Lesson Concept

Energy can be in different forms.

Link

Lesson 6.1 Forms of Energy is an introduction to the many forms of energy. All forms of energy can do work. Energy station materials are explored and discussed to introduce and clarify characteristics of each form of energy. This lesson links to the next Lesson 6.2 where energy is classified as either potential energy or kinetic energy.

Time

75 minutes

Materials

Whole class

Minute timer

Per Group (Divide class into 5 groups)

Station: Balloon

10 inflated balloons
Powdered gelatin
Small bits of paper
4 different types of fabric (i.e.: wool, silk, polyester, cotton, etc)

Station: Bouncing Ball

Meter Stick
Various types of bouncing balls of different size labeled with a letter
Scale to measure grams

Station: Reaction

Baking soda
Vinegar
Erlenmeyer flask
100 ml graduated cylinder
Several balloons
Spoon
Small funnel
Station: Wind-up Toys
Assortment of wind-up toys that have different actions/movements

Station: Magnets
Assortment of magnets
Small bits of paper
Several pennies
Several quarters
Several metal paper clips

Individual
H1 a,b,c,d,e,f Energy Survey Lab worksheet
H2 a,b Forms of Energy handout
Highlighter marking pen

Resources
Energy Survey Lab and Forms of Energy adapted from JASON Operation: Infinite Potential

Advance preparation
1. Duplicate handouts, H1 a,b,c,d,e,f (Energy Survey Lab) & H2 a,b (Forms of Energy Handout).
2. Set up materials for the 5 Energy Stations.

Procedure:
**Engage** *(25 minutes) and the concept for this section*
1. Ask students to think, pair, share what they know about energy. Chart responses on a KWL chart.
2. Ask students to talk to a partner about what they want to learn about energy? Chart ideas on the W part of the chart.
3. Distribute H2 a,b (Forms of Energy). Read and discuss energy forms by asking individual students to read aloud. Ask students to add any new ideas about forms of energy to the L part of the KWL chart.
4. Ask students to add any additional ideas to the W portion of the KWL chart. Explain to students that the investigation is finding out about different forms of energy placed at five stations in the classroom. Each station has a form of energy to observe and identify.
Explore (40 minutes) Energy can be many different forms but all can do work.

5. Distribute H1 a,b,c,d,e,f (Energy Survey Lab) and explain that each lab sheet is to be completed at one of five stations. Discuss the instructions and demonstrate the activity for each station.

6. Divide students into 5 groups and assign to a beginning station. Explain that students will work at each station for approximately 6 minutes then rotate. Each group will rotate to all 5 stations. A timer will be used to help plan time for each group.

7. Ask students to complete the station then work together to answer the questions for each station.

Explain (10 minutes) Forms of energy can be identified.

8. Debrief each lab station whole class by asking students the following questions: What form of energy was highlighted at each station? What is your reasoning for the choice for the form of energy? Does anyone have a different form of energy for the station shared?

9. Explain to students that worksheets can be revised based on consensus of the class or their group.

Extend (10 minutes) Forms of energy can be observed and identified by characteristics of the energy.

10. Ask students to review the last page of the handout H1f. Ask students to select one station and answer the following questions?

   a. What form of energy was demonstrated?
   b. How do you know?
   c. What helped you figure this out?

Evaluate (5 minutes) Energy includes things I am sure about and things I need to learn more about.

11. Ask students to review the KWL chart and add any additions.

12. Complete the following prompt in their notebook. What I know for sure about Energy? What I am still not sure of about energy?
ENERGY SURVEY LAB

Station: Balloon
Objective: To determine the forms of energy on a balloon.

Materials: inflated balloon, pieces of fabric, gelatin powder, paper scraps

Forms of Energy

Instructions:
1. Gently rub the surface of the balloon with one of the fabrics or your hair for about 1 minute. Place fabric to the side and place balloon near the paper scraps on your desk observe, then remove paper. Repeat with Gelatin (placed on scratch paper). Repeat trial with your hair.

Trial 1:
Fabric Type:  

Drawing-Paper  

Drawing - Gelatin

Observations:  

Observations:

Trial 2:
Hair:  

Drawing-Paper  

Drawing - Gelatin

Observations:  

Observations:

2. Hi-lite the forms of energy you observed at this station on the top of page.
3. Describe how you think the length of time you rub the balloon will affect the strength of its effects on the paper or gelatin.

4. Based on your observations, how do you think the type of material used to rub the balloon affects the strength of its effects on the paper or gelatin?

5. How do you think the length of time you rub the balloon will impact the distance at which it can affect the paper or gelatin?
Station: Bouncing Ball
Objective: To determine the forms of energy impacting a bouncing ball.

Materials: assortment of different balls, meter stick, balance

Forms of Energy

Instructions:
1. Select 3 balls and determine the mass of each ball in grams. Record data in table.
2. Hold the meter stick vertical on the floor so 0m is on the floor and 1m is at top of stick.
3. Hold 1st ball bottom even with top of the meter stick.
4. Drop each ball and note how high it bounces up after the 1st and 2nd bounces. Record.

