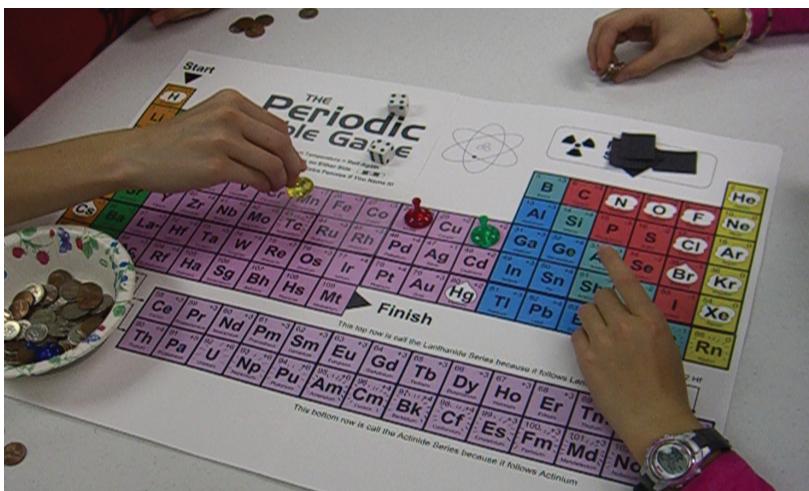


# THE PERIODIC TABLE GAME: "Race to Rutherfordium"



You will need: copies of the four pattern pages, assembled to make the Periodic Table, coins (about 5 pennies, 5 nickels, 5 dimes, and 1 quarter per player), a tuna can or small plastic container of similar size, a pair of standard dice, some tokens (one per player, and they don't have to be real game tokens, you can use anything), and some black paper squares the size of one space on the game board (two rectangles per player)

You may also want to make copies of the list of names and places for the students to study BEFORE the game starts. Once the game starts, no peeking at the list. Of course, the list may have to be consulted during the game to check answers.

*NOTE: Again, if you need a digital file to print from, you can find one at [www.ellenjmchenry.com](http://www.ellenjmchenry.com) in the chemistry section of the free downloads.*

## About the game board:

The number in the upper right hand corner of each square is the valence number. It is the number of electrons the element would like to receive or give away. Many elements (especially in the middle of the table) have more than one valence number. I've chosen just to list the highest valence for each element. It simplifies the game considerably and makes the mathematical pattern of the table more obvious. However, you may want to make your players aware that in reality many of the elements can have more than one valence number. In this game, the elements in each column end up displaying the same valence, which is a basic concept in learning to understand the Periodic Table. The word "periodic" means it has repeating patterns, and the valencies are one of these patterns. Notice that the last five elements do not have a valence number listed. These elements only exist for a fraction of a second and therefore their valence cannot be determined.

The large letters in each box are the symbols for each element. Underneath the symbol is the name of the element.

Most elements are solids at room temperature. Notice that the elements that are liquids at room temperature are marked with a liquid drop, and those that are gases at room temperature are marked with a gas cloud.

There is a strange break at two places in the Periodic Table. One is after Lanthanum and one is after Actinium. These extra sections are listed at the bottom of the table simply because inserting them in the middle of the table would make the table too wide to fit comfortably on a page. There's no scientific reason for putting them at the bottom--it's simply a graphics decision.

The black and white version of the game is identical to the colored version (except for the color, of course). The black and white version is for students who love to color, or who will learn more by coloring their own table. The black and white version is also cheaper and easier to reproduce.

### How to play:

Before starting the game, players get a chance to study the information page that lists elements named after people and places. You might want to make additional photocopies of it. Once the game starts, no peeking except to check answers.

