

RECREATE THE PERIODIC TABLE OF ELEMENTS

(MODIFIED FOR ADEED)

INSTRUCTIONS



Overview:

The students will use material safety data sheets (MSDS) to examine element properties of their assigned elements and look for trends. Next, each group will organize their elements according to physical properties. Finally, the students will use a simple circuit to test the conductivity of given elements (separate metals from nonmetals).

Objectives:

The student will:

- classify elements and explain their classification;
- predict patterns in the elements by developing groups based on element properties; and
- write a report about their newly created periodic table.

GLEs Addressed:

Science

[10-11] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, analyzing data, developing models, inferring, and communicating.

[11] SB1.1 The student demonstrates an understanding of the structure and properties of matter by predicting the properties of an element (i.e., reactivity, metal, non-metal) using the periodic table and verifying the prediction through experimentation.

Writing

[10] 4.2.2 [10] 4.2.2 The student writes for a variety of purposes and audiences by writing in a variety of nonfiction forms (e.g., letter, report, biography, autobiography, and/or essay) to inform, describe or persuade.

Vocabulary:

atomic mass - the mass of any kind of atom usually expressed in atomic mass units

atomic number - a characteristic of a chemical element representing the quantity of protons in the nucleus (also called a proton number)

ductility - the ability of a material of being drawn out (as into a wire) or hammered thin without fracture.

group/family - several things having common characteristics; especially: a closely related series of elements or chemical compounds.

luster - a shine or sheen especially from reflected light.

malleability - the ability to be extended or shaped by beating with a hammer or by the pressure of rollers; the amount of strain a material will take before it breaks

metal - any of various substances (e.g. gold, tin, or copper) that have a somewhat shiny appearance, conduct electricity and heat, can melt, and are usually capable of being shaped; especially one that is a chemical element rather than an alloy

neutron - an uncharged atomic particle with a mass nearly equal to that of the proton; present in all known atomic nuclei except the hydrogen nucleus

non-metal - any of a number of elements, such as oxygen or sulfur, that lack the physical and chemical properties of a metal

period - a series of elements of increasing atomic number as listed in horizontal rows in the periodic table

proton - an atomic particle that occurs in the nucleus of every atom and carries a positive charge equal in size to the negative charge of an electron

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quantum number – the energy level of the electron in an atom

reactivity - the relative capacity of an atom, molecule, or radical to combine chemically with another atom, molecule, or radical

transitional element - any of the metallic elements that have an incomplete inner electron shell and that serve as transitional links between the most and the least electropositive in a series of elements; characterized by multiple valences, colored compounds, and the ability to form stable complex ions; also called transition metal

valence shell electron - an electron contained in the outermost, or valence, electron shell of an atom

Materials:

- Safety goggles (one per student)
- Elements (various, enough for student testing)
- Material safety data sheets (MSDS) (one for each element given to a group)
- 6-volt dry cell battery (one per group)
- Electrical wire with insulation removed from each end (three lengths per group)
- 6-volt light bulb (one per group)
- 6-volt light bulb socket (one per group)
- OVERHEAD: "Periodic Table of Elements"
- STUDENT INFORMATION SHEET: "Simple Light Circuit"
- STUDENT WORKSHEET: "Conductivity Chart"

Activity Preparation:

1. Using the chalkboard, white board, or a large sheet of paper, create a large blank periodic table of elements for students to fill in during the lesson.

Activity Procedure:

Gear Up

Process Skills: communicating, inferring

1. Ask students to discuss what they know about the periodic table. Create a KWL chart of responses.

Explore

Process Skills: observing, analyzing data, classifying, communicating

2. Explain/define the vocabulary terms associated with element classification.
3. Divide students into teams of four and give each group a periodic table of elements. Assign each group a dozen elements from the periodic table and distribute a set of Material Safety Data Sheets (MSDS) on the elements they are assigned. Explain each group will use the MSDS to examine element properties of their assigned elements and look for trends. Next, each group will organize their elements according to physical properties.

Generalize

Process Skills: communicating, inferring, predicting

4. Ask students why elements are grouped together in the periodic table. Why do certain combinations of elements yield predictable reactions?
5. Invite each group to present the trends they discovered to the class.
6. After each group has presented, ask each group to place their elements on the large blank periodic table. As a class, compare and contrast the newly created periodic table to the current accepted version.
7. Complete the "what you learned" section of the KWL chart.

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8. Ask students the following questions:
 - a. What properties of elements follow trends?
 - b. What properties would an element need to fill the gaps in the newly created periodic table?

