Building Blocks of Matter

Grade Level: 4th Grade Science
Written by: Deborah Kay Willett, Elbert County Charter School, Elizabeth, CO
Length of Unit: Three lessons, one hour each

I. ABSTRACT

This is a Science unit on the basic terms and concepts of chemistry. The unit will provide the students with experiences in concepts in the Fourth Grade *Core Knowledge Sequence* about atoms and elements. Students will learn about these terms and concepts in a variety of ways through literature, games, conducting experiments, and constructing models to demonstrate their learning. Upon completion of this unit the students will understand the basic skills of chemistry and see the connection between the concepts taught and the physical world.

II. OVERVIEW

A. Concept Objectives
1. The students will know and understand composition and common properties of matter.
2. The students will understand the process of scientific investigation and model design.

B. Content from the *Core Knowledge Sequence*
1. All matter is made up of particles too small for the eye to see, called atoms. (page l04)
2. Scientists have developed models of atoms; while these models have changed over time as scientists make new discoveries, the models help us imagine what we cannot see. (page 104)
3. Atoms are made up of even tinier particles: protons, neutrons, and electrons.
4. (page 104)
5. The concept of electrical charge: Positive charge (+): proton, Negative charge (-): electron, Neutral (neither positive nor negative): neutron. “Unlike charges attract, like charges repel” (relate to magnetic attraction and repulsion) (page 104)

C. Skill Objectives
1. The students will recall vocabulary and increase their vocabulary knowledge.
2. The students will be able to identify parts and functions of an atom.
3. The students will understand that everything is made up of matter.
4. The students will label particles of an atom and their charges.
5. The students will identify effects of charged particles.
6. The students will understand similarities and differences in the properties of matter.
7. The students will describe and explain properties and composition of samples of matter by using a periodic table.
8. The students will develop simple models to explain observed properties of matter.
9. The students will draw conclusions from scientific experiences.
10. The students will be able to follow a set of simple instructions.

III. BACKGROUND KNOWLEDGE

A. For Teachers
1. *Atoms and Molecules*, by Phil Roxbee Cox and Max Parsonage
2. *Science Encyclopedia*, by Parr Dempsey
3. *What’s Smaller Than A Pygmy Shrew?*, by Robert E. Wells

B. For Students
   1. Basic concepts of atoms (review from grade 1)

IV. RESOURCES

A. *What's Smaller Than A Pygmy Shrew?*, by Robert E. Wells
B. Bill Nye the Science Guy, *Atoms*, Newtown, PA: Disney Educational Productions, ISBN#0-89625-692-8
C. Large atom posters (found at any teacher supply store)
D. Large poster of the Periodic Table of the Elements (found at any teacher supply store or students have a copy of it in their student planners)
E. Bingo cards: (Teacher made or readymade available for $39.95 plus $2.00 shipping at http://wiscocomputing.com/wordpwr.htm)

V. LESSONS

Lesson One: Atoms

A. *Daily Objectives*
   1. Concept Objective(s)
      a. The students will know and understand the basic composition and common properties in matter.
   2. Lesson Content
      a. All matter is made up of particles too small for the eye to see, called atoms.
      b. Atoms are made up of even tinier particles: protons, neutrons, and electrons.
   3. Skill Objective(s)
      a. The students will understand that everything is made up of matter.
      b. The students will be able to identify the parts of an atom.
      c. The Students will recall vocabulary and increase their vocabulary knowledge.

B. *Materials*
   1. Wells, Robert E. *What's Smaller Than A Pygmy Shrew?*
   2. Large atom posters (found at any teacher supply store)
   3. Teacher Background Knowledge on atoms (Appendix A)
   4. Overhead Projector
   5. Transparency of Key Vocabulary with definitions (Appendix B)
   6. Student handout to write vocabulary on (Appendix C), one copy for each student
   7. Pencils
   8. One ½" x 2" Post It Note (one for each student)
   9. Scissors

C. *Key Vocabulary*
   1. Pygmy Shrew: a Pygmy Shrew is an animal so small it can weigh as little as a U.S. penny and are three inches log; it eats mostly insects and worms; they live in fields, woodlands, gardens, and marshes in both the Eastern and Western hemispheres, including many areas of North America
   2. Matter: matter is what all materials consist of, and matter is anything that takes up space and has weight
   3. Atoms: Greek word meaning "uncutable," atoms are the smallest part of any element that still has the properties of that element; they are composed of three main subatomic particles: protons, neutrons, and electrons
   4. Protons: protons are particles located in the nucleus of an atom
   5. Neutrons: neutrons are particles located in the nucleus of an atom

