

Periodic Table

Fifth Grade

Activity: 1

Time: 1 Class Period

General Description

The teacher will introduce the Periodic Table to the students. In fifth grade, students need to know only the very basics of the Periodic Table in order to understand what an atom and an element is.

Objectives

Students will identify the basic structure of the Periodic table.

Students will identify specific elements using the Periodic Table.

Arizona State Standards

SC05 S5C1 PO1 Identify that matter is made of smaller units called:

- molecules (e.g., H₂O, CO₂)
- atoms (e.g., H, N, Na)

Teacher Information

The Periodic Table is divided several different ways. The first division is dividing the elements into rows and columns, formally referred to as Periods and Groups. Another division is to divide the elements into three main groups. The three groups are metals, non-metals, and metalloids. The table is also divided into those elements that are radioactive and those that are not.

Materials

Teacher notes - Activity Card 5-1a

Periodic Table of Elements - Activity Card 5-1b

Colored printer paper

Research sources

Internet sites

Poster paper

Procedures/Exploration

1. Divide the class into groups and assign each team a column (Group) of elements to investigate. Students will look for common properties and how those elements behave in their column (Group.)
2. Have the students share what they learned about their column (Group) of elements. Ask them what pattern they discovered.
3. Explain to the students that the columns are formally called Groups in the Periodic and they all have similar properties and react the same way in similar situations.
4. Explain to the students that the rows are called Periods because the properties across a row will gradually change. The elements also grow in atomic size.
5. Tell the students this is one way the Periodic Table is divided.
6. Ask students if they know of another way the Periodic Table might be divided.
7. Lead them to discover the coloring.

8. Explain that the table is divided into metals, metalloids, and non-metals.
9. Color their own periodic table according which are metals, non-metals, and metalloids.
10. Under each section put the characteristics of those divisions.
11. Finally, explain that each square is a different element.

Periodic Table

Teacher Notes

Fifth Grade
Activity: 1
Activity Card: 5-1a

Periodic Table

- ◆ Originally Dmitri Mendeleev began to organize the Periodic Table of elements by looking at patterns.
- ◆ Many elements were not in the first Periodic Table as they were not discovered yet.
- ◆ Horizontal rows are called the periods.
- ◆ Vertical columns are called the groups.
- ◆ Those elements found in the same column have similar chemical and physical properties.

Properties

- ◆ Properties are determined by the number of electrons in the outer energy level of the atom.
- ◆ Those with the same number in the outer shell will be in the same group.
- ◆ According to the Bohr model of an atom, there are several shells or energy levels for the electrons to travel in.
- ◆ The energy levels have a predetermined number of electrons it can hold.
- ◆ The first layer will hold up to as many as two electrons.
- ◆ The second layer can hold up to as many as eight electrons.
- ◆ The third layer can hold up to as many as 18 electrons.
- ◆ The fourth layer can hold as many as 32 electrons.
- ◆ The outer most shell of any atom will never have more than eight electrons.
- ◆ Example of similar properties:
 - Group 1:** All those elements in Group One will react explosively if combined with water.
- ◆ The periodic table is also split into three main groups. Those groups are metals, non-metals, and metalloids.

Metals

- ◆ Three or fewer electrons in the outer shell
- ◆ Good conductor of heat and electricity
- ◆ Luster (shiny)
- ◆ Malleable (can be pounded into shapes)
- ◆ Ductile (can be stretched into wire)
- ◆ Solid at room temperature
- ◆ Exception to the rule: Hg (Mercury) liquid at room temperature.
- ◆ Made up of a metallic bond.

Metallic Bond

- ◆ An ion is an atom that has either gained or lost an electron.
- ◆ Metallic bond is the attraction between electrons and ions
- ◆ Loosely bound electrons allow electric current to flow easily. This explains why metals are such good conductors.
- ◆ Remember that isotopes are different than ions.

Non-Metals

- ◆ Five or more electrons in the outer shell
- ◆ All in Group 17 & 18 are non-metals
- ◆ Lack luster
- ◆ Do not conduct heat or electricity
- ◆ Not ductile
- ◆ Not malleable
- ◆ Found as a solid and as a gas
- ◆ Exception: Br (Bromine) is the only liquid non-metal

Metalloids

- ◆ Has properties of both metals and non-metals
- ◆ Found along the zigzag line.
- ◆ Can behave as a metal or a non-metal.

