

The Nuts and Bolts of Periodic Tables

Or screwing around with elements

Introduction:

By organizing fasteners by their properties, students are introduced to the basis of the periodic tables of elements.

Materials:

An assortment of Nuts and bolts (or other kinds of fasteners see optional materials)

At least 20 different kinds of fasteners

You will need at least one of each kind of fastener per

Teacher Assembly:

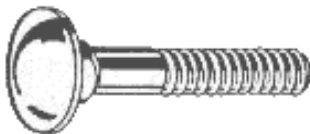
Organize an assortment of fasteners into packets. Each packet should contain at least one of each kind of fastener, then remove one fastener from each packet. Number the packets and keep track of the packet and the item removed.

To do and notice:

Working in pairs, have students organize their packets of fasteners as though they are managers of a hardware store. Fasteners can be organized into a table. This can be done right on their desk. Students need to agree on the reasons for their organizational scheme.

Things and properties to think about when sorting and organizing fasteners:

Color, shape, slot type (Phillips, Allen wrench, flat slot...), length, thread type (machine or wood threads), points. Nuts vs. bolts, hex or square....



After the tables have been created, ask them if there are any "holes" or missing slots in their table. If there are, what would the missing fastener look like? Hand the students the fastener that was removed from their packet. Ask them where they would put it.

What's going on:

Hardware stores need to organize their fasteners so that customers can easily find and purchase them.

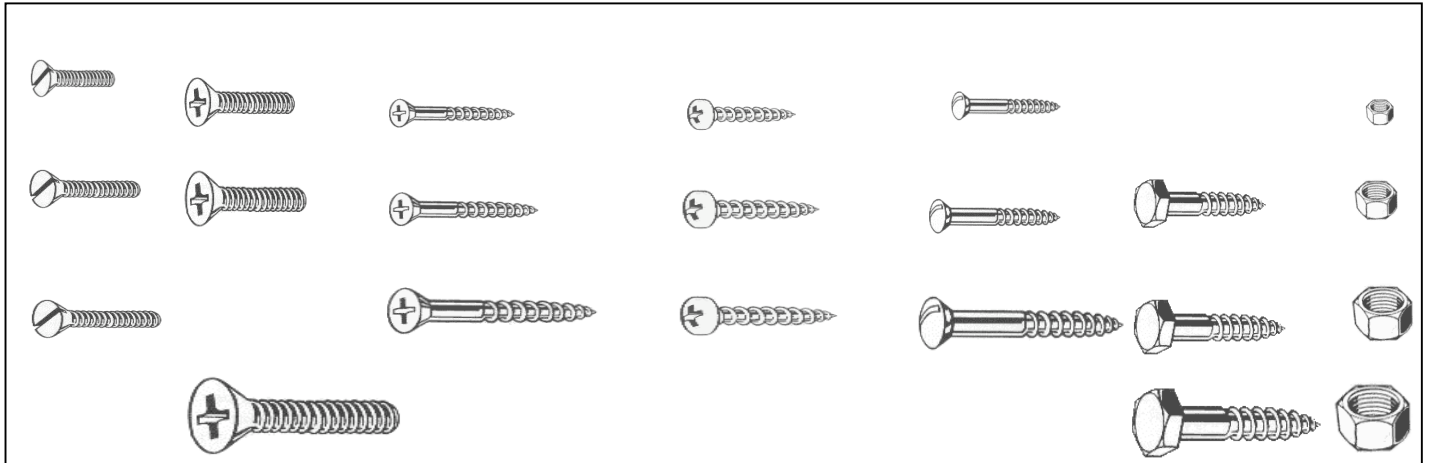
In the case of fasteners, they can be organized by their physical properties and by how they interact with one another, like how a specific bolt interacts with a specific nut.



Elements can be arranged the same way.

In the late 1860's DMITRI MENDELEEV organized all of the 63 known elements into a table. In this periodic table he arranged elements based on atomic, physical and chemical properties. There were some gaps in his table and he correctly predicted the existence of these missing elements.

Periodic table of Fasteners



Periodic Table of Elements

Period	Group**																		
	1 IA 1A	2 IIA 2A											13 IIIA 3A	14 IVA 4A	15 VA 5A	16 VIA 6A	17 VIIA 7A	18 VIIIA 8A	
1	H 1.008																		He 4.003
2	Li 6.941	Be 9.012											B 10.81	C 12.01	N 14.01	O 16.00	F 19.00	Ne 20.18	
3	Na 22.99	Mg 24.31	3 IIIB 3B	4 IVB 4B	5 VB 5B	6 VIB 6B	7 VIIB 7B	8 VIII 8	9 VIII 8	10 VIII 8	11 IB 1B	12 IIB 2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95	
4	K 39.10	Ca 40.08	Sc 44.96	Ti 47.88	V 50.94	Cr 52.00	Mn 54.94	Fe 55.85	Co 58.47	Ni 58.69	Cu 63.55	Zn 65.39	Ga 69.72	Ge 72.59	As 74.92	Se 78.96	Br 79.90	Kr 83.80	
5	Rb 85.47	Sr 87.62	Y 88.91	Zr 91.22	Nb 92.91	Mo 95.94	Tc 98	Ru 101.1	Rh 102.9	Pd 106.4	Ag 107.9	Cd 112.4	In 114.8	Sn 118.7	Sb 121.8	Te 127.6	I 126.9	Xe 131.3	
6	Cs 132.9	Ba 137.3	La* 138.9	Hf 178.5	Ta 180.9	W 183.9	Re 186.2	Os 190.2	Ir 190.2	Pt 195.1	Au 197.0	Hg 200.5	Tl 204.4	Pb 207.2	Bi 209.0	Po (210)	At (210)	Rn (222)	
7	Fr (223)	Ra (226)	Ac~ (227)	Rf (257)	Db (260)	Sg (263)	Bh (262)	Hs (265)	Mt (268)	--- O	--- O	--- O	--- O	--- O	--- O	--- O	--- O	--- O	

Lanthanide Series**	Ce 140.1	Pr 140.9	Nd 144.2 (147)	Pm (147)	Sm 150.4 (150)	Eu 152.0 (152)	Gd 157.3 (157)	Tb 158.9 (159)	Dy 162.5 (163)	Ho 164.9 (165)	Er 167.3 (167)	Tm 168.9 (169)	Yb 173.0 (173)	Lu 175.0 (175)
Actinide Series--	Th 232.0 (232)	Pa 231 (231)	U 238 (238)	Np 237 (237)	Pu 244 (244)	Am 243 (243)	Cm 247 (247)	Bk 247 (247)	Cf 251 (251)	Es 252 (252)	Fm 257 (257)	Md 258 (258)	No 259 (259)	Lr 262 (262)

Optional assessment:

You may want your students to draw and write about their table. They should include the reasons for selecting the patterns and the organizational scheme they did as well as how they decided where their missing fastener should go.

Optional material:

- Other kinds of materials to use:
- Buttons (i.e. shirt and coat)
- Containers (i.e. Cans, bottles, and jars)
- Candy (m and m's, skittles, etc.)



Image Reference: <http://www.boltdepot.com>, <http://www.aerobutton.com>, <http://pearl1.lanl.gov/periodic/default.htm>