6. Nucleus: the nucleus of an atom is the center that contains the protons and the neutrons tightly packed together
7. Electrons: electrons are particles moving around the nucleus of an atom at nearly the speed of light; they are 1/1840 the mass of protons and neutrons

D. *Procedures/Activities*

1. Gather students together on the floor in front of the board.
2. Introduce the book, *What's Smaller Than a Pygmy Shrew?* by Robert E. Wells.
3. Read the title and show the illustration.
4. Have students predict what the story is about or even predict the answer to the title.
5. Read the story. When you come to the pages that introduce cells, paramecia, amoebas, and bacteria tell the students they will be learning about that in 5^{th} grade. Skip reading the pages about the quarks. Just show the pictures of the protons and the neutrons.
6. After reading the story have students discuss what they have learned about atoms from the book. Record response on the board or chart paper. (Optional)
7. Introduce large atoms poster and point out all parts of the atom that were discussed in the book. (Appendix A)
8. Have students return to their desk.
9. Pass out the one Post It Note to each student. Have them get out their scissors. Have the students cut the rectangle in half, then in half again and again, and again down to the smallest piece possible. When they are finished, explain that the Greeks called that smallest piece an atom, meaning "can't be divided."
10. Hand out student vocabulary worksheet. Explain that we will be completing this together for the next two days. (Appendix C)
11. Place transparency on overhead (Appendix B). Label the atom together. Have the definitions covered. Discuss each vocabulary word together first then reveal the definition and have the students copy it down. Repeat this format for the rest of the vocabulary.
12. Have students put the vocabulary worksheet in their science folders.

E. *Assessment/Evaluation*

1. Participation in class discussions will allow the teacher to assess students' understanding.
2. Students will orally recall the parts of an atom correctly.
3. Teacher will monitor as students label individual atom models and complete vocabulary worksheet terms for the lesson.

Lesson Two: Electrical Charge

A. *Daily Objectives*

1. Concept Objective(s)
   a. The students will know and understand composition and common properties of matter
   b. The students will understand the process of scientific investigation and model design.
2. Lesson Content
   a. The concept of electrical charge: Positive charge (+) proton, Negative charge (-): electron, Neutral (neither positive nor negative): neutron.
   b. Unlike charges attract, like charges repel (relate to magnetic attraction and repulsion)
3. Skill Objective(s)
   a. The students will recall vocabulary and increase vocabulary knowledge.

b. The student will make observation and gather data on the charges of an atom through experiments.
c. The student will draw conclusions from scientific experiences
d. The students will label the particles of an atom an their charges.
e. The students will identify effects of charged particles.

B. *Materials*

1. Students vocabulary worksheet (Appendix C)
2. Pencil
3. Transparency of key vocabulary with definitions (Appendix B)
4. Overhead markers
5. Large atom poster
6. Balloons (blown up) or plastic combs for each student
7. Wool materials (such as a hat, scarf, or sweater)
8. Mirror (Full length)
9. Teachers background knowledge on the electrical charge of an atom (Appendix D)
10. Charge It experiment worksheet (Appendix E)
11. (Optional Activity) AIMS file folder game Balance you Charge Account (found on pages 14-17 in *Electrical Connections:* AIMS Activities for Grades 4-9, Fresno: California, AIMS Educational Foundation, 1991 ISBN # 1-881431-28-2)

