

**Lesson Topic:** Common Earth Elements**Objective:**

Students will be able to:

1. Identify the elements that make up Earth's crust.
2. Determine what an element is.
3. Calculate the percentages of each element present in Earth's crust.

**Time Required:** 60 minutes**Materials Needed:**

- Teacher computer with internet access
- Projector/Smartboard
- 1 computer/laptop/iPad per student with internet access
- Common Earth Elements handout (attached)
- 9 different colors of beads to represent the elements that make up Earth (colors can be different based on availability, but the number should be the same).
  - 47 - Red
  - 28 - Blue
  - 8 - Purple
  - 6 - Black
  - 4 - Orange
  - 3 - Green
  - 3 - Pink
  - 2 - Yellow
  - 1 - White
    - If you want to use more beads in the mixture, multiply all numbers by 2, 3, 4 etc.
- Clear bowl to put the bead mixture in.
- Ziplock baggies/bowl/cup (1 per pair)

**Teacher Preparation:**

- Assign a Legends of Learning Content Review [Quick Play](#) playlist for the day(s) you will be teaching the lesson.
  - Content Review - Middle School - Common Earth Elements
- Make copies of Common Earth Elements Worksheet (1 per student)

**Engage (10 minutes):**

1. Tell students "Today we are going to talk about the Earth. With the person sitting next to you, discuss the following question (write on the board): What is the Earth made of?"
2. Give students time to discuss, then share out.
3. Write their ideas on the board.
4. Tell students "These are all great ideas. In today's lesson we are going to think a little deeper and think about which elements make up the Earth. We know that all matter is made up of atoms."

5. Ask students “But what’s an element?” (an atom that has the same number of protons in its nucleus, and cannot be broken down into smaller pieces or a simpler substance).
6. Ask students “Any guesses as to which elements make up the Earth?”
  - a. Listen to student guesses.
7. Tell students “Today we are going to find out.”

**Explore (15 minutes):**

1. Show students the bead mixture in a clear bowl.
  - a. If beads are not readily accessible, other items could be used, such as marbles, candies, dried beans, etc. As long as there are 9 different varieties of an item.
2. Tell students “This mixture is like the Earth. Each bead color represents a different element that makes up the Earth.”
3. Pass out the Common Earth Elements handout.
4. Tell students “With a partner, you will get some of this mixture in a baggie/bowl/baggie. Please be careful working with these beads, so as not to lose any or drop any on the floor.”
  - a. You may choose to pour the actual mixture you made into small cups right there in front of students and pass them out. Or, you can make pre-made cups or baggies of the mixture to pass out to students.
    - i. It all depends on whether or not you want each group to have the same number of each bead color, or more of a random array for the Elaborate activity (teacher discretion).
5. Tell students “On your handout, you will find a chart. Fill in the chart based on the colors you find in your bag.
6. Give students time to fill in their chart and go through each bead in their container.
7. After all students are finished, call on a few groups to see what they found out.

**Explain (10 minutes):**

1. Tell students “look at the periodic table on your handout. Raise your hand and tell me the elements that make up the Earth. (In any order: oxygen, silicon, iron, calcium, aluminum, sodium, magnesium, potassium, traces of other elements).”
  - a. Let’s circle all the elements on the periodic table.
    - i. Do the circling with students either on a doc camera/overhead projector/ on the paper etc.
2. Then, make a list on the board of each element so students can fill it in in their handout.
  - a. Oxygen - 47%
  - b. Silicon - 28%
  - c. Aluminum - 8%
  - d. Iron - 6%
  - e. Calcium - 4%
  - f. Magnesium - 3%
  - g. Sodium - 3%
  - h. Potassium - 2%
  - i. Traces of other elements - 1%
    - i. Be sure to tell students that all of these numbers have been rounded to

the nearest percent.

**Elaborate (15 minutes):**

1. Tell students “I need your help calculating some class data.”
  - a. Have each pair/group tell how many of each color bead they had and write it on the board.
    - i. Students will record it in their hand out as well.
2. Tell students “Now that we have a total for the entire “Earth mixture,” let’s see if our percentages come out right.
3. Tell students to take the number of each color bead and use the following equation (it is on their handout)
  - a.  $\text{Number of x-color bead} / \text{total number of beads} = \% \text{ of element within Earth}$ 
    - i. (be sure to multiply answer by 100 to get the %)
  - b. Do this for each color of bead to see if the data works out to be similar to the percentages given during the Explain portion of the lesson (The data should be the same/similar to the percentages given earlier in class).
4. Tell students to answer the final question on their handout.
  - a. Discuss the question when everyone is finished working.
    - i. Sources of error - student error, students could have dropped beads, the percentages are rounded to the nearest percent, etc.