- 1) Put all the coins in the can and place it on the circle marked BANK. Put the players' tokens on START. Give each player 5 pennies to begin with.
- 2) Players take turns moving the number of spaces they roll on the dice. (Use two dice so the game doesn't go too slowly.) Unless your tokens are pretty small, you will probably want to allow only one token per square. Players will have to jump over each other. It's up to you whether to count that hop over another player as one of your actually "hops" or not. Either way is fine as long as everyone agrees to the rules ahead of time and abides by them while playing.
- 3) When a player lands on a space, he looks at the valence number, which is in the upper right corner. If it is a positive number, he takes that many pennies from the bank. If the number is negative, he loses that many pennies and must put them into the bank.
- 4) Certain elements have special features:
  - GASEOUS ELEMENTS (indicated by a cloud shape): extra roll
  - LIQUID ELEMENTS (indicated by a droplet shape): extra roll
  - PRECIOUS METAL: bonus of three pennies (Precious metals include silver, gold, platinum. You may add others to your list if you want to, as long as everyone agrees.)
  - RADIOACTIVE ELEMENTS: The radioactive elements have little "shine" lines around their letter symbols. The player must place a square black shield on the spaces before and after that space, to keep other players "safe." No one can land on a black shield. If other players come past while the shields are in place, they simply hop over all three spaces (the two with the black shields and the one in the middle that has a token sitting on it) and keep going with their turn. Those three spaces do not count at all (they do not use up three hops). Just ignore those three spaces as if they were not there. When it is the radioactive player's turn again, he removes the black shields and simply proceeds with his turn.
  - ELEMENT NAMED AFTER A PERSON OR PLACE: If a player lands on an element that he thinks was named after a person or a place, he may take a 3 penny bonus if he can name that person or place. If he is wrong, he does not get the bonus, but there is no penalty for guessing.
  - LANTHANIDES and ACTINIDES: Don't forget about these rows! After a player lands on lanthanum, he goes down to the lanthanide series. At the end of the row, he hops back up to hafnium. Similarly, after actinium comes thorium. After that row, hop back up to the main table and continue on with rutherfordium. (Often players forget the lanthanides the first time they play the game. If this happens and it's discovered too late to go back, you may want to just have the other players skip the lanthanides also, to make it fair play for everyone.) We don't know much about these rows yet, and they may seem like an annoyance in the game, but we'll find out in chapter 8 how incredibly important some of these are to our modern lifestyle (computers, cell phones, ipads, etc.).
- 5) At any time during the game a player may "make change," trading in pennies for nickels or dimes. The bank needs to have a good supply of pennies all the time, so when that supply gets low, players must make change to restock the bank.
- 6) After all players reach Rf, rutherfordium, the game is over. The player with the most money wins. (But everyone wins if you all learn and have fun!) The game does not go all the way to Oganesson because it is already pushing the patience of many players just to get to Rf (or even to Rn).
- 6) To make the game shorter, end at Radon instead of Rutherfordium.

**NOTE: These lists do not include the elements you can't land on in this game.**

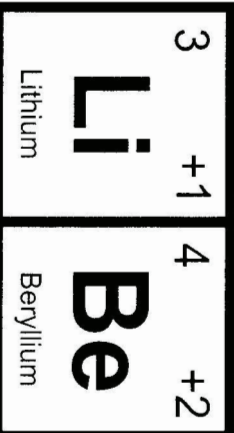
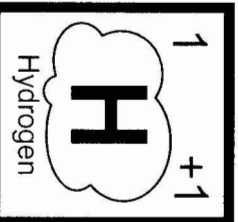
## **ELEMENTS NAMED AFTER PLACES:**

Americium: America  
Berkelium: Berkeley, CA  
Californium: California  
Cerium: the asteroid Ceres  
Erbium: Swedish town of Ytterby  
Europium: Europe  
Francium: France  
Gallium: France (Gall was the ancient name for France)  
Germanium: Germany  
Hafnium: Hafnia is Latin for Copenhagen, Denmark  
Holmium: Stockholm, Sweden  
Neptunium: the planet Neptune  
Palladium: the asteroid Pallas  
Plutonium: the until-recently-a-planet Pluto  
Polonium: Poland  
Rhenium: the Rhine River area of Germany  
Ruthenium: the province of Ruthenia in the Czech Republic  
Scandium: Scandinavia  
Strontium: Scottish town of Strontian  
Tellurium: the planet Earth (the Greek word is Tellus)  
Terbium: the Swedish town of Ytterby  
Thulium: Scandinavia (the ancient name for Scandinavia was Thule)  
Uranium: the planet Uranus  
Ytterbium: the Swedish town of Ytterby  
Yttrium: again, the Swedish town of Ytterby