C. *Key Vocabulary*

1. Matter: matter is the word Scientists use for "stuff," everything you can see and even things you can't see like air are matter
2. Atom: Greek word meaning "can't be divided," atoms are the smallest part of any element; they are composed of three particles: protons, neutrons, and electrons
3. Protons: protons are particles located in the nucleus of an atom with a positive charge (+)
4. Neutrons: neutrons are particles located in the nucleus of an atom with no charge (neutral)
5. Nucleus: the nucleus of an atom is the center that contains the protons and neutrons tightly packed together
6. Electrons: electrons are particles moving around the nucleus of an atom at nearly the speed of light with a negative charge(-); they are the smallest pieces of matter
7. Shells: shells are layers that surround the nucleus where the electrons orbit; shells have rules to operate by; the innermost shell near the nucleus can only have two electrons; the second shell can only have eight; all other shells beyond this can hold more electrons, except for the outermost shell, which never has more than eight electrons
8. Orbit: to orbit something means to go around it; the earth orbits the sun and the moon orbits the earth
9. Attraction: attraction exists between oppositely charged particles; attraction pulls objects together
10. Repulsion: repulsion exists between particles of the same charge; repulsion pushes objects apart (repel)
11. Charge: charge is not something you can see, weigh, or define; however, you can observe the effects of charge

D. *Procedures/Activities*

1. Have students get their vocabulary worksheets from their science folders.
2. Review yesterday's vocabulary terms.

3. Explain that today we are going to take a closer look at the protons, electrons, and neutrons and how they react with each other.
4. Display large atom poster on the board.
5. Introduce charge. See Appendix D for detailed explanation of how charges work.
6. Follow the same format for vocabulary worksheet as Lesson One.
7. Pass out Charge It worksheet. (Appendix E) Have students complete the top part independently. When finished put students into groups of two and have them work together to complete the experiment.
8. Discuss as a class the results from the experiment.
9. Have students turn in the Charge It experiment worksheet.
10. Play file folder game Balance Your Charge Account (optional activity). The rules and materials needed are located in each file folder.

E. *Assessment/Evaluation*

1. Teacher will monitor as students label individual atoms for charges and complete vocabulary worksheet terms for the lesson.
2. Teacher will observe student attention and responses during the experiments.
3. In class experiment worksheet (Appendix E) will be graded by teacher and recorded for completeness and accuracy.

Lesson Three: Scientific Models

A. *Daily Objectives*

1. Concept Objective(s)
   a. The Students will know and understand composition and common properties of matter.
   b. The students will understand the process of scientific investigation and model design.
2. Lesson Content
   a. Scientists have developed models of atoms; while these models have changed over time as scientists make new discoveries, the models help us imagine what we cannot see.
3. Skill Objective(s)
   a. The students will recall vocabulary and increase vocabulary knowledge
   b. Students will understand similarities and differences in the properties of matter.
   c. The students will describe and explain properties and composition of samples of matter by using a periodic table.
   d. The students will be able to follow a set of simple instructions.
   e. The students will develop simple models to explain observed properties of matter.

B. *Materials*

1. History of scientist's models of the atom (Appendix F)
2. Paper plate (one per student)
3. Two bags of miniature marshmallows, 10 each of three different colors per student
4. Glue
5. Markers
6. Scissors
7. Plastic baggies
8. 3" x 5" index cards (one per student)
9. Periodic Table of the Elements (poster or found in student planners)

C. *Key Vocabulary*

1. Atom: Greek work meaning "uncutable," atoms are the smallest part of any element; they are composed of three particles: protons, neutrons, and electrons
2. Protons: protons are particles located in the nucleus of an atom with a positive charge (+)
3. Neutrons: neutrons are particles located in the nucleus of an atom with no charge (neutral)
4. Nucleus: the nucleus of an atom is the center that contains the protons and neutrons tightly packed together
5. Electrons: electrons are particles moving around the nucleus of an atom at nearly the sped of light with a negative charge(-); they are the much smaller than the protons and neutrons
6. Shells: shells are the layers that surround the nucleus where the electrons orbit
7. Electrical Cloud: an electrical cloud is another word for shells were the electrons move in irregular obits
8. Orbit: to orbit something means to go around it
9. Attraction: attraction exists between oppositely charge particles; attraction pulls objects together
10. Repulsion: repulsion exists between particles of the same charge; repulsion pushes objects apart (repel)
11. Charge: charge is not something you can see, weigh, or define; however, you can observe the effects of charge
12. Atomic number: atomic number is the number of protons in the nucleus of an atom
13. Element: an element is matter made of just one kind of atom
14. Models: models are drawing or objects that are created to help us understand difficult concepts
15. Greek philosophers: the Greek philosophers had the earliest theory about the atomos "uncuttable" dating back to about 400 years BC; they believed that these particles had different shapes and sizes
16. John Dalton: John Dalton was the first to introduce the term atom with his theory in 1807
17. Joseph John Thompson: J. J. Thompson a British scientist was the first to make a model of the atom in 1904 (Draw model from teacher's background knowledge)
18. Ernest Rutherford: Ernest Rutherford a New Zealand-born physicist created another model to show his theory in 1911 (Draw model)
19. Niels Bohr: Niels Bohr a Danish physicist improved on Thomson's model in 1913 (Draw model)
20. Electron Cloud Model: the cloud model is a more up-to-date model of an atom (Draw model)