Experiment

Process Skills: classifying, developing models

9. Instruct groups to create a chart of their assigned elements.
10. Instruct groups to choose *five* element properties from the vocabulary list to use in classifying their elements.
11. Next, direct groups to examine their elements and record each element's properties.
12. Distribute the STUDENT WORKSHEET: "Simple Light Circuit" and necessary materials (elements, safety goggles, 6-volt light bulb, 6-volt light bulb socket, electrical wire, and 6-volt battery). Instruct groups to follow the instructions on the worksheet to perform an experiment, which will test whether elements are metals or non-metals.
13. Direct students to compare their results to the accepted periodic table of elements.

Interpret

Process Skill: communicating

14. Instruct a spokesperson from each group to present their element placement trends and compare them to the accepted periodic table of elements.

Apply/Assess

Process Skill: communicating

15. Assign students a written report explaining why their newly created periodic table differs from the accepted version; which is more accurate, and why?

Extension Ideas:

Discuss the following:

1. What additional element properties might be considered when grouping elements into periods and families/groups?
2. Provide students with the properties of an element *not used* in their chart and instruct them to determine where it would fit within their table of elements.

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RUBRIC

Objective	GLE	Emergent	Developing	Proficient	Advanced
The student classifies elements and explains their classification.	SA1.1	The student cannot explain periodic trends.	The student can explain periodic trends and recognize that by adding a proton an element is changed.	The student accounts for valence shell properties in classifying their elements.	The student groups elements according to their valence shell properties.
The student predicts patterns in the elements by developing groups based on element properties.	SB1.1	The students cannot identify properties that identify elements and create periods or families/groups based on elements properties.	The student identifies three properties that distinguish elements but cannot create periods or families/groups based on element properties.	The student identifies five properties that distinguish elements and create periods, but not families/groups based on element properties.	The student can identify seven properties that distinguish elements and create both periods and families/groups based on element properties.
The student writes a report about their newly created periodic table.	W4.2.2	The student's report does not contain a proper essay format. The report is not clearly written and contains many grammatical errors.	The student's report contains an introductory paragraph but does not provide supporting paragraphs. The report is not clearly written and contains many grammatical errors.	The student's report contains an introductory paragraph and provides support paragraphs. The report contains only a few grammatical errors.	The student's report contains an introductory paragraph and support paragraphs. The report is free of grammatical errors.



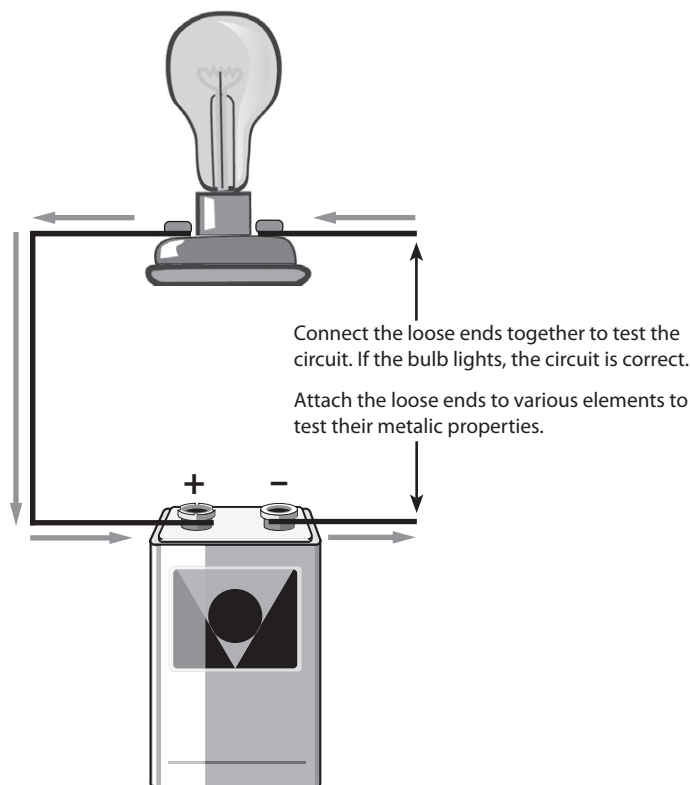
RECREATE THE PERIODIC TABLE OF ELEMENTS SIMPLE LIGHT CIRCUIT

STUDENT INFORMATION



Directions: Create a simple light circuit by completing the following steps.

1. Attach the end of one length of electrical wire to the positive end (+) of the battery holder.
2. Attach the other end of the same piece of wire to one end of the light bulb socket.
3. Attach another length of wire to the other end of the light bulb socket
4. Attach a third piece of wire to the negative (-) end of the battery.
(The result should resemble the diagram below.)
5. Connect the loose wires together and screw the light bulb into the socket.
6. If the light bulb lights, the circuit is correct. If not, try again.
7. Once the simple circuit is working properly, disconnect the loose wires.
8. Test the metallic properties of elements by placing the element between the two wires, so that the wires are touching the element, but not each other.
9. Record the results on the STUDENT WORKSHEET: "Conductivity Chart."