Periodic Table

Fifth Grade
Activity: 1
Activity Card: 5-1b

Student's Name: _____
Date: _____

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18																																																																																													
LIGHT METALS		NON METALS																																																																																																												
Hydrogen 1.0080 1 H	Lithium 6.939 3 Li	Boron 10.811 5 B	Beryllium 9.012 4 Be	Sodium 22.990 11 Na	Magnesium 24.312 12 Mg	Aluminum 26.981 13 Al	Silicon 28.086 14 Si	Phosphorus 30.974 15 P	Sulfur 32.064 16 S	Chlorine 35.453 17 Cl	Argon 39.948 18 Ar	Potassium 39.098 19 K	Calcium 40.078 20 Ca	Scandium 44.956 21 Sc	Titanium 47.88 22 Ti	Vanadium 50.942 23 V	Chromium 51.996 24 Cr	Manganese 54.938 25 Mn	Iron 55.847 26 Fe	Cobalt 58.933 27 Co	Nickel 58.71 28 Ni	Copper 63.546 29 Cu	Zinc 65.37 30 Zn	Gallium 69.723 31 Ga	Germanium 72.630 32 Ge	Arsenic 74.922 33 As	Selenium 78.96 34 Se	Bromine 79.904 35 Br	Krypton 83.80 36 Kr	Rubidium 85.47 37 Rb	Sr 87.62 38	Yttrium 88.905 39 Y	Zirconium 91.224 40 Zr	Niobium 92.906 41 Nb	Molybdenum 95.94 42 Mo	Technetium (99) 98 Tc	Ruthenium 101.07 44 Ru	Rhodium 102.91 45 Rh	Palladium 106.4 46 Pd	Silver 107.87 47 Ag	Cadmium 112.40 48 Cd	Indium 114.82 49 In	Tin 118.69 50 Sn	Antimony 121.75 51 Sb	Tellurium 127.60 52 Te	Iodine 126.90 53 I	Xenon 131.30 54 Xe	Cesium 132.90 55 Cs	Ba 137.34 56	Hafnium 178.49 72 Hf	Tantalum 180.95 73 Ta	Wolframium 183.85 74 W	Rhenium 186.21 75 Re	Osmium 190.2 76 Os	Iridium 192.22 77 Ir	Platinum 195.09 78 Pt	Gold 196.97 79 Au	Mercury 200.59 80 Hg	Thallium 204.37 81 Tl	Lead 207.19 82 Pb	Bismuth 208.98 83 Bi	Polonium (209) 84 Po	Astatine (210) 85 At	Radon (222) 86 Rn	Francium 223 87 Fr	Ra (226) 88	Actinium 227 89 Ac	Uranium 238.03 92 U	Np (237) 93	Pu (242) 94	Am (243) 95	Cm (247) 96	Bk (249) 97	Cf (251) 98	Es (252) 99	Fm (257) 100	Md (258) 101	No (259) 102	Lr (260) 103	Lu (174.97) 71	Yb (173.04) 70	Tm (168.93) 69	Er (167.26) 68	Hf (178.49) 72	Ta (180.95) 73	Dy (162.50) 66	Ho (164.93) 67	Yttrium (88.905) 39 Y	Scandium (44.956) 21 Sc	Europium (151.96) 63 Eu	Gadolinium (157.25) 64 Gd	Terbium (158.92) 65 Tb	Dysprosium (162.50) 66 Dy	Neodymium (144.24) 60 Nd	Praseodymium (140.91) 59 Pr	Ce (140.12) 58	Th (232.04) 90	Pa (231) 91	U (238.03) 92	Np (237) 93	Pu (242) 94	Am (243) 95	Cm (247) 96	Bk (249) 97	Cf (251) 98	Es (252) 99	Fm (257) 100	Md (258) 101	No (259) 102	Lr (260) 103

Key

Information: Name of Element, Atomic Weight, Atomic Symbol, Atomic Number

Color: Red, Yellow, Black, Green

Periodic Table of The Elements

In the periodic table, the elements are arranged in order of increasing atomic number. Vertical columns headed by Arabic numerals are called **Groups**. A horizontal sequence of elements and a zigzag line of elements are called **periods**. The zigzag line (Groups 13-17) roughly separates metallic from non-metallic elements.

Groups—Elements within a group have similar properties and contain the same number of electrons in their outside energy level. The first group (1) includes hydrogen and the alkali metals.

The last (18) contains the **inert gases**.

Group 17 includes the **halogens**.

Groups 2 and 13 are called **transition elements**.

Short vertical columns without Arabic numeral headings are called **boron**.

Periods—In a given period the properties of the elements gradually pass from a strong metallic to a strong non-metallic being an inert gas.

What is an Atom?

Fifth Grade

Activity: 2

Time: 1 Class Period

General Description

The teacher will introduce the basic structure of an atom. Students will explain how the number of protons is the identifier of the element. Students will practice how to find the number of neutrons by using the atomic mass and the periodic table.

Objectives

Students will identify the basic atomic structure of an element.

Students will use the Periodic table to find the number of protons, neutrons, and electrons of an element.

Students will identify specific elements using the Periodic Table.

Arizona State Standards

SC05 S5C1 PO1 Identify that matter is made of smaller units called:

- molecules (e.g., H₂O, CO₂)
- atoms (e.g., H, N, Na)

Teacher Information

Everything we see, touch, smell, is made up of matter. All matter is made up of atoms. It is difficult for student to understand a concept that they can not see or touch therefore allowing them the opportunity to draw different atoms is helpful.

