



BICYCLE MINERALS

ANSWER KEY

Bicycles are used as a form of transportation, for fun and exercise and even in professions like messenger delivery and sports. Bicycles are made with materials that come from mining.

Think About It: Have you ever wondered what materials are needed to make a bicycle and how we get these materials? Where are these materials found?

Minerals in Your Everyday Life



Directions for Activity:

The table on this page lists many of the mineral resources needed to make a bicycle, the percentage of the mineral resource imported by the United States and major sources. Add how each mineral resource is used in making a bicycle to this table. Then answer the questions on the back.

Mineral Resources Needed to Make a Bicycle

Mineral Resource	Net % Imported by U.S.	Major Sources	% U.S. Self-Sufficiency (Subtract % Imported from 100%)	Used In
BAUXITE AND ALUMINA	100	Australia, China, Brazil, Indonesia	0	Spokes, gears, seat post, frame and handlebars
GRAPHITE (natural)	100	China, India, Brazil, North Korea	0	Frame
IODINE	88	Chile, Japan, China, Azerbaijan, Russia	12	Tires and brakes
IRON ORE	0	China, Australia, Brazil, India	100	Spokes, gears, seat post, frame, handlebars, brakes and tires
MAGNESIUM (metal)	31	China, Russia, Israel, United States	69	Example: Frame
MOLYBDENUM	0	China, United States, Chile, Peru	100	Frame
QUARTZ (industrial sand)	0	United States, Italy, Germany, Australia	100	Tires and brakes
SALT	19	China, United States, Germany, India	81	Brakes and tires
SCANDIUM	100	China, Russia, Ukraine, Kazakhstan	0	Frame
SULFUR	19	China, United States, Russia, Canada	81	Brakes and tires
TITANIUM (sponge metal)	64	China, Japan, Russia, Kazakhstan	36	Spokes, frame and handlebars
ZINC	72	China, Australia, Peru, United States	28	Tires and brakes



FUN FACTS:

- ♦ More than 100 million bicycles are made worldwide each year.
- ♦ The fastest recorded bicycle speed on a flat surface is 83 miles per hour (133 km/h).
- ♦ The Guinness World Record for the longest rideable bicycle is 28.1 m (92 ft 2 in.) in length.



1. Can a bicycle manufacturer in the United States build a bike without having to use any mineral resources imported from another country? **No.** Why or why not? **Graphite and scandium are 100% imported from other countries.**
2. What is the fewest number of countries needed to get the mineral resources to make a bicycle? **Two.** List the countries. **China, and either the United States, Italy, Germany or Australia.**
3. List the mineral resources used to make a bicycle from lowest percent to highest percent imported by the United States. **Lowest – 0% iron ore, 0% molybdenum, 0% quartz (industrial sand), 19% salt, 19% sulfur, 31% magnesium (metal), 64% titanium (sponge metal), 72% zinc, 88% iodine, 100% bauxite and alumina, 100% graphite, 100% scandium – Highest**
4. List some other uses you know for any of the minerals or elements in a bicycle.
Iron: used in steel, magnets, auto parts, cosmetics and paints.
Quartz: used in glass, telescope lenses, watches, computers and paints.
Titanium: used in jet engines, armor-plated vehicles, fireworks, propeller shafts and other ship parts, satellites and spacecraft, and joint replacement.
Zinc: used in automotive parts, fluorescent lights, electrical fuses, nutrition, sunblock, rust-preventing coatings and pennies.
For more ideas see:
<http://www.MineralsEducationCoalition.org/minerals>
<http://www.nma.org/index.php/minerals-publicatons/40-common-minerals-and-their-uses>
<http://www.Geology.com/minerals>
<http://www.chemicool.com/elements>
5. Which of the mineral resources in bicycles do you think may also be obtained through recycling?
Aluminum, iron (and steel), magnesium, titanium, zinc and silica (from glass) are obtained through recycling.

Extension Activity

Some bikes are made with titanium or scandium-aluminum alloyed metals. Some bikes are made with a steel alloyed frame. Titanium, scandium and aluminum are all less than half the density of steel (density is the weight of a material for a given volume). What advantage might be gained with the less dense materials and why? **Using the less dense materials might make the bike lighter, which might give an advantage in making it easier to move forward and get going, especially when climbing the steepest hills** (see <http://newhorizonsbikes.com/articles/bicycle-weight-the-benefits-quantified-pg170.htm>).

Go to the MEC website to read more about the mineral resources used to make different styles and qualities of bikes in the article [Bicycle Frames...What's the Difference?](#). Published by the USGS.

For information on more of the mineral resources used to make bicycles, go to http://www.conservation.ca.gov/cgs/information/kids_geozone/Pages/answers.aspx.

www.MineralsEducationCoalition.org

