Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
**7th grade Science Semester Exam Study Guide**Forms of energy, energy transfer, sound, physical and chemical properties and reactions/changes, elements, periodic table

**Energy   
Vocabulary to know:**

Energy

Kinetic Energy

Potential Energy

Law of conservation of energy

Energy efficiency

Chemical Energy

Mechanical Energy

Nuclear Energy

Sound Energy

Electromagnetic Energy

Heat Energy

Electrical Energy

**Comprehension Questions**

1. Is chemical energy considered potential or kinetic? Why?
2. Why does a book sitting on a table have potential energy?
3. If an object has energy, then that object has the ability to cause \_\_\_\_\_\_\_\_\_\_\_\_.
4. What law states that the total amount of energy in the universe never changes (it is never created or destroyed)
5. Energy occurs in many ­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
6. What two **main** types of energy **relate** to motion?
7. State an example for an energy transfer that involves electrical energy being changed into thermal energy.
8. Give an example of chemical energy being converted to thermal energy.
9. Give an example of electrical energy being converted to mechanical energy.

**Complete the chart**

**Example Forms of Energy PRODUCED by each example**

**Windmill**

**Microwave**

**Firecracker**

**Bicycle**

**Battery**

**A band playing**

**Child running**

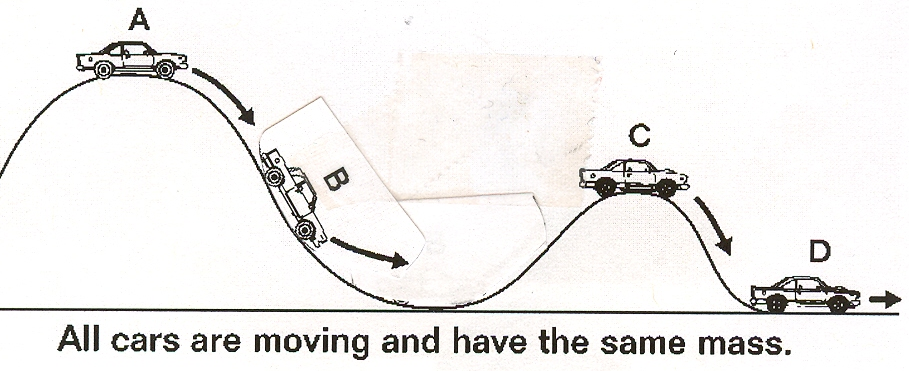
**Flashlight**

**Fire**

**Car moving**

**Sun**

**Use the figure below to answer questions 10-12.**

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1. What car has the GREATEST potential energy?
2. What car has the LEAST potential energy?
3. Which car has the GREATEST kinetic energy?

Sound   
**Vocabulary**  
Amplitude

Mechanical waves

Compression/longitudinal waves

Infrasonic

Intensity

Pitch

Ultrasonic

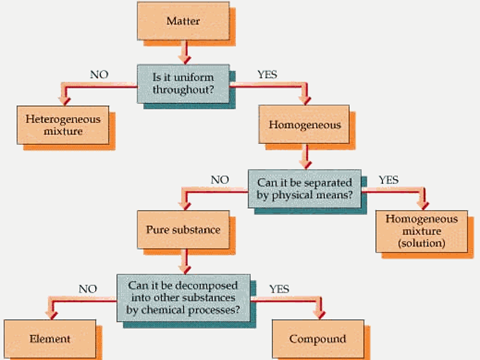
Oscilloscope

**Concept Questions**

1. What are the two factors that affect the speed of sound?
2. The speed of sound is affected by the material of the medium. Order the following from slowest to fastest: air, steel, water.
3. Is the speed of sound affected by the density of the material it travels through? How?
4. The more energy a wave has the greater its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ will be.
5. Draw a graph of a wave representing a sound that is low-pitched and soft.
6. Draw a graph of a wave representing a sound that is low-pitched and loud.
7. Draw a graph of a wave representing a sound that is high-pitched and soft.
8. What is the speed of sound in air? Water? Solid?
9. What unit is used to represent frequency?
10. What is the organ in the ear that contains many tiny hairs?