Materials

Teacher Notes - Activity Card 5-2a

Periodic Table of Elements - Activity Card 5-2b

Research sources

Internet sites

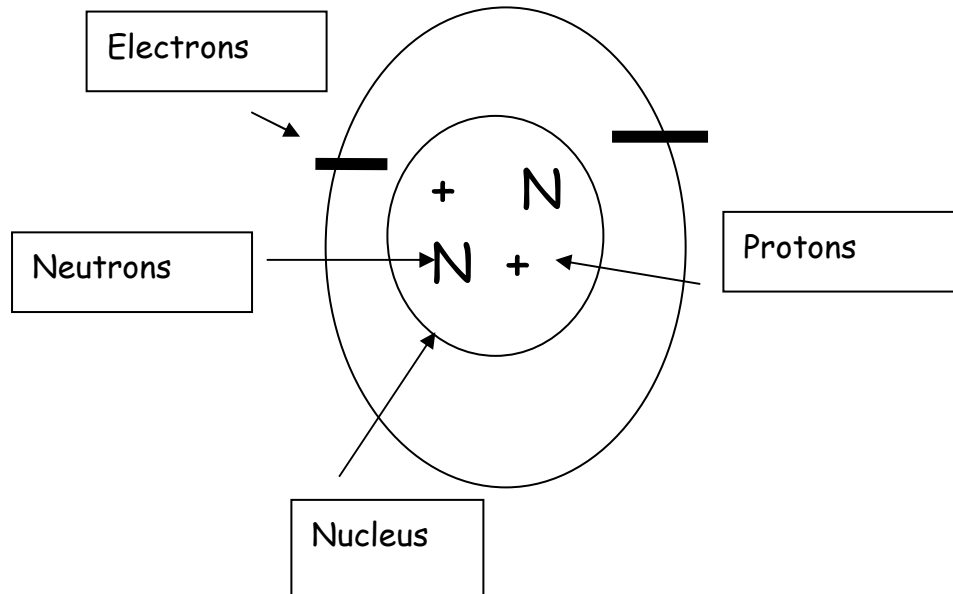
Construction Paper

Markers/colored pencils

Procedures/Exploration

1. Ask students what they think matter is. Write these ideas on the board.
2. Ask them if air is matter. Clarify that air is matter since it takes up space; use a balloon to prove this concept.
3. Explain that all matter is made up of atoms. These are particles that we can not see with our eyes.
4. Draw a simple atom of Helium on the board or over head for students to look at; see picture below. Include in the drawing the protons, electrons, neutrons and nucleus.
5. Using the periodic table show them how you knew what to draw. Relate the Periodic Table to a drawing manual.

6. Explain that each element has a specific number of protons; protons are positive particles of the nucleus.
7. Explain that the number of electrons always equals the number of protons.
8. Show them how to find the number of neutrons which is the number of protons subtracted from the atomic number.
9. Assign different elements to the students and have them draw them accurately.



What is an Atom?

Fifth Grade

Activity: 2

Activity Card: 5-2a

Teacher Notes

Atom

- ◆ Every element has characteristics specific to that element.
- ◆ Elements are made up of many particles.
- ◆ One individual particle is called an atom.
- ◆ An atom has those specific characteristics of that element. An atom of the same elements will always have those same specific characteristics.
- ◆ Every atom is made of three parts, protons, neutrons, and electrons.
- ◆ Protons and neutrons make up the nucleus
 - Protons are positively charged
 - Neutrons have a neutral charge
- ◆ Electrons travel around the nucleus in shells.
- ◆ Electrons are negatively charged.
- ◆ Atoms are found in nature without a charge. They are considered to be neutral.

Protons' Jobs

- ◆ All atoms have a specific number of protons.
- ◆ The number of protons identifies the element from which the atom comes from.
- ◆ Atomic number signifies the number of protons.
- ◆ Protons and Neutrons: Together they equal the mass number, sometimes called the atomic mass.
 - ✓ Have the students identify an element by its atomic number.
 - ✓ Have students determine the number of protons in a particular element. Give them the following formula: atomic mass minus the atomic number will give the number of neutrons.
- ◆ An element's atomic number will never change, if there is a different atomic number than you have a different element.
- ◆ Atomic mass can vary from atom to atom of the same element. The atomic mass varies due to the variation of neutrons. These variations are called isotopes.

Symbols

- ◆ Chemical symbols are used to denote specific elements without have to write out the whole name.
- ◆ Have students' practice finding the symbols for different elements. You can do this as a game such as "popcorn" or just call on students.

Periodic Table

Fifth Grade
Activity: 2
Activity Card: 5-2b

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Periodic Table of The Elements

1 Hydrogen 1.0080 H		2 Helium 4.003 He		3 Lithium 6.939 Li		4 Beryllium 9.012 Be		5 Boron 10.811 B		6 Carbon 12.01115 C		7 Nitrogen 14.007 N		8 Oxygen 15.999 O		9 Fluorine 18.998 F		10 Neon 20.183 Ne	
11 Sodium 22.990 Na		12 Magnesium 24.312 Mg		13 Aluminum 26.981 Al		14 Silicon 28.086 Si		15 Phosphorus 30.974 P		16 Sulfur 32.064 S		17 Chlorine 35.453 Cl		18 Argon 39.948 Ar		19 Potassium 39.102 K		20 Calcium 40.08 Ca	
37 Rubidium 85.47 Rb		38 Strontium 87.62 Sr		39 Yttrium 88.905 Y		40 Zirconium 91.22 Zr		41 Niobium 92.906 Nb		42 Molybdenum 95.94 Mo		43 Technetium 98.906 Tc		44 Ruthenium 101.07 Ru		45 Rhodium 102.91 Rh		46 Palladium 106.4 Pd	
55 Cesium 132.90 Cs		56 Barium 137.34 Ba		57 Lanthanum 138.91 La		72 Hafnium 178.49 Hf		73 Tantalum 180.95 Ta		74 Tungsten 183.85 W		75 Rhenium 186.21 Re		76 Osmium 190.2 Os		77 Iridium 192.2 Ir		78 Platinum 195.09 Pt	
87 Francium 223 Fr		88 Radium 226 Ra		89 Actinium 227 Ac		104 Rutherfordium 261 Rf		105 Dubnium 262 Db		106 Seaborgium 263 Sg		107 Bohrium 264 Bh		108 Hassium 265 Hs		109 Meitnerium 266 Mt		110 Darmstadtium 267 Ds	
81 Thallium 204.37 Tl		82 Lead 207.19 Pb		83 Bismuth 208.98 Bi		84 Polonium 209 Po		85 Astatine 210 At		86 Radon 222 Rn		87 Francium 223 Fr		88 Radium 226 Ra		89 Actinium 227 Ac		90 Thorium 232.04 Th	
101 Mendelevium 256 Md		102 Nobelium 259 No		103 Lawrencium 260 Lr		104 Rutherfordium 261 Rf		105 Dubnium 262 Db		106 Seaborgium 263 Sg		107 Bohrium 264 Bh		108 Hassium 265 Hs		109 Meitnerium 266 Mt		110 Darmstadtium 267 Ds	
99 Einsteinium 254 Es		100 Fermium 253 Fm		98 Californium 251 Cf		97 Berkeleyium 249 Bk		96 Curium 247 Cm		95 Americium 243 Am		94 Plutonium 242 Pu		93 Neptunium 237 Np		92 Uranium 238.03 U		91 Protactinium 231 Pa	
69 Thulium 168.93 Tm		70 Ytterbium 173.04 Yb		71 Lutetium 174.97 Lu		67 Dysprosium 162.50 Dy		66 Terbium 158.92 Tb		65 Gadolinium 157.25 Gd		64 Europium 151.96 Eu		63 Gadolinium 150.35 Sm		62 Neodymium 144.24 Nd		61 Promethium 147 Pm	
111 Roentgenium 260 Rg		112 Copernicium 285 Cn		113 Nihonium 284 Nh		114 Flerovium 289 Fl		115 Moscovium 288 Mc		116 Livermorium 293 Lv		117 Tennessine 289 Ts		118 Oganesson 294 Og		119 Ununennium 288 Uue		120 Unbinilium 286 Uub	