D. *Procedures/Activities*

1. Bags of miniature marshmallows should be opened to allow marshmallows to harden for at least a day (optional).
2. Plastic bags with the marshmallows should be made up ahead of time for each student.
3. Introduce and discuss the scientists involved with the atom and their models (Appendix F).
4. Have students pull out their vocabulary worksheet and complete the new vocabulary terms learned. (Appendix C)
5. Draw a hydrogen, helium, and carbon atom on the board. (Appendix F)

6. Discuss how each atom has an atomic number that determines what kind of atom it will be. The number of protons present determines this. For example, helium has an atomic number of 2. It has two protons, two electrons, and usually two neutrons. Have the students determine the atomic numbers of hydrogen and carbon.
7. Display a poster of the Periodic Table of the Elements; also have the students open up the student planners to their copy of the Periodic Table. Locate the three elements introduce in Procedure #4. Point out how each box shows the element's name, atomic number, symbol, and weight.
8. Ask students how we could make a model of an atom. Take at least five suggestions.
9. Explain that today we will be making three models of atoms using paper plates and marshmallows.
10. Pass out the marshmallows, paper plates, and 3" x 5" index cards.
11. Have students make a key for their atom models on the 3" x 5" index card. For example, pink = protons (+), green = neutrons, orange = electrons (-). Then, have them glue a marshmallows next to the written word of the color.
12. Demonstrate how to make a helium atom. Have students complete each step as you finish. First, glue two protons and two neutrons together in the center of the atom to form the nucleus. Draw a circle around the nucleus to represent the shell. Have students trace the circle of the paper plate. Since the electron is much smaller than a proton or a neutron have the students cut their electron marshmallow into fourths. Now, glue two electrons pieces somewhere on the drawn circle.
13. Have students independently construct the hydrogen and carbon atoms. Point out to the students that the carbon atom will need two circles (shells).
14. With a marker have students label the electrons and the protons with (-) and (+) signs on each model.
15. Have students clean up their areas and leave models on their desks to dry. At this time they may eat any left over marshmallows.
16. Discuss that these marshmallow models are only like real atoms because they show the nucleus made of protons and neutrons, and they show the electrons orbiting the nucleus in shells. Explain that models are used to help us understand difficult concepts.
17. Discussion or written questions to follow experiment (Appendix F).

E. *Assessment/Evaluation*
1. Teacher will evaluate students learning through verbal responses during class discussions.
2. The students will demonstrate their understanding of an atom by creating a Bohr model of an atom by using a paper plate and marshmallows.

VI. CULMINATING ACTIVITY (two days)

A. This activity is to act as a review. Show students the Bill Nye the Science Guy video, *Atoms*. Running time: 26 minutes. It reviews Lessons One-Three and introduces Properties of Matter and Solutions that will need to be covered to complete the chemistry content. When students have finished viewing the video ask the Nifty Questions In This Episode located on the back of the case.

B. This activity is to act as a review. Play Atom Bingo. Have students fill in their bingo cards with terms and vocabulary words (Appendix G). Have students cross out each term or vocabulary word as they place them. Then ask the review questions in Appendix H.

Have students cover the correct term or vocabulary answer with a bingo chip. Prizes are optional.

