



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

Date: \_\_\_\_\_

**Problem 2: Evaluate US import reliance for raw materials that are needed to make a cell phone.**

2012 U.S. NET IMPORT RELIANCE ON SELECTED NONFUEL MINERAL COMMODITIES			
COMMODITY (Element, Ore, or Raw Mineral)	ORE MINERAL or RAW MINERAL	Percent Import Reliance	WHAT IS THIS COMMODITY USED FOR?
fluorine ore (F): fluor spar	fluorite	100	Fluorine is used in fluoride toothpaste, fluorocarbon refrigerant gases and fire extinguishers, and fluoropolymer plastics that coat nonstick fry pans and insulate wiring in cell phones, laptops, and airplanes.
graphite (C)	graphite	100	Graphite is used to make carbon steel, pencils, carbon fiber reinforced plastics in car bodies, and negative ends of most batteries (including those in all cell phones, power tools, computers, and hybrid/electric vehicles).
indium metal (In)	sphalerite with In as an impurity	100	Indium is used to make solar cells and liquid-crystal displays (LCDs) in cell phones, computers, and flat-screen television sets.
mica (sheet)	muscovite	100	Muscovite is used in heating elements of hair dryers and toasters, joint compound, and cosmetics with a satiny or glittery sheen.
quartz crystal (industrial)	quartz (clear transparent)	100	Crystals of cultured pure quartz are used to make quartz watches and the frequency controls and timers in every computer and cell phone.
niobium metal (Nb, "columbium")	columbite (in "coltan")	100	Niobium is used to make high-strength noncorrosive steel alloys (for jet engines, power plants) and arc welding rods, plus electrical insulation coatings in cell phones, computers, and electronic games.
tantalum metal (Ta)	tantalite (in "coltan")	100	Tantalum is used to make "tantalum capacitors" that buffer the flow of electricity between a battery and electronic parts in the circuits of cell phones, laptops, iPods, and most other electrical devices.
gallium metal (Ga)	bauxite is Ga ore	100	Gallium is used to make light-emitting diode (LED) bulbs and liquid-crystal displays (LCDs) in things like cell phones, computers, and flat-screen television sets.
vanadium metal (V)	magnetite with V as an impurity	100	Vanadium is used for cutting tools; mixed with iron to make lightweight shock-resistant steel for car axles and gears, springs, and cutting tools.
bismuth metal (Bi)	galena with Bi as an impurity	95	Bismuth is used as a nontoxic replacement for lead (in ceramic glazes, fishing sinkers, food processing equipment, plumbing, and shot for hunting) and in antidiarrheal medications.
garnet (industrial)	garnet	88	Industrial garnet is used as an abrasive in things like sandpaper and sandblasting.
zinc metal (Zn)	sphalerite is an ore of Zn	82	Zinc is used to make alloys like brass, skin-healing creams, and galvanized (rust-proof) steel and roofing nails; added to vitamin pills for a healthy immune system and to aid protein production.
silver metal (Ag)	native silver; galena with Ag as an impurity	72	Silver is used to make jewelry and silverware, photographic film, and solder on electrical circuit boards of computers and cell phones.
barium metal ore (Ba)	barite	70	Barium (Ba) is widely used to make capacitors (that store energy) and memory cells in cell phones and other portable electronic devices.
chromium metal (Cr)	chromite is an ore of Cr	66	Chromium is used to make stainless steel, yellow and green ceramic glazes and paints, and military camouflage paints; added to vitamin pills for healthy metabolism and lower cholesterol levels.
tungsten metal (W)	wolframite is W ore	49	Tungsten is a dense metal that makes cell phones and pagers vibrate (by attaching it to an electric motor spinning off center); also used for light bulb filaments, golf clubs, and tungsten carbide cutting tools.
magnesium metal (Mg)	dolomite and olivine are Mg ores	43	Magnesium is used to make strong, lightweight frames for jet engines and rockets, lightweight cell phone and laptop cases, and incendiary flares and bombs; added to vitamin pills to aid good brain and muscle function and strengthen bones.
aluminum (Al)	bauxite is Al ore	40	Aluminum is a lightweight silvery metal used to make drink cans, foil, airplanes, and solar panels.
nickel metal (Ni)	pyrrhotite contains Ni as an impurity	37	Nickel is used to make rechargeable batteries (Ni-Cd) for portable electronic devices, screw-end caps of light bulbs, and stainless steel.
copper metal (Cu)	azurite, bornite, chalcocopyrite, chrysocolla, and malachite are Cu ores	36	Copper is used to make copper pipes; electrical wire for homes, businesses, electric motors, and circuit boards in cell phones and other electrical devices. Hybrid cars contain about 100 pounds (45 kg) of copper. Added to vitamin pills for healthy hair and skin.
salt	halite	32	It is used as table salt, road salt (to melt snow), in water softeners, and as a food preservative.
iron metal (Fe), steel	goethite, limonite, magnetite, and hematite are Fe ores	25	Iron and steel are used to construct machines, buildings, bridges, nails, bolts, tools, file cabinets; iron is added to vitamin pills to aid hemoglobin production in red blood cells for oxygen transport.
gypsum	gypsum	14	Gypsum is used to make plaster of paris, drywall, and for art (alabaster).
sulfur (S)	native sulfur; pyrite is a S ore	11	It is used to make matches, gunpowder, fertilizer, fungicide, insecticide, and harden rubber (car tires).
cement	calcite	10	Calcite is processed into cement, which is used to make concrete.

**Figure 3.23 Selected net nonfuel mineral resource imports by the United States.** Net import reliance is the total of U.S. production and imports minus the percentage of exports. (Adapted from USGS Mineral Commodity Summaries, accessed March 2016.)