NON METALS

gen and the alkali metals.
—The last (18) contains the *inert* gases.
—Group 17 includes the *halogens*.
—The elements intervening between groups 2 and 13 are called *transition elements*.
—Vertical columns, without Arabic numeral headings are called *subgroups*.

Periods—in a given period the properties of the elements gradually pass from a strongly metallic character to a strongly non-metallic nature, with the last number of a period being an inert gas.

—The first group (1) includes hydro-

gens and the alkali metals.
—The last (18) contains the *inert* gases.
—Group 17 includes the *halogens*.
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Periods—in a given period the properties of the elements gradually pass from a strongly metallic character to a strongly non-metallic nature, with the last number of a period being an inert gas.

Key

Information Color

Name of Element Red
Atomic Weight Yellow
Atomic Symbol Black
Atomic Number Green

Chemical Change

Fifth Grade

Activity: 3

Time: 1 Class Period

General Description

Elements and compounds undergo physical and chemical changes; these are based on physical and chemical properties. This series of activities is designed to provide opportunities for students to make predictions, observations, plan investigations, and evaluate their results.

Objectives

Students will observe and investigate chemical changes.

Arizona State Standards

SC05 S5C1 PO3 Describe changes of matter:

- physical – cutting wood, ripping paper, freezing water
- chemical – burning of wood, rusting of iron, milk turning sour

SC05 S1C2 PO1 Demonstrate safe behavior and appropriate procedures (e.g., use and care of technology, materials, organisms) in all science inquiry.

SC05 S1C1 PO1 Formulate a relevant question through observations that can be tested by an investigation.

SC05 S1C1 PO2 Formulate predictions in the realm of science based on observed cause and effect relationships.

Teacher Information

Allowing students the opportunity to explore chemical changes improves their understanding and retention of the concept.

Materials

Set #1

Steel wool

Ziploc bags

Water

Set #2

Copper pennies

Plastic or glass shallow container

Vinegar

Set #3

Baking powder

Water

Small plastic water

Procedures/Exploration

Set #1

1. Ask students to predict what will happen when they combine water and steel wool. Have them record their predictions in their science journal
2. Give them the materials from set #1 and ask them to plan how they will test what happens when water and steel wool are put together.
3. Students must have their plan checked by you before they can start. Students should plan to put one piece of steel wool into each bag and add water to only one bag.
4. Record what happens in their journal, compare the results to their predictions.

Set #2

1. Ask students to predict what will happen when they combine copper and vinegar. Have them record their predictions in their science journal
2. Give them the materials from set #2 and ask them to plan how they will test what happens when vinegar and copper are put together.
3. Students must have their plan checked by you before they can start. Students should plan to put one piece of copper into each container and add vinegar to only one container.
4. Record what happens in their journal, compare the results to their predictions.

Set #3

1. Ask students to predict what will happen when they combine water and baking powder. Have them record their predictions in their science journal
2. Give them the materials from set #3 and ask them to plan how they will test what happens when water and baking powder are put together.
3. Students must have their plan checked by you before they can start. Students should plan to put baking powder into a container and add water to it.
4. Record what happens in their journal, compare the results to their predictions.

Electricity Events and Inventions Timeline

Fifth Grade

Activity: 4

Time: 1-2 Class Periods

General Description

Students will construct a historical timeline of events and inventions associated with electricity. Each student will illustrate an event or invention and these drawings will be placed on a piece of butcher paper to be displayed in the class or hallway.

Objectives

Students will identify major events and inventions associated with the history of electricity and the resulting technologies.