Mixtures, elements, compounds

* Ultimately, all matter can be classified as mixtures, elements and compounds.
* ­\_\_\_\_\_\_\_\_\_\_\_ – two or more substances that are not chemically combined with each other and can be separated by physical means. The substances in a mixture retain their individual properties.
* Solutions –
* \_\_\_\_\_\_\_\_\_\_\_\_ – simplest form of pure substance. They cannot be broken into anything else by physical or chemical means.
* Compounds –



**Is it uniform throughout?**

* If the answer is **no**, the matter is a ­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mixture.
  + Considered the “\_\_\_\_\_\_\_\_mixed.”
  + Does not appear to be the same throughout.
  + Particles are large enough to be seen and to be separated from the mixture.

**Examples** of heterogeneous mixtures: Sand and pebbles, Oil and water, Powdered iron and powdered sulfur

Is it uniform throughout?

* If the answer is **yes**, the matter is **homogeneous** (looks the same throughout).
  + That leads us to another question.

**Can it be separated by physical means?**

* If the answer is **yes**, the matter is a homogeneous mixture or solution.

**Homogeneous Mixtures**

* A mixture that appears to be the ­­­\_\_\_\_\_\_\_\_ throughout.
* It is “well mixed.”
* The particles that make up the mixture are very small and not easily recognizable.
* Milk, toothpaste, and mayonnaise are homogeneous mixtures. They are also colloids.
* In a \_\_\_\_\_\_\_\_\_ the particles are mixed together but not dissolved.
* The particles are relatively large and are kept permanently suspended.

**Solutions**

* A solution is a type of homogeneous mixture formed when one substance \_\_\_\_\_\_\_\_\_\_\_\_\_ in another.
* It is the best \_\_\_\_\_\_\_\_ of all mixtures.
* A solution always has a substance that is dissolved and a substance that does the dissolving.
* The substance that is dissolved is the \_\_\_\_\_\_\_\_\_\_\_ and the substance that does the dissolving is the \_\_\_\_\_\_\_\_\_.

**The universal solvent: Water**

**Water as a solvent:**

* Many liquid solutions contain water as the solvent.
* Ocean water is basically a water solution that contains many salts.
* Body fluids are also water solutions.
* Air is a solution of oxygen and other gases dissolved in nitrogen

**Can it be separated by physical means?**

* If the answer is **no**, the matter is a ­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + An element
  + Or a compound
* \_\_\_\_\_\_\_\_\_\_\_\_ are the simplest pure substance.
  + An element \_\_\_\_\_\_\_\_ be changed into a simpler substance by heating or any chemical process.
* The smallest particle of an element that has the properties of that element is called an \_\_\_\_\_\_\_\_\_.
  + An atom is the\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* There are more than one hundred known elements in the universe listed on the periodic table of elements.
  + These elements combine in such a way to create millions of compounds.
  + All elements are made of atoms.
  + Atoms of the same element are alike.
  + Atoms of different elements are different.
* **Compounds** are also pure substances.
* But \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are made from more than one \_\_\_\_\_\_\_\_\_\_\_\_\_.
* Water is a compound.
* Water can be broken down into simpler substances – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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| --- |
| **Physical and Chemical Properties** |

All substances have properties that we can use to identify them. For example we can identify a person by their face, their voice, height, finger prints, DNA etc. The more properties that we can identify, the better we know the person. In a similar way matter has properties - and there are many of them. There are two basic types of properties that we can associate with matter. These properties are called **Physical** properties and **Chemical**properties:

|  |  |
| --- | --- |
| **Physical properties:** | Properties that do not change the chemical nature of matter |
| **Chemical properties:** | Properties that do change the chemical nature of matter |

**Examples of physical properties are:**color, smell, freezing point, boiling point, melting point, infra-red spectrum, attraction (paramagnetic) or repulsion (diamagnetic) to magnets, opacity, viscosity and density. There are many more examples. Note that measuring each of these properties will not alter the basic nature of the substance.