<table>
<thead>
<tr>
<th>Ball</th>
<th>Mass (kg)</th>
<th>Drop Height (m)</th>
<th>Rebound Height First Bounce (m)</th>
<th>Rebound Height Second Bounce (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>1 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>1 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>1 m</td>
<td></td>
<td></td>
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</tbody>
</table>

5. Hi-lite the forms of energy you observed at this station on the top of page.

6. Based on your data, describe the changes you noticed between the 1st and 2nd bounce heights for each ball.
   A: ____________________________________________

   B: ____________________________________________

   C: ____________________________________________

7. Predict how the height of the 3rd bounce would compare to the 1st & 2nd bounces.

8. Explain why you think the 2nd bounce can never be higher than the 1st bounce.

9. What are some factors that might affect the height of the 1st bounce?

6.1 Energy in Earth Systems: Forms of Energy

*Science Matters*
Station: Reaction
Objective: To determine the forms of energy within a reaction.

Materials: baking soda, vinegar, graduated cylinder, balloon, spoon, bottle, safety goggles

Forms of Energy

Instructions:
1. Put on the goggles and pour 1 spoonful baking soda into the balloon by using the funnel.
2. Fill the bottle with 50 mL of vinegar (use graduated cylinder to measure)
3. Slip the balloon over the bottle opening.
4. Invert the balloon, so the baking soda mixes with the vinegar
5. Describe and draw the changes you see in the bottle and balloon.
   Balloon: [Drawings of balloon changes]
   Bottle: [Drawings of bottle changes]

6. Hi-lite the forms of energy you observed at this station on the top of page.

7. How can you determine the identity of the gas in the balloon?
**Station: Wind-up Toy**

**Objective:** To determine the forms of energy associated with a wind-up toy.

**Materials:** assortment of wind-up toys

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**Forms of Energy**

- Gravitational
- Elastic
- Chemical
- Nuclear
- Magnetic
- Electrostatic
- Mechanical
- Thermal
- Electrical
- Sound
- Electromagnetic

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**Instructions:**

1. Wind up each toy.

2. In the table, describe how each toy is wound, include direction of winding action and direction of motion of toy.

<table>
<thead>
<tr>
<th>Wind-up Toy</th>
<th>Description of Winding Action</th>
<th>Description of Resulting Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

3. Hi-lite the forms of energy you observed at this station on the top of page.

4. Describe any relationship you observed between the amount of winding and the strength of the resulting action for each toy.

5. List and describe some factors that could affect how much a wind-up toy moves after it is wound and released.

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6.1 Energy in Earth Systems: Forms of Energy

※SCIENCE MATTERS
Station: Magnets

Objective: To determine the forms of energy associated with magnets.

Materials: assortment of magnets, paper, penny, quarter, metal paperclip

Forms of Energy

Gravitational | Elastic | Chemical | Nuclear | Magnetic | Electrostatic | Mechanical | Thermal | Electrical | Sound | Electromagnetic

Instructions:

1. In the table, predict whether you think each material will be attracted to the magnet or not, then provide an explanation for your prediction. Test each one and document your observations.

<table>
<thead>
<tr>
<th>Material</th>
<th>Prediction</th>
<th>Explanation for Prediction</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penny</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal Paperclip</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Experiment with only the magnets by placing them together in different arrangements. Describe all your observations (you may use drawings to show your description).

3. Hi-lite the forms of energy you observed at this station on the top of page.

4. How did your predictions about each material compare with your observations? If different, explain why.

5. Based on your observations, explain how picking up a paperclip with a magnet is different than picking it up with a piece of tape.
LAB REVIEW:

Select one of the stations you just worked out and reflect on the energy forms present.

Station Name: ______________________

∞ What forms of energy were demonstrated?

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∞ How do you know?

∞ What helped you figure this out?
# Forms of Energy

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravitational</td>
<td>Energy that an object has due to its position in a gravitational field. Examples include an apple on a tree, a cyclist at the top of a hill, and a book on your desk.</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Energy of motion that is attributed to a specific object. Examples include waterfalls, a car moving down the street, and a ball flying through the air.</td>
</tr>
<tr>
<td>Elastic</td>
<td>Energy stored in the bending, stretching, or twisting of an object. Examples include a bent bow, wound spring, or stretched elastic.</td>
</tr>
<tr>
<td>Thermal</td>
<td>Total energy within a substance, measured in units of heat and temperature. Examples include ice melting and water boiling.</td>
</tr>
<tr>
<td>Chemical</td>
<td>Energy stored within the chemical bonds of a substance. Examples include the food we eat, gasoline, and a candle.</td>
</tr>
<tr>
<td>Electrical</td>
<td>Energy associated with the movement of charges. Examples include lightning and a lit light bulb.</td>
</tr>
</tbody>
</table>
6.1 Energy in Earth Systems

**Forms of Energy**

- **Nuclear**: Energy stored in subatomic matter. An example includes the uranium rods found in power plants.

- **Sound**: Energy that is transmitted through the compression of matter. Examples include hearing music from a radio and hearing thunder.

- **Magnetic**: Energy stored within magnetic fields that can be seen in the attraction or repulsion of objects. Examples include magnets on your refrigerator and the needle on a compass.

- **Electromagnetic**: Energy that travels in waves and can travel in a vacuum. Examples include visible light, a rainbow, and radio waves.

- **Elastic**: Energy that an object has due to its position in an electric field. Examples include clothes sticking together when they come out of the dryer or your hair sticking up after taking off a wool hat.