Arizona State Standards

SC05 S1C1 PO3 Locate information (e.g., book, article, website) related to an investigation

SC05 S1C4 PO1 Communicate verbally or in writing the results of an inquiry

SC05 S1C4 PO3 Communicate with other groups or individuals to compare the results of a common investigation

SC05 S2C1 PO1 Identify how diverse people and/or cultures, past and present, have made important contributions to scientific innovations (e.g., Percy Lavon Julian [scientist], supports Strand 4; Niels Bohr [scientist], supports Strand 5; Edwin Hubble [scientist], supports Strand 6

SS05 S1C1 PO2 Construct timelines of the historical era being studied (e.g., presidents/ world leaders, key events, people)

R05 S3C1 PO5 Locate appropriate print and electronic reference sources (e.g., encyclopedia, atlas, almanac, dictionary, thesaurus, periodical, textbooks, CD-ROM, website) for a specific purpose

W05 S3C6 PO1 Paraphrase information from a variety of sources (e.g., Internet, reference materials)

Teacher Information

Electricity and the resulting technologies associated with electricity have changed the daily lives of people drastically in the past 250 years. Scientific discoveries about the nature of electricity paved the way for an explosion of inventions. Information about these inventions can be derived in a variety of resources including almanacs, encyclopedias, and library books about inventions.

Materials

Butcher paper at least 20 feet long (to calculate number of feet needed exactly: 8.5 inches multiplied by the number of students in your class divided by 12)

Library books

Encyclopedias

Almanacs

Colored pencils and markers

Glue

Scissors

Activity Cards 5-4a and 5-4b

Procedures/Exploration

1. Ask students to imagine what life would be like without electricity. Have them suggest ways their lives would be different from what it is today. Point out that the history of electricity is relatively short (from early 1700s to today). Tell students that as a class they will construct a timeline that will identify the major events and inventions in the history of electricity.
2. Tell students that each of them will be responsible for illustrating a particular event or invention in the history of electricity. Their illustrations will be put together in chronological order on a piece of butcher paper to create a timeline. Hand out an Invention/Event page to each student (Activity Card 5-4a). Tell them they will fill in the date, event or invention, inventor/scientist, and draw a picture that illustrates their assigned event or invention.
3. Assign each student a number. Hand out the Electricity Events and Inventions information sheet (Activity Card 5-4b). Explain to students that the event or invention they are responsible for corresponds with the number the teacher assigned to them. (Modify the events and invention numbers according to interest and number of students in the class.)
4. Allow students time to draw and color their event or invention. Let them use the encyclopedias, invention books, almanacs, etc. for information on how to draw their illustration. Encourage creativity with the drawings. For example, show people using the invention, the scientist discovering the electrical principle, etc.
5. Have students come up one by one to tape or glue their illustrations in place on the butcher paper. Have a student use a marker to write the dates: 1700, 1750, 1800, 1850, 1900, and 1950 in the appropriate places on the butcher paper. Add a title to the timeline.
6. Discuss the usefulness of timelines. Ask students to identify the time period when there were most electrical inventions. Ask them why they thought that happened when it did. Have them discuss which they think are the most important events.

Invention/Event

Fifth Grade

Activity: 4

Activity Card: 5-4a

Student's Name:

Date:

Invention/Event:

Date of Invention/Event:

Inventor/Scientist:

Electricity Events and Inventions

Fifth Grade
Activity: 4
Activity Card: 5-4b

Student's Name:

Date:

1. Event - People in Ancient Greece first discovered that amber would attract light objects after being rubbed with fur. The term “electricity” comes from the Greek word for amber.
2. Event - 1600 - William Gilbert - Did experiments with static electricity. First person to coin the word “electric”.
3. Event - 1729 - Stephen Grey - Transported static electricity hundreds of feet.
4. Event - 1746 - Pieter von Musschenbroek - Stored a small charge of electricity in a Leyden jar.
5. Event - 1752 - Benjamin Franklin - Performed his famous kite experiment that proved lightning was electricity.
6. Invention - 1800 - Alessandro Volta - Invented a simple "wet" electric cell or battery. From his name, "volt" is the unit used to measure electrical force.
7. Event - 1820 - Hans Christian Oersted - Discovered that an electric field surrounds a conductor. Began the study of electricity and magnetism.
8. Event - 1820 - A.M. Ampere - Described more fully the connection between electricity and magnetism by providing a theoretical and mathematical explanation. From his name, “ampere” or “amps” is the unit of current.
9. Invention - 1831 - Michael Faraday - Investigated the effects of electromagnetic induction with his induction ring. He also helped to popularize science.
10. Invention - 1832 - Hippolyte Pixii - Invented the first practical electrical generator.
11. Invention - 1837 - Samuel Morse - Patented the telegraph. He sent a message from Baltimore to Washington in 1844 which said “What hath God wrought..”
12. Invention - 1859 - George B. Simpson - First electric hot plate.
13. Invention - 1866 - Georges LeClanche - First dry cell battery.
14. Invention - 1876 - Alexander Graham Bell - First telephone.
15. Invention - 1877 - Thomas Edison - Phonograph.
16. Invention - 1878 - David Edward Hughes - Microphone.
17. Invention - 1879 - Thomas Edison - Light bulb.
18. Event - 1880s - Heinrich Hertz - Demonstrated the existence of radio waves. From his name “hertz” is the unit of frequency.
19. Invention - 1882 - Henry W. Seely - Iron.
20. Invention - 1884 - Charles Parsons - Steam turbine generators.
21. Event - 1888 - Fred Kimball - Demonstrates an electric car.
22. Event - 1889 - Otis Brothers and Company - Electric elevator is installed in New York City.
23. Event - 1895 - First large-scale hydroelectric generator.
24. Invention - 1906 - General Electric - Kitchen range.
24. Invention - 1911 - George Claude - Neon light.
25. Invention - 1926 - Charles Strite - Toaster.