C. This activity is an Assessment/Evaluation. Give students a quiz on Atoms (Appendix I).

VII. HANDOUTS/WORKSHEETS

A. Appendix A – Teacher background knowledge on Atoms
B. Appendix B – Teacher vocabulary key of definitions
C. Appendix C – Student vocabulary worksheet
D. Appendix D – Teacher background knowledge on electrical charge of an atom
E. Appendix E – Student Charge It experiment worksheet
F. Appendix F – Teacher background knowledge of scientist's models of the atom
G. Appendix G – Student Atom Bingo Card
H. Appendix H – Teacher review question to go with Atom Bingo Game
I. Appendix I – Atom Quiz

VIII. BIBLIOGRAPHY

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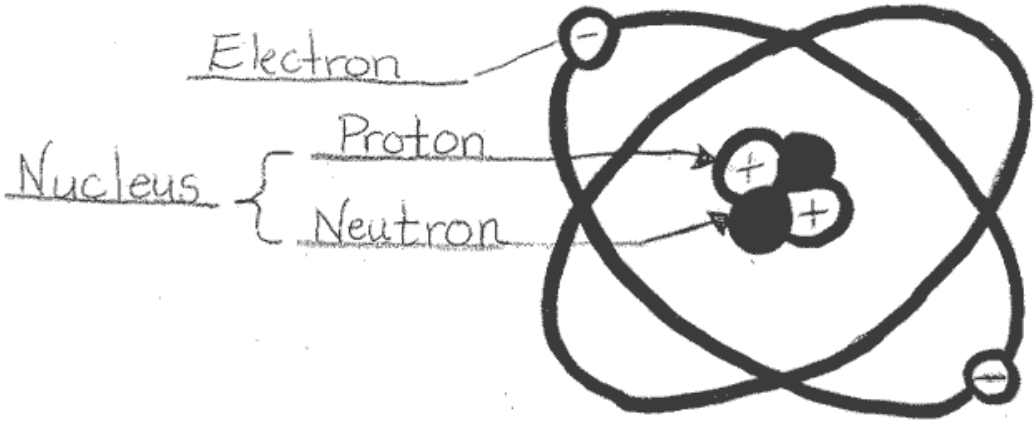
Appendix A-Building Blocks of Matter

Teacher background knowledge of an atom

The Atom, Building Block of Nature



- All matter is made up of very tiny particles.
- These particles are called Atoms. The building blocks of all matter.
- Atoms are found in everything.
- The Greek word for atoms mean "uncutable"
- Atoms are tiny and filled with empty space.
- All atoms are about the same size
- They are too small to be seen even with the most powerful microscope.
- Atoms are composed of three different subatomic particles: protons, neutrons, and electrons.
- Protons and neutrons are located in the center of an atom packed tightly together in the nucleus. Most of an atom mass is found in the nucleus.
  Protons have a positive electrical charge
  Neutrons have neither a positive nor a negative electrical charge, they are neutral.
- Electrons have a negative electrical charge.
  Electrons are much smaller than protons and neutrons.
  Electrons are always moving very quickly around the nucleus of an atom.
  Electrons move in definite areas around the atom called shells, or electrical clouds
  Each energy level can only hold a certain number of electrons.
- Atoms have the same number or protons and electrons making the atom neutral charged.
- The number of protons determines an atomic number of an atom.

Appendix B, page 1-Building Blocks of Matter

Building Blocks of Matter Vocabulary Key

Label the parts of an atom.

Word Box	
nucleus	neutron
proton	electron

1. Matter:
   Matter is anything that has mass and takes up space and is made up of atoms.

2. Atoms:
   Atom is a Greek word meaning "uncutable". Atoms are the smallest part of any element. They are made up of three particles: protons, neutrons, and electrons

3. Protons:
   Protons are particles located in the nucleus of an atom. Protons have a positive charge (+).

4. Neutrons:
   Neutrons are particles located in the nucleus of an atom. Neutrons have no charge they are neutral.

5. Nucleus:
   The nucleus of an atom is the center that contains the protons and neutrons tightly packed together.

6. Electrons:
   Electrons are particles moving around the nucleus of an atom at nearly the speed of light. Electrons have a negative charge(-). They are the smallest pieces of matter.

7. Shells:
   Shells are layers that surround the nucleus where the electrons orbit.

8. Orbit:
   To orbit something means to go around it.

9. Charge:
   Charge is a quality that gives an atom electric and magnetic forces. You can't see it, but you can observe the effects of it.

Appendix B, page 2-Building Blocks of Matter

10. Attraction:
    Attraction exists between oppositely charge particles. Attraction pulls objects together.

11. Repulsion:
    Repulsion exists between particles of the same charge. Repulsion pushes objects apart. (Repel)

12. Element:
    An element is matter made of just one kind of atom.

13. Periodic table of Elements:
    The Periodic Table of Elements is a chart that was created to organize all the elements in a way that made sense to people all over the world.