NAME: _____

CONDUCTIVITY CHART

Directions: As you perform the "Simple Light Circuit" activity, list each element in the appropriate column of the chart below, then indicate its conductivity by making a mark in the appropriate column.

Conductivity Chart

Element	Full conductivity	Partial conductivity	No conductivity

The Periodic Table of Elements

1 H Hydrogen 1	2 He Helium 4	NON-METALS																																																																																																																	
3 Li Lithium 7	4 Be Beryllium 9	5 B Boron 11	6 C Carbon 12	7 N Nitrogen 14	8 O Oxygen 16	9 F Fluorine 19	10 Ne Neon 20	11 Na Sodium 23	12 Mg Magnesium 24	13 Al Aluminum 27	14 Si Silicon 28	15 P Phosphorus 31	16 S Sulfur 32	17 Cl Chlorine 35	18 Ar Argon 40	19 K Potassium 39	20 Ca Calcium 40	21 Sc Scandium 45	22 Ti Titanium 48	23 V Vanadium 51	24 Cr Chromium 52	25 Mn Manganese 55	26 Fe Iron 56	27 Co Cobalt 59	28 Ni Nickel 59	29 Cu Copper 64	30 Zn Zinc 65	31 Ga Gallium 70	32 Ge Germanium 73	33 As Arsenic 75	34 Se Selenium 79	35 Br Bromine 80	36 Kr Krypton 84	37 Rb Rubidium 85	38 Sr Strontium 88	39 Y Yttrium 89	40 Zr Zirconium 91	41 Nb Niobium 93	42 Mo Molybdenum 96	43 Tc Technetium ● 98	44 Ru Ruthenium 101	45 Rh Rhodium 103	46 Pd Palladium 106	47 Ag Silver 108	48 Cd Cadmium 112	49 In Indium 115	50 Sn Tin 119	51 Sb Antimony 122	52 Te Tellurium 128	53 I Iodine 127	54 Xe Xenon 131	55 Cs Cesium 133	56 Ba Barium 137	57 La Lanthanum 139	58 Ce Cerium 140	59 Pr Praseodymium 141	60 Nd Neodymium 144	61 Pm Promethium 145	62 Sm Samarium 150	63 Eu Europium 152	64 Gd Gadolinium 157	65 Tb Terbium 159	66 Dy Dysprosium 163	67 Ho Holmium 165	68 Er Erbium 167	69 Tm Thulium 169	70 Yb Ytterbium 173	71 Lu Lutetium 175	72 Hf Hafnium 178	73 Ta Tantalum 181	74 W Tungsten 184	75 Re Rhenium 186	76 Os Osmium 190	77 Ir Iridium 192	78 Pt Platinum 195	79 Au Gold 197	80 Hg Mercury 201	81 Tl Thallium 204	82 Pb Lead 207	83 Bi Bismuth 209	84 Po Polonium 209	85 At Astatine 210	86 Rn Radon 222	87 Fr Francium 223	88 Ra Radium 226	89 Ac Actinium 227	90 Th Thorium 232	91 Pa Protactinium 231	92 U Uranium 238	93 Np Neptunium 237	94 Pu Plutonium 244	95 Am Americium 243	96 Cm Curium 247	97 Bk Berkelium 247	98 Cf Californium 251	99 Es Einsteinium 252	100 Fm Fermium 257	101 Md Mendelevium 258	102 No Nobelium 259	103 Lr Lawrencium 262	104 Rf Rutherfordium 261	105 Db Dubnium 268	106 Sg Seaborgium 266	107 Bh Bohrium 264	108 Hs Hassium 277	109 Mt Meitnerium 276	110 Ds Darmstadtium 281	111 Rg Roentgenium 280	112 Uub Ununbium 285	113 Uut Ununtrium 284	114 Uuq Ununquadium 289	115 Uup Ununpentium 288	116 Uuh Ununhexium 291	117 Uus Ununseptium not yet observed	118 Uuo Ununoctium 294

Atomic Number = Number of Protons = Number of Electrons

Chemical Symbol

Chemical Name

Atomic Weight = Number of Protons + Number of Neutrons*

6

C

Carbon

12

METALS

KEY

- = Solid at room temperature
- = Liquid at room temperature
- = Gas at room temperature
- = Radioactive
- = Artificially Made

*The atomic weights listed on this Table of Elements have been rounded to the nearest whole number. As a result, this chart actually displays the mass number of a specific isotope for each element. An element's complete, unrounded atomic weight can be found on the IUPAC's Elemental web site: <http://education.jlab.org/itselemental/index.html>

Modified from: <http://education.jlab.org>