26. Invention - 1929 - Vladimir K. Zworykin - Television.
27. Invention - 1935 - International Business Machines
28. Corporation - Typewriter.
29. Invention - 1935 - Edwin H. Armstrong - FM radio.
30. Invention - 1945 - J.G. Brainerd, J.P. Eckert, H.H. Goldstine, John
31. Mauchly, and Sperry Corporation - Computer.
32. Invention - 1947 - Percy Spencer - Microwave oven.
33. Invention - 1956 - Ampex Corporation - Videotape recorder.
34. Invention - 1959 - Chester Carlson and Xerox Corp. - Photocopier.

Electric Invention Research

Fifth Grade

Activity: 5

Time: 5 Class Periods

General Description

Students will work in partners to research an invention that uses electricity. The partner groups will prepare a report, advertisement, and a 3-D model of their invention. Students will share their information with the class by giving short oral presentations.

Objectives

Students will create a report, advertisement, and a small replica of an electric invention and present their information to the class.

Arizona State Standards

SC05 S1C1 PO3 Locate information (e.g., book, article, website) related to an investigation

SC05 S1C4 PO1 Communicate verbally or in writing the results of an inquiry

SC05 S1C4 PO3 Communicate with other groups or individuals to compare the results of a common investigation

SC05 S2C1 PO1 Identify how diverse people and/or cultures, past and present, have made important contributions to scientific innovations (e.g., Percy Lavon Julian [scientist], supports Strand 4; Niels Bohr [scientist], supports Strand 5; Edwin Hubble [scientist], support Strand 6)

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R05 S3C1 PO5 Locate appropriate print and electronic reference sources (e.g., encyclopedia, atlas, almanac, dictionary, thesaurus, periodical, textbooks, CD-ROM, website) for a specific purpose

W05 S3C6 PO1 Paraphrase information from a variety of sources (e.g., Internet, reference materials)

Teacher Information

Electricity and the resulting technologies associated with electricity have changed the daily lives of people drastically in the past 250 years.

Materials

Information books

Encyclopedias

Invention almanacs

Colored pencils/markers

White paper

Tape/glue

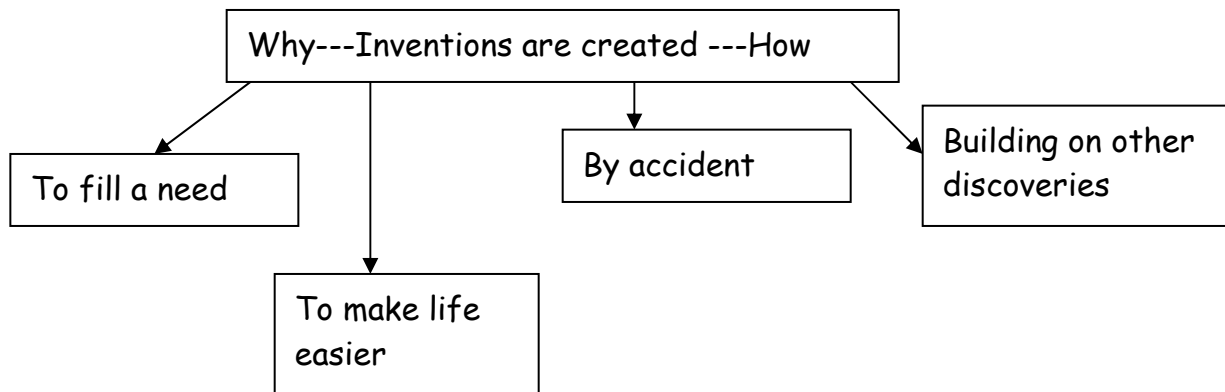
Construction paper

Materials for the models:

Cardboard
Paper towel rolls
Boxes
Wooden popsicle sticks
Toothpicks
Paper clips
Models of an advertisement and a brochure
Activity Cards 5-5a, 5-5b, 5-5c

Procedures/Exploration

1. Develop a class definition of the word “invention”. Put the definition on the board or on butcher paper where the students can refer the class is satisfied with the term.
2. Discuss some of the reasons inventions are created (how and why). Write the word “invention” on the board and create a web of reasons around the word. For example:



3. Tell students they are going to research an invention that uses electricity. Hand out the Invention Project information sheet (Activity Card 5-5a) and go over the details with the students. (This sheet can also be used as a grading rubric during the presentations). Discuss elements of a good advertising and provide examples.
4. Have students choose a partner or assign partners.
5. Have students choose an invention from the list of Electric Inventions to Research (Activity Card 5-5b) or assign inventions or have students draw an invention from a hat. Each partner group should do a different invention to provide the most information for the class. Depending on the students’ research skills and the amount of information available, it may be useful to provide folders of photocopied information and photos from the resources for each invention.
6. Discuss available materials, projected time to complete the project, and partner behavior expectations.
7. Allow students to begin the project. Each successive class period should begin with time for project questions and a review of partner behavior expectations. At the conclusion of each class period, discuss positive and negative observations of class researching techniques.

8. Before beginning the presentations, discuss elements of a good presentation. Also discuss appropriate audience behavior. Each presentation will be evaluated by the audience using the Student Evaluation Cards (Activity Card 5-5c). These cards should be given to the teacher and presenters for review after the presentations.