**Examples of chemical properties are:** heat of combustion, reactivity with water, pH, and electromotive force.

The more properties we can identify for a substance, the better we know the nature of that substance. These properties can then help us model the substance and thus understand how this substance will behave under various conditions.

**Physical and Chemical Properties**

**Vocabulary**

**Physical Change:**

1. **Physical Properties:**
   1. **Density**: the mass per unit volume of a substance. You can think of it as the amount of stuff something has in the space that it takes up.
   2. **Thermal conductivity**:
   3. **Electrical conductivity**:
   4. **Ductility:**
   5. **Brittleness:**
   6. **Elasticity:**
   7. **State**:
   8. **Malleability**:
   9. **Solubility**:   
        
      This can be a confusing property. The way to think about it is this: if I dissolve sugar into water and then leave that sugar water in the sun until all the water evaporates, then I get sugar with the same properties at the end of the process.

**Chemical Change**:

1. **Chemical Property**:
   1. **Reactivity**:   
        
        
      Baking soda reacts with vinegar to make carbon dioxide but we can only see baking soda’s reactivity if we combine it with vinegar. Iron reacts with oxygen to form iron oxide (rust).
   2. **Flammability**:   
        
      I can only observe a match’s flammability by burning it.
   3. **Rusting**:

# Development of Atomic Theory: Part 2 (Rutherford to Modern Theory)

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|  |  |
| --- | --- |
| In **1909** a former student of Thomson’s, **Ernest Rutherford** decided to test the idea that electrons are evenly distributed throughout the atom. Draw a diagram that shows **Rutherford’s Gold Foil Experiment.** |  |
| What did Rutherford discover about the movement of the particles that he shot at the gold foil? | * Most of the particles \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * But surprisingly a few particles \_\_\_\_\_\_\_\_\_\_\_\_   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and some even \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Due to the results of his experiment **Rutherford revised the atomic theory in 1911**. **Complete the statements** **that describe Rutherford’s revised atomic theory.** | **Result**: *Most of the positively charged particles went straight through the gold foil.*  **Atomic Theory**: Most of the matter of the atom is found in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_part of the atom. This is called the \_\_\_\_\_\_\_\_\_\_\_ of the atom. It is very tiny and extremely \_\_\_\_\_\_\_\_\_\_.  **Result:** *Some of the positively charged particles*  *were deflected or even bounced back.*  **Atomic Theory:** Like charges repel so the nucleus must have a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. If electrons have a negative charge they could not be in a positively charged nucleus. Electrons must \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  **Result:** *The diameter of the nucleus is 100,000 times smaller than the diameter of the entire gold atom.*  **Atomic Theory:** Atoms are mostly \_\_\_\_\_\_\_\_\_\_\_\_\_\_ with a tiny, massive \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. |
| Explain why the head of a pin compared to the diameter of a stadium is like an atom? |  |
| In **1913, Niels Bohr** studied the way that atoms react to light.   * What did he learnabout **electron movement?** * **Can they change paths?** |  |
| **The Modern Theory** of the atom states that electrons do not travel in specific paths or orbits.   * **Describe the region where electrons travel.** * **Can we predict where an electron may be found?** |  |
| Electron clouds exist at a certain **Energy Level**. Therefore **the energy that an electron has is based on what?** |  |
| Explain how the **bookshelves** can help you understand the **movement of electrons in an atom**. |  |
| Atoms are very small.   * How many atoms could fit inside a penny? |  |
| We still are not able to see an actual picture of an atom but what can a **scanning tunneling electron microscope** show us? |  |

Elements, periodic table notes that you get this week will also need to be studied.