## **ELEMENTS NAMED AFTER PEOPLE, REAL or MYTHOLOGICAL:**

Cobalt: kobalds (gremlins)  
Curium: Marie Curie, discoverer of radium and polonium  
Einsteinium: Albert Einstein  
Fermium: Enrico Fermi, a physicist during the World War II era  
Gadolinium: Johan Gadolin, a Finnish chemist  
Gallium: Lecoq de Boisbaudran, a 19<sup>th</sup> century chemist (Gallus is Latin for "cock")  
Iridium: Iris, goddess of the rainbow  
Lawrencium: Ernest O. Lawrence, a 20<sup>th</sup> century physicist  
Mendelevium: Dmitri Mendeleev, inventor of the Periodic Table  
Mercury: Mercury, mythological Roman god  
Nickel: the devil  
Niobium: Niobe, the daughter of mythological Greek god Tantalus  
Nobelium: Alfred Nobel, inventor of dynamite, and namesake of the Nobel Prize  
Promethium: Prometheus, mythological Greek god who gave fire to mankind  
Samarium: Vasili Samarsky-Bykhovets, a Russian general  
Tantalum: Tantalus, mythological Greek god  
Tin: Tinia, mythological Etruscan god ("Sn" comes from its Latin name, stannum)  
Thorium: Thor, mythological Norse god of thunder  
Vanadium: Vanadis, mythological Scandinavian goddess

# Start



19	K	+1	20	Ca	+2	21	Sc	+3	22	Ti	+4	23	V	+5	24	Cr	+6	25	Mn	+7	26	Fe	+3	27	Co	+3
Potassium			Calcium			Scandium			Titanium			Vanadium			Chromium			Manganese			Iron			Cobalt		
37	Rb	+1	38	Sr	+2	39	Y	+3	40	Zr	+4	41	Nb	+5	42	Mo	+6	43	Tc	+7	44	Ru	+3	45	Rh	+3
Rubidium			Strontium			Yttrium			Zirconium			Niobium			Molybdenum			Technetium			Ruthenium			Rhodium		

# THE PERIODIC Table Game

Liquid or Gas at Room Temperature > Roll Again

Radioactive > Put up Shields on Either Side

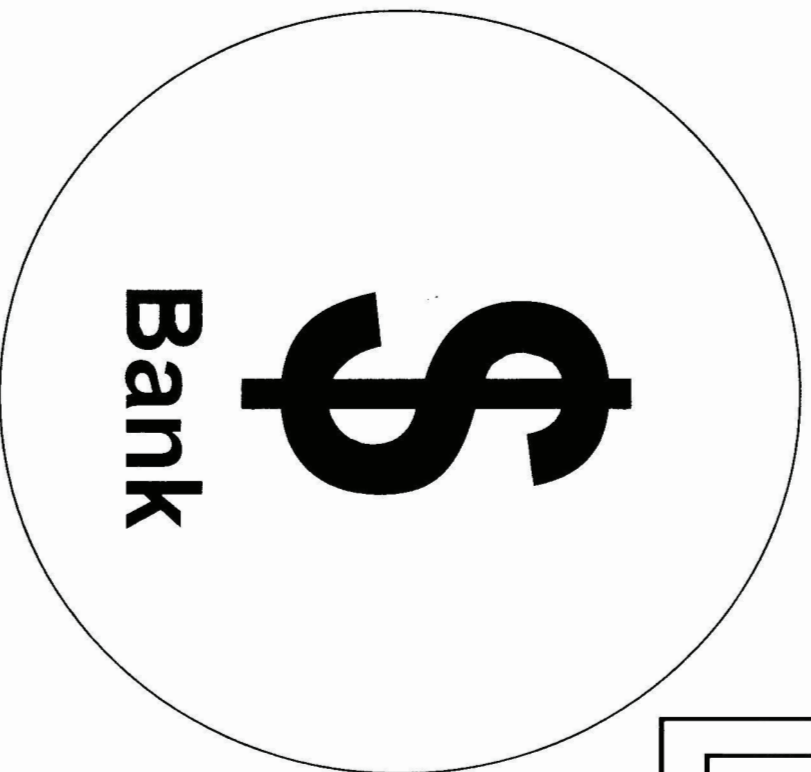
Named After Person or Place > 3 Extra Pennies if You Name It!