14. Atomic number:
    Atomic number of an atom is determined by the number of protons in that atom. The atomic number is how elements are listed on the Periodic Table of Elements.

15. Models:
    Models are drawings or objects that scientist create to help us understand difficult concepts.

16. Greek philosophers:
    Earliest records of atomism trace back to the ancient Greeks as long ago as 400BC.

17. John Dalton:
    British chemist, first to introduce the term "atom".

18. Joseph John Thompson:
    British scientist, Developed the first model of the atom in 1904.

19. Ernest Rutherford:
    British scientist, in 1911 he altered the model of an atom.

20. Niels Bohr:
    Danish Scientist in 1913 refined the model of the atom by showing that the electrons travel around the nucleus in a specific orbit.

21. Electron Cloud Model:
    Model used by scientist today. It was developed in 1928.

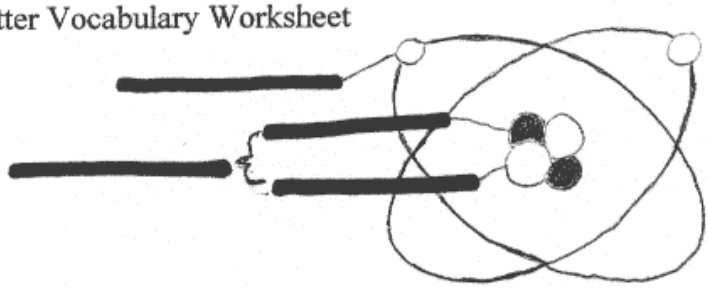
Appendix C, page 1-Building Blocks of Matter

Name:

Date:

Building Blocks of Matter Vocabulary Worksheet

Label the parts of an atom.



Word Box	
nucleus	neutron
proton	electron

1. Matter:

2. Atoms:

3. Protons:

4. Neutrons:

5. Nucleus:

6. Electrons:

7. Shells:

8. Orbit:

9. Charge:

Appendix C, page 2-Building Blocks of Matter

10. Attraction:

11. Repulsion:

12. Element:

13. Periodic table of Elements:

14. Atomic number:

15. Models:

16. Greek philosophers:

17. John Dalton:

18. Joseph John Thompson:

19. Ernest Rutherford:

20. Niels Bohr:

21. Electron Cloud Model:

Appendix D-Building Blocks of Matter

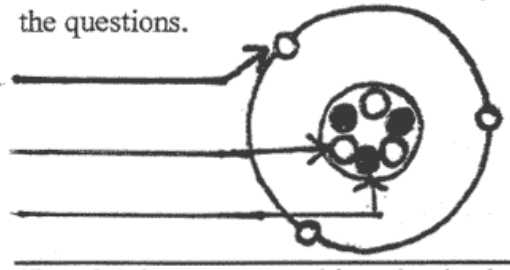
Teacher background knowledge on electrical charge of an atom.

- Atoms are held together by electricity. (Charge)
- Charge is a quality that gives an atom electric and magnetic forces.
- Charge is not something you can see, weigh, or define, however, you can observe the effects of charge.
- Protons and electrons have charge.
- Protons have a positive charge (+)
- Electron have a negative charge (-)
- Neutrons have no charge (o) they are neutral
- Positive and negative charges are opposite to each other. Particles with opposite charges are attracted to each other like a magnet, they move toward one another.
- This makes subatomic particles stay together in an atom.
- Like or same charges repel or move away from each other.
- Protons and electrons have the same amount of charge even though there is a size difference between them.
- Atoms that have the same number of protons and electrons are electrically neutral.
- Most objects have a balanced charge.
- It an atom does not have equal electrons than protons they are no longer neutral they are called ions.
- An atom that has more electrons than protons is called a negative ion.
- An atom that has more protons than electrons is called a positive ion.
- Objects can gain and lose electrons through friction (rubbing things together)
- Static electricity is an example of charges gathering together on an object

Appendix E, page 1-Building Blocks of Matter

Charge It! Experiment Worksheet

Label the atom.
Write the correct name on each blank, fill in the charge signs for the particles and answer the questions.