**Evaluate (10 minutes):**

1. Have your students [sign in to Legends of Learning](#). Instruct students to complete the Content Review playlist.
2. [Analyze student results](#) to determine what concepts need to be a focus for reteaching.

**Additional Lesson Strategies:**

- To use Legends for additional instruction, create a [custom playlist](#) with an [instructional game](#) and pre and post [assessment](#).
- To use Legends for a quick formative assessment, create a 5-question [assessment](#) in a [playlist](#).
- To use Legends for a student-directed experience, create a [targeted freeplay](#) playlist.
- Encourage students to play on their own at home in [Legends of Learning: Awakening](#) for a student-driven experience including avatars, battling, and quests all centered around topics they are covering in class.

Name: \_\_\_\_\_

# Common Earth Elements

**Periodic Table of the Elements**

1 1IA 11A <b>H</b> Hydrogen 1.008	2 IIA 2A <b>He</b> Helium 4.003											18 VIIIA 8A <b>Ar</b> Argon 39.948																	
3 <b>Li</b> Lithium 6.941	4 <b>Be</b> Beryllium 9.012											19 <b>K</b> Potassium 39.098																	
5 <b>Na</b> Sodium 22.990	6 <b>Mg</b> Magnesium 24.305											20 <b>Ca</b> Calcium 40.078																	
7 <b>Sc</b> Scandium 44.956	8 <b>Ti</b> Titanium 47.88	9 <b>V</b> Vanadium 50.942	10 <b>Cr</b> Chromium 51.996	11 <b>Mn</b> Manganese 54.938	12 <b>Fe</b> Iron 55.845	13 <b>Co</b> Cobalt 58.933	14 <b>Ni</b> Nickel 58.693	15 <b>Cu</b> Copper 63.546	16 <b>Zn</b> Zinc 65.38	17 <b>Ga</b> Gallium 69.723	18 <b>Ge</b> Germanium 72.630	19 <b>As</b> Arsenic 74.922	20 <b>Se</b> Selenium 78.96	21 <b>Br</b> Bromine 79.904	22 <b>Kr</b> Krypton 83.80														
19 <b>Rb</b> Rubidium 85.468	20 <b>Sr</b> Strontium 87.62	21 <b>Y</b> Yttrium 88.906	22 <b>Zr</b> Zirconium 91.224	23 <b>Nb</b> Niobium 92.906	24 <b>Mo</b> Molybdenum 95.94	25 <b>Tc</b> Technetium 98.906	26 <b>Ru</b> Ruthenium 101.07	27 <b>Rh</b> Rhodium 102.905	28 <b>Pd</b> Palladium 106.42	29 <b>Ag</b> Silver 107.868	30 <b>Cd</b> Cadmium 112.411	31 <b>In</b> Indium 114.818	32 <b>Sn</b> Tin 118.710	33 <b>Sb</b> Antimony 121.757	34 <b>Te</b> Tellurium 127.6	35 <b>I</b> Iodine 126.905	36 <b>Xe</b> Xenon 131.29												
37 <b>Cs</b> Cesium 132.905	38 <b>Ba</b> Barium 137.327	39-47 <b>Lanthanide Series</b>	48 <b>Hf</b> Hafnium 178.49	49 <b>Ta</b> Tantalum 180.948	50 <b>W</b> Tungsten 183.84	51 <b>Re</b> Rhenium 186.207	52 <b>Os</b> Osmium 190.23	53 <b>Ir</b> Iridium 192.22	54 <b>Pt</b> Platinum 195.084	55 <b>Au</b> Gold 196.967	56 <b>Hg</b> Mercury 200.59	57 <b>Tl</b> Thallium 204.384	58 <b>Pb</b> Lead 207.2	59 <b>Bi</b> Bismuth 208.980	60 <b>Po</b> Polonium 209	61 <b>Rn</b> Radon 222													
55 <b>Fr</b> Francium 223	56 <b>Ra</b> Radium 226	57-71 <b>Lanthanide Series</b>	62 <b>Rf</b> Rutherfordium 261	63 <b>Db</b> Dubnium 262	64 <b>Sg</b> Seaborgium 266	65 <b>Bh</b> Bohrium 264	66 <b>Hs</b> Hassium 265	67 <b>Mt</b> Meitnerium 268	68 <b>Ds</b> Darmstadtium 271	69 <b>Rg</b> Roentgenium 272	70 <b>Cn</b> Copernicium 285	71 <b>Uuo</b> Ununoctium 289	72 <b>Uuq</b> Ununquadium 289	73 <b>Uup</b> Ununpentium 289	74 <b>Uuh</b> Ununhexium 289	75 <b>Uuh</b> Ununhexium 289	76 <b>Uuo</b> Ununoctium 289												
77 <b>La</b> Lanthanum 138.905	78 <b>Ce</b> Cerium 140.12	79 <b>Pr</b> Praseodymium 140.908	80 <b>Nd</b> Neodymium 144.24	81 <b>Pm</b> Promethium 144.913	82 <b>Sm</b> Samarium 150.36	83 <b>Eu</b> Europium 151.964	84 <b>Gd</b> Gadolinium 157.25	85 <b>Tb</b> Terbium 158.925	86 <b>Dy</b> Dysprosium 162.50	87 <b>Ho</b> Holmium 164.930	88 <b>Er</b> Erbium 167.259	89 <b>Tm</b> Thulium 168.934	90 <b>Yb</b> Ytterbium 173.054	91 <b>Lu</b> Lutetium 174.967	92 <b>Ac</b> Actinium 227	93 <b>Th</b> Thorium 232.038	94 <b>Pa</b> Protactinium 231.036	95 <b>U</b> Uranium 238.029	96 <b>Np</b> Neptunium 237.048	97 <b>Pu</b> Plutonium 244.064	98 <b>Am</b> Americium 243.061	99 <b>Cm</b> Curium 247.070	100 <b>Bk</b> Berkelium 247.070	101 <b>Cf</b> Californium 251.083	102 <b>Es</b> Einsteinium 252.083	103 <b>Fm</b> Fermium 257.103	104 <b>Md</b> Mendelevium 258.103	105 <b>No</b> Nobelium 259.103	106 <b>Lr</b> Lawrencium 260.103