Invention Project

Fifth Grade
Activity: 5
Activity Card: 5-5a

Date: _____ Names: _____

Invention: _____

Points Earned: _____

You and your partner have been assigned an invention to research. You will have at least three class periods to prepare a report, advertisement, and a 3-D model. You will be graded on creativity, neatness, and accuracy of information. You will also share the information you learned with the class by giving a short oral presentation. The information for the report and advertisement should be interesting and fun, as well as factual. You should be careful not to copy information straight from books for your report. The requirements and how each part will be graded as described below. Have fun and try to make your presentation interesting.

Requirements

<p>Possible Points: _____</p>	<p>Report: the report should first describe your invention (what it is, when it was invented, etc.) The rest of the report should include information about the inventor or other interesting related facts. The report should be at least one to two pages.</p>	<p>Points Earned: _____</p>
<p>Possible Points: _____</p>	<p>Advertisement: This should be a newspaper, magazine, billboard, or other type of ad. The information should be short and to the point. You may want to think of a slogan, poem, or jingle to help sell your invention. Put the ad on a piece of typing paper or poster board and make it colorful.</p>	<p>Points Earned: _____</p>
<p>Possible Points: _____</p>	<p>Model of invention: This should be a small replica of the invention. It can be made of scrap materials such as string, construction paper, small boxes, button, popsicle sticks, clay cotton balls, toothpicks, etc. It must be 3-D</p>	<p>Points Earned: _____</p>
<p>Possible Points: _____</p>	<p>Research techniques: I will be looking for and expecting good partner behavior and researching techniques.</p>	<p>Points Earned: _____</p>
<p>Possible Points: _____</p>	<p>Presentation: The presentation will include reading your report or describing your invention and trying to sell your invention to us. Describe our ad and model. The presentation should be 3-5 minutes long.</p>	<p>Points Earned: _____</p>

Electric Inventions to Research

**Fifth Grade
Activity: 5
Activity Card: 5-5b**

Student's Name:

Date:

Telegraph - 1837 - Samuel Morse
Telephone - 1876 - Alexander Graham Bell
Microphone - 1878 - David Edward Hughes
Light bulb - 1879 - Thomas Edison
Streetcar - 1880 -
Iron - 1882 - Henry W. Seely
Elevator - 1889 - Otis Brothers and Company
Tape recorder - 1900 - Valdemar Poulsen
Kitchen range - 1906 - General Electric
Washing machine - 1907 -
Neon light - 1911 - George Claude
Home refrigerator - 1913 -
Phonograph - 1925 - J.P. Maxfield and H.C. Harrison
Toaster - 1926 - Charles Strite
Television - 1929 - Vladimir K. Zworykin
Typewriter - 1935 - International Business Machines Corporation
FM radio - 1935 - Edwin H. Armstrong
Computer - 1945 - J.G. Brainerd, J.P. Eckert, H.H. Goldstine, John Mauchly, and Sperry Corp.
Microwave oven - 1947 - Percy Spencer
Videotape recorder - 1956 - Ampex Corporation
Photocopier - 1959 - Chester Carlson and Xerox Corporation
Calculator- 1971 - Texas Instruments

Student Evaluation Card

Fifth Grade
Activity: 5
Activity Card: 5-5c

Student Evaluation Card
(Make comments for each part below.)
Name of invention:
Who invented it and when:
One thing I learned from the presentation:
One positive comment for presenters:
Overall Presentation Rating: _____
1 = incomplete model, ad lacks color, report is poorly written, presentation is boring
2 = some parts are well done but other parts are poorly done, presentation is okay
3 = good model, ad, report, and presentation but lacks excellence in all areas
4 = quality model, colorful and creative ad, report is well done, presentation is lively

Student Evaluation Card
(Make comments for each part below.)
Name of invention:
Who invented it and when:
One thing I learned from the presentation:
One positive comment for presenters:
Overall Presentation Rating: _____
1 = incomplete model, ad lacks color, report is poorly written, presentation is boring
2 = some parts are well done but other parts are poorly done, presentation is okay
3 = good model, ad, report, and presentation but lacks excellence in all areas
4 = quality model, colorful and creative ad, report is well done, presentation is lively

Student Evaluation Card
(Make comments for each part below.)
Name of invention:
Who invented it and when:
One thing I learned from the presentation:
One positive comment for presenters:
Overall Presentation Rating: _____
1 = incomplete model, ad lacks color, report is poorly written, presentation is boring
2 = some parts are well done but other parts are poorly done, presentation is okay
3 = good model, ad, report, and presentation but lacks excellence in all areas
4 = quality model, colorful and creative ad, report is well done, presentation is lively

Student Evaluation Card
(Make comments for each part below.)
Name of invention:
Who invented it and when:
One thing I learned from the presentation:
One positive comment for presenters:
Overall Presentation Rating: _____
1 = incomplete model, ad lacks color, report is poorly written, presentation is boring
2 = some parts are well done but other parts are poorly done, presentation is okay
3 = good model, ad, report, and presentation but lacks excellence in all areas
4 = quality model, colorful and creative ad, report is well done, presentation is lively

Electric Invention Models

Fifth Grade

Activity: 6

Time: 2-3 Class Periods

General Description

Students will create an invention to help solve a problem or fill a need. The invention should include electricity as its energy source. The invention will be described in an information brochure. Students will create a model of what their invention might look like and how it would solve a problem

Objectives

Students will use creative skills to develop an electrical invention and a corresponding brochure.

