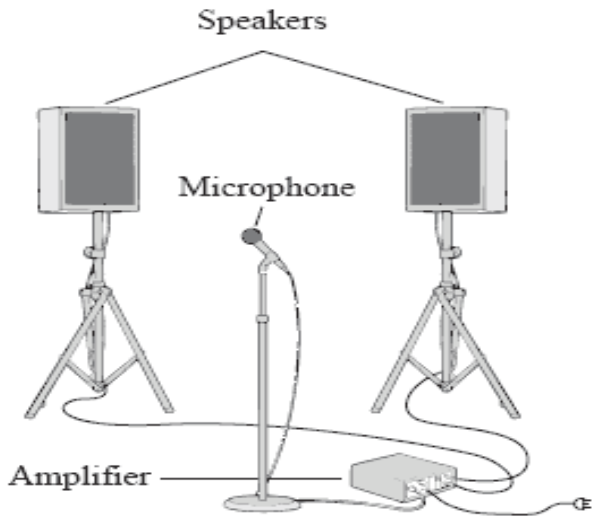
A. wind

B. sound

C. magnetic

D. light

Q. The public address system shown below uses a microphone, an amplifier, and speakers to make voices louder. (PS #4)



In this system, which of the following types of energy is used to make a person's voice louder?

A. electrical

B. heat

C. light

D. nuclear