**Alkali Metals**

**Alkaline Earths**

**Transition Metals**

**Main Group**

**Nonmetals**

**Halogens**

**Noble Gas**

**Actinide Series**

**Lanthanide Series**

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Fill in the chart, based on the colors in your bag.

Element	Bead Color	Number of Beads
Oxygen	Red	
Silicon	Blue	
Aluminum	Purple	
Iron	Black	
Calcium	Orange	
Magnesium	Green	
Sodium	Pink	
Potassium	Yellow	
Traces of other elements	White	

Next to each element below, write in the percent found in the Earth's crust.

Oxygen: \_\_\_\_\_

Silicon: \_\_\_\_\_

Aluminum: \_\_\_\_\_

Iron: \_\_\_\_\_

Calcium: \_\_\_\_\_

Magnesium: \_\_\_\_\_

Sodium: \_\_\_\_\_

Potassium: \_\_\_\_\_

Traces of other elements: \_\_\_\_\_

**CLASS DATA**

In the chart below, fill in the whole class data for each color. Then, calculate the percent of each color.

Use the following formula:

$$\text{Number of color of bead} / \text{total number of beads} \times 100 = \%$$

Element	Bead Color	Number of Beads	Percent
Oxygen	Red		
Silicon	Blue		
Aluminum	Purple		
Iron	Black		
Calcium	Orange		
Magnesium	Green		
Sodium	Pink		
Potassium	Yellow		
Traces of other elements	White		

Answer the following question:

1. Do the class percentages of each element match the percentages given at the beginning of class? Why or why not?

**KEY**

 Fill in the chart, based on the colors in *your* bag.

Element	Bead Color	Number of Beads
Oxygen	Red	Answers will vary.
Silicon	Blue	Answers will vary.
Aluminum	Purple	Answers will vary.
Iron	Black	Answers will vary.
Calcium	Orange	Answers will vary.
Magnesium	Green	Answers will vary.
Sodium	Pink	Answers will vary.
Potassium	Yellow	Answers will vary.
Traces of other elements	White	Answers will vary.

Next to each element below, write in the percent found in the Earth's crust.

 Oxygen: **47%**

 Silicon: **28%**

 Aluminum: **8%**

 Iron: **6%**

 Calcium: **4%**

 Magnesium: **3%**

 Sodium: **3%**

 Potassium: **2%**

 Traces of other elements: **1%**

**CLASS DATA**

In the chart below, fill in the whole class data for each color. Then, calculate the percent of each color. The number of beads for each color will vary based on how many beads you used for your mixture.

Use the following formula:

$$\text{Number of color of bead} / \text{total number of beads} \times 100 = \%$$

Element	Bead Color	Number of Beads	Percent
Oxygen	Red	Answers will vary	47%
Silicon	Blue	Answers will vary	28%
Aluminum	Purple	Answers will vary	8%
Iron	Black	Answers will vary	6%
Calcium	Orange	Answers will vary	4%
Magnesium	Green	Answers will vary	3%
Sodium	Pink	Answers will vary	3%
Potassium	Yellow	Answers will vary	2%
Traces of other elements	White	Answers will vary	1%

Answer the following question:

- Do the class percentages of each element match the percentages given at the beginning of class? Why or why not? **Yes, because this mixture was said to represent the Earth, and these are the percentages of each element found in the Earth.**