

STEM *Sims*™

Bacteria Miner



Bacteria Miner

**Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.**

Start learning right now about how copper can be extracted from ore using common bacteria. Take the following brief quiz to see how much you already know about the element called copper. See the bottom of page 4 to check your answers.

1. Which country currently produces the most copper?
 - a. Peru
 - b. Chile
 - c. United States
 - d. China
2. Which country has the largest amounts of in-ground copper reserves?
 - a. United States
 - b. China
 - c. Argentina
 - d. Chile
3. What percentage of the total world copper reserves does the country from the previous question have?
 - a. 12%
 - b. 24%
 - c. 38%
 - d. 56%
4. In the United States, each year more copper is placed into service through recycling than by newly-mined ore.
 - a. true
 - b. false
5. Which country currently has the greatest demand for copper?
 - a. China
 - b. Germany
 - c. United States
 - d. Mexico

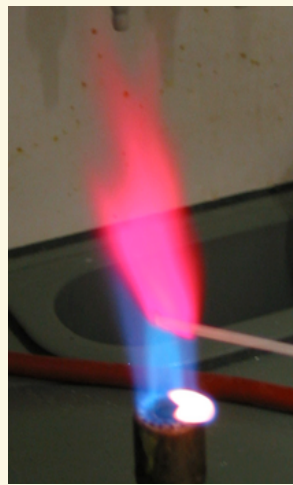


My Old Flame

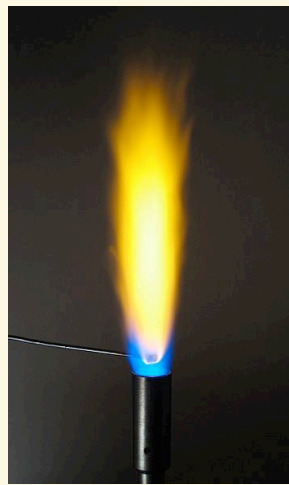
Flame tests are a method used to identify various substances. The electrons in a metal atom, such as copper or iron, can be excited through different ways. Electrons in a stable atom have set positions located at specific distances from the nucleus. Adding heat is one way to move electrons in the stable atom temporarily to higher energy levels, which are greater distances from the nucleus. As the electrons fall back down to their normal position, they give off some of this gained energy in the form of light. The color of the light is an indication of how far the electron has fallen in returning to its normal location. Can you identify the element by the flames shown below? See the bottom of page 4 to check your answers.



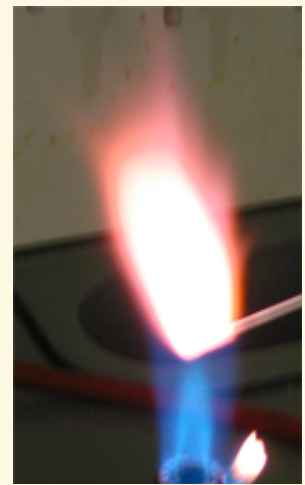
a.



b.



c.



d.