55	+1	<b>Cs</b> Cesium	56	+2	<b>Ba</b> Barium	57	+3	<b>La</b> Lanthanum	72	+4	<b>Hf</b> Hafnium	73	+5	<b>Ta</b> Tantalum	74	+6	<b>W</b> Tungsten	75	+7	<b>Re</b> Rhenium	76	+3	<b>Os</b> Osmium	77	+4	<b>Ir</b> Iridium
87	+1	<b>Fr</b> Francium	88	+2	<b>Ra</b> Radium	89	+3	<b>Ac</b> Actinium	104	+4	<b>Rf</b> Rutherfordium	105		<b>Db</b>	106		<b>Sg</b>	107		<b>Bh</b>	108		<b>Hs</b>	109		<b>Mt</b>

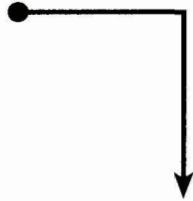
58	+3	<b>Ce</b> Cerium	59	+3	<b>Pr</b> Praseodymium	60	+3	<b>Nd</b> Neodymium	61	+3	<b>Pm</b> Promethium	62	+3	<b>Sm</b> Samarium
90	+4	<b>Th</b> Thorium	91	+5	<b>Pa</b> Protactinium	92	+6	<b>U</b> Uranium	93	+6	<b>Np</b> Neptunium	94	+6	<b>Pu</b> Plutonium



78 +4 <b>Pt</b> Platinum	79 +3 <b>Au</b> Gold	80 +2 <b>Hg</b> Mercury	81 +3 <b>Tl</b> Thallium	82 +4 <b>Pb</b> Lead	83 -3 <b>Bi</b> Bismuth	84 / / -2 <b>Po</b> Polonium	85 / / -1 <b>At</b> Astatine	86 / / 0 <b>Rn</b> Radon
110 <b>Ds</b>	111 <b>Rg</b>	112 <b>Cn</b>	113 <b>Nh</b>	114 <b>Fl</b>	115 <b>Mc</b>	116 <b>Lv</b>	117 <b>Ts</b>	118 <b>Og</b>

Go to 72 Hf 

63 +3 <b>Eu</b> Europium	64 +3 <b>Gd</b> Gadolinium	65 +3 <b>Tb</b> Terbium	66 +3 <b>Dy</b> Dysprosium	67 +3 <b>Ho</b> Holmium	68 +3 <b>Er</b> Erbium	69 +3 <b>Tm</b> Thulium	70 +3 <b>Yb</b> Ytterbium	71 +3 <b>Lu</b> Lutetium
95 +6 <b>Am</b> Americium	96 +4 <b>Cm</b> Curium	97 +4 <b>Bk</b> Berkelium	98 +4 <b>Cf</b> Californium	99 +3 <b>Es</b> Einsteinium	100 +3 <b>Fm</b> Fermium	101 +3 <b>Md</b> Mendelevium	102 +3 <b>No</b> Nobelium	103 +3 <b>Lr</b> Lawrencium

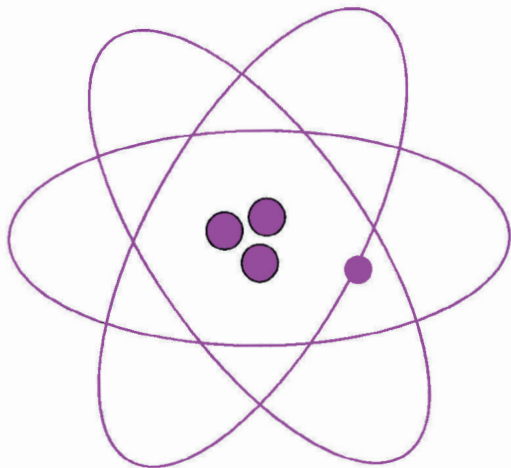
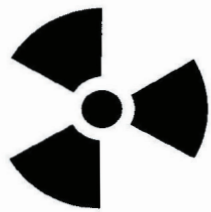