Arizona State Standards

SC05 S1C1 PO3 Locate information (e.g., book, article, website) related to an investigation

SC05 S1C4 PO1 Communicate verbally or in writing the results of an inquiry

SC05 S1C4 PO3 Communicate with other groups or individuals to compare the results of a common investigation

SC05 S2C1 PO1 Identify how diverse people and/or cultures, past and present, have made important contributions to scientific innovations (e.g., Percy Lavon Julian [scientist], supports Strand 4; Niels Bohr [scientist], supports Strand 5; Edwin Hubble [scientist], supports Strand 6)

R05 S3C1 PO5 Locate appropriate print and electronic reference sources (e.g., encyclopedia, atlas, almanac, dictionary, thesaurus, periodical, textbooks, CD-ROM, website) for a specific purpose

W05 S3C6 PO1 Paraphrase information from a variety of sources (e.g., Internet, reference materials)

Teacher Information

Inventions are generally created to improve the quality of life. Inventions are sometimes the result of careful planning and other times they are developed by accident. Most often, inventions are developed to fill a need or desire of the inventor.

Materials

Gather materials students can use to create a model of their invention. Collect car brochures, appliance information booklets, etc. that show examples of inventions, their features and how to operate the item.

Procedures/Exploration

1. Develop or review the class definition of the word “invention”, if you have not already done so, and discuss some of the reasons inventions are created (how and why).
2. Tell students they are going to create an invention that uses electricity. They will describe the features of their invention by creating a brochure that describes how it works, what it looks like, etc.
3. Hand out the examples of invention brochures from the car companies, home appliances, etc. Discuss the types of information present in the booklets.
4. Have students brainstorm a list of inventions. Discuss the fact that many inventions are often an improvement of existing products and how others are new products. Do a class example of how to improve an existing invention. For example, a wooden pencil and a mechanical pencil.
5. Have students list five inventions on a piece of paper and think of ways to improve these inventions.
6. Allow students time to think of an invention that uses electricity. Hand out folded sheets of white typing paper. Tell students to create a brochure that describes their invention. It should contain:
 - a. A diagram of the invention
 - b. A description of how it works
 - c. Steps to properly use the invention
 - d. A description of how this invention would improve or enhance life.
7. Allow the students to begin the project. Tell them they can make a model of their invention as an optional assignment.
8. Have the students present their inventions with the class.

Energy Cartoon Strips

Fifth Grade

Activity: 7

Time: 1-2 Class Periods

General Description

Students will learn how energy cannot be created or destroyed but can be changed from one form to another. Students will then create cartoon strips that illustrate examples of transformation energy.

Objectives

Students will demonstrate their understanding of conservation of energy through the creation of cartoon like illustrations.

Arizona State Standards

SC05 S1C1 PO3 Locate information (e.g., book, article, website) related to an investigation

SC05 S1C4 PO1 Communicate verbally or in writing the results of an inquiry

SC05 S1C4 PO3 Communicate with other groups or individuals to compare the results of a common investigation

SC05 S2C1 PO1 Identify how diverse people and/or cultures, past and present, have made important contributions to scientific innovations (e.g., Percy Lavon Julian [scientist], supports Strand 4; Niels Bohr [scientist], supports Strand 5; Edwin Hubble [scientist], supports Strand 6)

SC05 S5C2 PO3 Examine forces and motion through investigations using simple machines (e.g., wedge, plane, wheel and axle, pulley, and lever)

R05 S3C1 PO5 Locate appropriate print and electronic reference sources (e.g., encyclopedia, atlas, almanac, dictionary, thesaurus, periodical, textbooks, CD-ROM, website) for a specific purpose

W05 S3C6 PO1 Paraphrase information from a variety of sources (e.g., Internet, reference materials)

Teacher Information

Energy is defined as the ability or capacity to make things happen. According to the Law of Conservation of Matter, energy cannot be created or destroyed. However, energy can be changed or transformed from one form to another. There are many different forms of energy including chemical, heat, electrical, mechanical, nuclear and magnetic. Energy is often changed from one form to another before it is used by humans.

Materials

Long strips of white paper or sentence strips

Colored pencils/crayons/markers

Examples of cartoon strips from newspapers

Examples where the characters are using energy

Items to demonstrate energy transformations such as a flashlight, hair dryer, toaster, matches, a tea kettle, a pinwheel, etc.

Procedures/Exploration

1. Discuss with students the various forms of energy and ask for examples.
2. Forms and examples:
 - light - sun, lamps, overhead lights, car lights
 - chemical - batteries, food, fuel (oil, coal, natural gas, wood)
 - heat - sun, burning wood
 - mechanical - moving parts of machines
 - electrical - energy to make appliances work
3. If possible, demonstrate energy transformations and discuss these with the students.
4. For example:
 - an electric hair dryer:*** electrical energy changes to heat energy
 - flashlight:*** chemical energy changes to light energy
 - match:*** chemical and mechanical change to heat and light
 - toaster:*** electrical changes to heat and mechanical
 - Teakettle and pinwheel:*** boil water and allow steam to turn the pinwheel. Electrical energy changes to heat energy which changes to mechanical energy to cause the pinwheel to spin.
5. Distribute cartoon strips from the newspaper. Have students analyze cartoon strips for examples of energy transformations. Discuss the types of energy transformations.
6. Hand out the white strips of paper and tell students to create their own cartoon strips that illustrate examples of their characters using energy. The cartoon strips should indicate the types of energy transformations.
7. Have the students share their cartoon strips with the class and explain the types of energy transformations they illustrate.