hydrogen																		helium																																																					
1 H																		2 He																																																					
1.0079																		4.0026																																																					
lithium				beryllium				boron				carbon				nitrogen				oxygen				fluorine				neon																																											
3 Li				4 Be				5 B				6 C				7 N				8 O				9 F				10 Ne																																											
6.941				9.0122				10.811				12.011				14.007				15.999				18.998				20.180																																											
sodium				magnesium				aluminum				silicon				phosphorus				sulfur				chlorine				argon																																											
11 Na				12 Mg				13 Al				14 Si				15 P				16 S				17 Cl				18 Ar																																											
22.990				24.305				26.982				28.086				30.974				32.065				35.453				39.948																																											
potassium				calcium				scandium				titanium				vanadium				chromium				manganese				iron				cobalt				nickel				copper				zinc				gallium				germanium				arsenic				selenium				bromine				krypton			
19 K				20 Ca				21 Sc				22 Ti				23 V				24 Cr				25 Mn				26 Fe				27 Co				28 Ni				29 Cu				30 Zn				31 Ga				32 Ge				33 As				34 Se				35 Br				36 Kr			
39.098				40.078				44.956				47.867				50.942				51.996				54.938				55.845				58.933				58.693				63.546				65.39				69.723				72.61				74.922				78.96				79.904				83.80			
rubidium				strontium				yttrium				zirconium				niobium				molybdenum				technetium				ruthenium				rhodium				palladium				silver				cadmium				indium				tin				antimony				tellurium				iodine				xenon			
37 Rb				38 Sr				39 Y				40 Zr				41 Nb				42 Mo				43 Tc				44 Ru				45 Rh				46 Pd				47 Ag				48 Cd				49 In				50 Sn				51 Sb				52 Te				53 I				54 Xe			
85.468				87.62				88.906				91.224				92.906				95.94				(98)				101.07				102.91				106.42				107.87				112.41				114.82				118.71				127.60				126.90				131.29							
cesium				barium				lanthanum				cerium				praseodymium				neodymium				promethium				samarium				europium				gadolinium				terbium				dysprosium				holmium				erbium				thulium				ytterbium											
55 Cs				56 Ba				57-70 Lu				71 Hf				72 Ta				73 W				74 Re				75 Os				76 Ir				77 Pt				78 Au				79 Hg				80 Tl				81 Pb				82 Bi				83 Po				84 At				85 Rn			
132.91				137.33				174.97				174.97				178.49				180.95				183.84				186.21				188.91				192.22				195.08				197.04				200.59				204.38				208.98				[209]				[210]				[222]			
francium				radium				lawrencium				rutherfordium				dubnium				seaborgium				bohrium				hassium				meitnerium				unnilium				ununium				unbinium				ununquadium				[289]				[289]				[289]											
87 Fr				88 Ra				103 Lr				104 Rf				105 Db				106 Sg				107 Bh				108 Hs				109 Mt				110 Uun				111 Uuu				112 Uub				114 Uuq				[289]				[289]				[289]											
[223]				[226]				[262]				[261]				[262]				[266]				[264]				[269]				[268]				[271]				[272]				[277]				[289]				[289]				[289]															

* Lanthanide series

lanthanum														cerium														praseodymium														neodymium														promethium														samarium														europium														gadolinium														terbium														dysprosium														holmium														erbium														thulium														ytterbium													
57 La														58 Ce														59 Pr														60 Nd														61 Pm														62 Sm														63 Eu														64 Gd														65 Tb														66 Dy														67 Ho														68 Er														69 Tm														70 Yb													
138.91														140.12														140.91														144.24														[145]														150.36														151.96														157.25														158.93														162.50														164.93														167.26														168.93														173.04													
actinium														thorium														protactinium														uranium														neptunium														plutonium														americium														curium														berkelium														californium														einsteinium														fermium														mendelevium														nobelium													
89 Ac														90 Th														91 Pa														92 U														93 Np														94 Pu														95 Am														96 Cm														97 Bk														98 Cf														99 Es														100 Fm														101 Md														102 No													
[227]														232.04														231.04														238.03														[237]														[244]														[243]														[247]														[247]														[251]														[252]														[257]														[258]														[259]													

** Actinide series

Bacteria Miner

Got copper?

Copper is an important element in human health, work, and lifestyles. Copper is a trace element necessary to maintain good health in plants and in animals. In humans, copper is stored mainly in the liver, muscles, and bones. A number of foods are high in copper, including shellfish, nuts, and olives. Deficiencies in dietary copper can lead to anemia-like symptoms since copper is required to help uptake iron inside the body.



The brownish metal is also used to kill certain bacteria and fungi. Copper has been shown to be an effective agent in killing influenza, adenovirus, *E. coli* O157:H7, *Staphylococcus aureus* (MRSA), *Staphylococcus*, and *Clostridium difficile*. In fact, copper was shown to kill 99% of disease-causing pathogens within two hours of its cleaning application. Antimicrobial materials made from copper now are used as doorknobs and handles in hospitals to reduce the spread of disease in that environment.



In some patients with liver disease and other disorders, copper can build up in tissue. The area surrounding the iris of the eye is one such location. The copper build-up called Kayser-Fleischer rings can be seen in some individuals. The brownish discoloration at the edge of the colored part of the eye is evidence of the collection of copper in the tissue.

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Answers: (1) b, (2) d, (3) c, (4) a, (5) a, China uses about 22% of the world's copper. **Page 3 My Old Flame Answers:** a) copper, b) lithium, c) sodium, d) potassium.

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