How many electrons does this atom have? _____

How many neutrons? _____

How many protons? _____

How do charges react with each other?
Draw arrows from the charges to show it the charges are attracting or repelling each other.

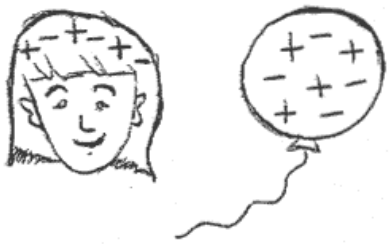
Explain why.
Opposite charges _____. Same charges _____.

EXPERIMENT: I'm stuck on you!

Have you ever static electricity in your hair? If not, today your chance. Static electricity occurs when objects become unbalanced electrically. Some materials easily lose or gain electrons, causing them to switch to positive or negative charged objects. In this experiment, you will be making charges move from a balloon to your hair.

Materials Needed:

- A balloon
- wool clothing
- mirror



Procedure:

1. First, take the balloon and rub it on you hair. You have just charged you balloon. By rubbing two things together objects become charged. (friction)

Appendix E, page 2-Building Blocks of Matter

2. Take the balloon away from you hair. Look in the mirror. What happened to your hair?

3. Bring the charged balloon back near you hair without touching it. What happens? Why?

4. Charge the balloon again and this time bring it near a wall. What happens? Why?

5. Now take the wool clothing and charge in on your hair. What happened to your hair Is it the same or different as when you rubbed the balloon against your Hair?

What Happened?

Most objects normally have about the same number of electrons and protons, making them electrically balance. When the balloon was rubbed on your hair it gained electrons from you hair and became negatively charged. Your hair became positively charged. Your hair stuck strait up because like charges repel. Your hair followed the balloon because opposites attract.

Experiments adapted from *What's the Matter*

Appendix F-Building Blocks of Matter

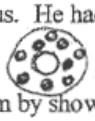
Teachers background knowledge of scientist's models of the atom.

Earliest records trace back to the ancient Greeks at long ago as 400BC. Two philosophers were developing ideas of atomism they were Leucippus and his student Democritus. They believed that everything was made of a few small parts. Another Greek philosopher named Democritus also believed that all matter was made of the same kind of substance only it differed in size and shape.

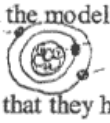
Dalton's Theory John Dalton, a British chemist, was the first to introduce the term 'atom'. He used many experiments as a basis for his Atomic Theory. His main ideas were: * All matter is made up of tiny particles called atoms. * Atoms cannot be made, destroyed or divided. * Atoms of the same element are exactly alike. * Chemical reactions are the result of atoms rearranging themselves. * Atoms can join together to form larger particles in compounds.

Joseph John Thompson J. J. Thompson another British scientist in 1897 discovered that atoms did indeed, have smaller parts and that atoms contained electrons. He developed the first model of the atom in 1904. According o his model the atom was a sphere of positive matter that held electrons in it, like a watermelon holds its seeds.

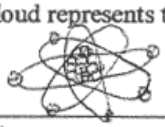
Ernest Rutherford Ernest Rutherford was a student of Thompson. In 1911 he altered that model of the atom to show negatively charged electrons circling a positively charged nucleus. He had discovered that the atom had a nucleus and that it contained most of the mass of the atom.



Niels Bohr Niels Bohr a Danish scientist in 1913 refined the model of the atom by showing that the electrons travel around the nucleus in a specific orbit.

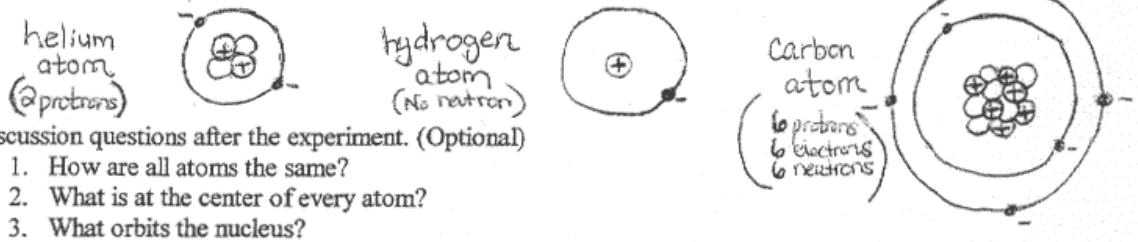


Electron Cloud Model By 1928 the scientist believed that they had the correct description and the cloud model was developed. The cloud represents the space that electrons are most likely to be found. The scientist uses this model today.