Go to 104 Rf





# Radioactive Shields

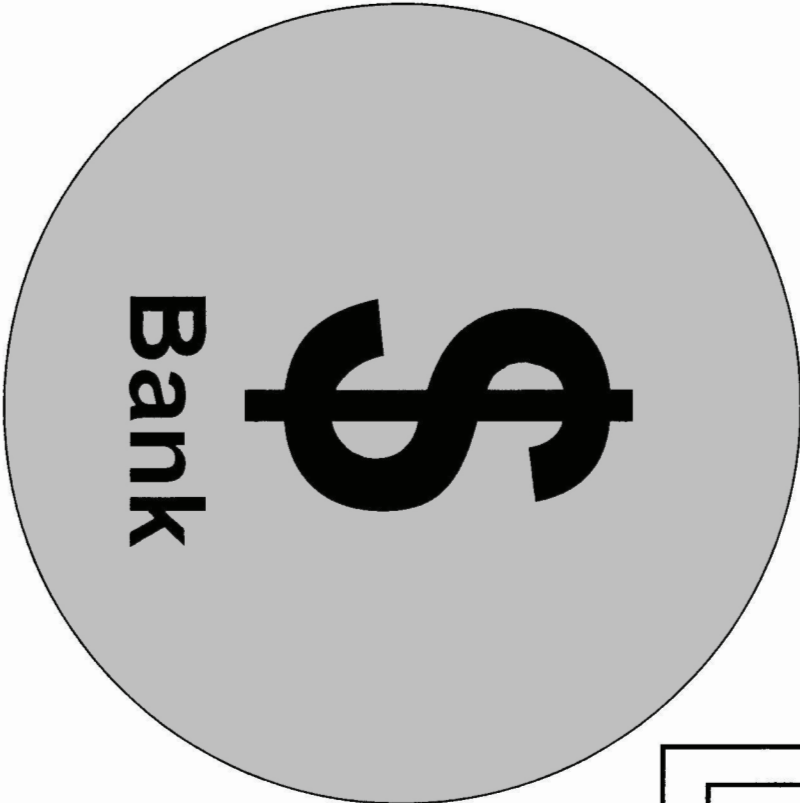


28	+3	<b>Ni</b> Nickel	29	+2	<b>Cu</b> Copper	30	+2	<b>Zn</b> Zinc	31	+3	<b>Ga</b> Gallium	32	+4	<b>Ge</b> Germanium	33	-3	<b>As</b> Arsenic	34	-2	<b>Se</b> Selenium	35	-1	<b>Br</b> Bromine	36	0	<b>Kr</b> Krypton									
46	+4	<b>Pd</b> Palladium	47	+1	<b>Ag</b> Silver	48	+2	<b>Cd</b> Cadmium	49	+3	<b>In</b> Indium	50	+4	<b>Sn</b> Tin	51	-3	<b>Sb</b> Antimony	52	-2	<b>Te</b> Tellurium	53	-1	<b>I</b> Iodine	54	0	<b>Xe</b> Xenon									
5	+3	<b>B</b> Boron	6	+4	<b>C</b> Carbon	7	-3	<b>N</b> Nitrogen	8	-2	<b>O</b> Oxygen	9	-1	<b>F</b> Fluorine	10	0	<b>Ne</b> Neon	13	+3	<b>Al</b> Aluminum	14	+4	<b>Si</b> Silicon	15	-3	<b>P</b> Phosphorus	16	-2	<b>S</b> Sulfur	17	-1	<b>Cl</b> Chlorine	18	0	<b>Ar</b> Argon



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110 <b>Ds</b>	111 <b>Rg</b>	112 <b>Cn</b>	113 <b>Nh</b>	114 <b>Fl</b>	115 <b>Mc</b>	116 <b>Lv</b>	117 <b>Ts</b>	118 <b>Og</b>

Go to 72 Hf →

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95 <b>Am</b> Americium +6	96 <b>Cm</b> Curium +4	97 <b>Bk</b> Berkelium +4	98 <b>Cf</b> Californium +4	99 <b>Es</b> Einsteinium +3	100 <b>Fm</b> Fermium +3	101 <b>Md</b> Mendelevium +3	102 <b>No</b> Nobelium +3	103 <b>Lr</b> Lawrencium +3

Go to 104 Rf →