Scientific Models Experiment

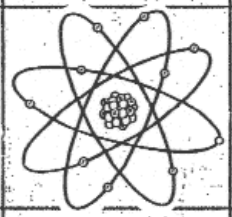
Draw these atoms on the board for the students to model.



Discussion questions after the experiment. (Optional)

1. How are all atoms the same?
2. What is at the center of every atom?
3. What orbits the nucleus?
4. How is the nucleus of the hydrogen atom different from the nucleus of the helium atom?
5. How is the carbon atom different from the helium atom?

The experiment was adapted from *AIMS*

B	I	N	G	O
				

Write one term in each box.
Cross out the term when finished.

1. Matter
2. Atoms
3. Protons
4. Neutrons
5. Nucleus
6. Electrons
7. Positive (+)
8. Negative (-)
9. Neutral
10. Shells
11. Orbit
12. Attract
13. Repel
14. Charge
15. Atomic Number
16. Element
17. Models
18. Greek Philosophers
19. John Dalton
20. Niels Bohr
21. Electron Cloud Model
22. Empty Space
23. Uncutable
24. Periodic Table

Appendix H, page 1-Building Blocks of Matter

Atom Review Bingo Question

1. Anything that has mass and takes up space and is made up of atoms is?
2. What is so tiny that it can't be seen even with the most powerful microscope?
3. Particles located in the nucleus of an atom with a positive charge are?
4. Particles located in the nucleus of an atom with no charge are?
5. The center of an atom that contains the protons and neutrons tightly packed together is called?
6. Particles moving around the nucleus of an atom at nearly the speed of ligh with a negative charge are?
7. Protons have what kind of charge (-), (+) or neutral?
8. Electrons have what kind of charge (-), (+) or neutral?
9. Neutrons have what kind of charge (-), (+) or neutral?
10. Layers that surround the nucleus where the electrons orbit are?
11. To go around something is to _____it.
12. Opposite charges _____ each other.
13. Like charges _____each other.
14. Something that you can't see, but you can observe the effects of?

Appendix H, page 2-Building Blocks of Matter

15. The number of protons in the nucleus of an atom determines the?

16. Something that is made up of just one kind of atom?

17. Drawing or objects that scientist create to help us understand difficult concepts are?

18. First people to study the atom as long ago as 400B.C. they thought the atom was made of a few small parts were the ?

19. In 1803 a British chemist did many experiments and found out that each different kind of element was made up of a different kind of atom. He also stated that each atom in an element was exactly the same as the other atom. Who was this Scientist?

20. A Danish scientist who in 1913 introduced his idea that the electrons traveled around the nucleus in fixed orbits was?

21. Today we use what model to explain the structure of an atom?

22. Atoms are the building blocks of all matter and are fill with what?

23. The Greek word for an atom means what?

24. Chart used to name and classify elements by their properties is called?

1. Matter
2. Atoms
3. Protons
4. Neutrons
5. Nucleus
6. Electrons
7. Positive (+)
8. Negative (-)
9. Neutral
10. Shells
11. Orbit
12. Attract
13. Repel
14. Charge
15. Atomic Number
16. Element
17. Models
18. Greek Philosophers
19. John Dalton
20. Niels Bohr
21. Electron Cloud Model
22. Empty Space
23. Uncutable
24. Periodic Table

Appendix I-Building Blocks of Matter

Name: _____

Date: _____

Building Blocks of Matter Quiz

Fill in the blanks with the correct term(s)

1. All matter is made up of _____.
2. The Greek word for atom means _____.
3. List the three particles of an atom and their charge:

   _____( ), _____( ), _____( ).
4. Opposite charges _____ each other.
5. Like charges _____ each other.
6. Electrons obit around the nucleus on _____. Many scientists now call this an _____.
7. The center of an atom that contains the protons and neutrons tightly packed together is called the _____.
8. The chart that was created to organize all the elements in a way that made sense to people all over the world is called the _____.
9. Scientists build or create _____ to show us how difficult concepts work.
10. A _____is a quality that gives an atom electric and magnetic forces. You can't see it, but you can observe the effects of it.