



## The Periodic Table



World's Largest: Wayne State, 10/23/2019

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## The Periodic Table



Periodic – having repeated cycles

First proposed by Mendeleyev, a Russian chemist in 1869

Arranged 69 known elements by weight and chemical properties

Had 4 empty spaces, 3 of which he predicted

eka-Aluminum (Gallium)

eka-Boron (Scandium)

eka-Silicon (Germanium)

Eka = Samarian for “undiscovered”

The 4<sup>th</sup>, technetium was not discovered until the 1920's

Ordered Te & I by chemical properties, not weight

Established state standards for alcohol content in Vodka



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## Chemistry Department Periodic Table

[1]																		[118]																	
1																		2																	
H																		He																	
3																		4																	
Li																		Be																	
6.341																		9.012																	
11																		12																	
Na																		Mg																	
22.99																		24.31																	
13																		14																	
Al																		Si																	
26.98																		28.09																	
15																		16																	
P																		S																	
30.97																		32.06																	
17																		18																	
Cl																		Ar																	
35.45																		39.95																	
19																		20																	
K																		Ca																	
39.09																		40.08																	
21																		22																	
Sc																		Ti																	
44.96																		47.88																	
23																		24																	
V																		Cr																	
50.94																		52.00																	
25																		26																	
Mn																		Fe																	
54.94																		55.85																	
27																		28																	
Co																		Ni																	
58.93																		58.93																	
29																		30																	
Cu																		Zn																	
63.55																		65.38																	
31																		32																	
Ga																		Ge																	
69.72																		72.64																	
33																		34																	
As																		Se																	
74.92																		78.96																	
35																		36																	
Br																		Kr																	
79.90																		83.80																	
37																		38																	
Rb																		Sr																	
85.47																		87.62																	
39																		40																	
Y																		Zr																	
88.91																		91.22																	
41																		42																	
Nb																		Mo																	
92.91																		95.94																	
43																		44																	
Tc																		Ru																	
98.91																		101.1																	
45																		46																	
Rh																		Pd																	
101.1																		106.4																	
47																		48																	
Ag																		Cd																	
107.8																		112.4																	
49																		50																	
In																		Sn																	
114.8																		117.4																	
51																		52																	
Sb																		Te																	
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53																		54																	
I																		Xe																	
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55																		56																	
Cs																		Ba																	
132.9																		137.3																	
57																		58																	
La																		Ce																	
138.9																		140.1																	
59																		60																	
Pr																		Nd																	
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61																		62																	
Pm																		Sm																	
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63																		64																	
Eu																		Gd																	
151.9																		157.3																	
65																		66																	
Tb																		Dy																	
158.9																		162.5																	
67																		68																	
Ho																		Er																	
164.9																		167.3																	
69																		70																	
Tm																		Yb																	
168.9																		173.0																	
71																		72																	
Lu																		Hf																	
174.9																		178.5																	
73																		74																	
Ta																		W																	
180.9																		183.8																	
75																		76																	
Re																		Os																	
186.2																		193.2																	
77																		78																	
Ir																		Pt																	
192.2																		195.1																	
79																		80																	
Au																		Hg																	
196.9																		200.6																	
81																		82																	
Tl																		Pb																	
204.4																		207.2																	
83																		84																	
Bi																		Po																	
208.9																		209.0																	
85																		86																	
At																		Fr																	
210.0																		223.0																	
87																		88																	
Ra																		Ac																	
226.0																		227.0																	
89																		90																	
Th																		Pa																	
232.0																		231.0																	
91																		92																	
U																		Np																	
238.0																		237.0																	
93																		94																	
Pu																		Am																	
244.0																		243.0																	
95																		96																	
Cm																		Bk																	
247.0																		247.0																	
97																		98																	
Cf																		Es																	
251.0																		252.0																	
99																		100																	
Fm																		Md																	
257.0																		258.0																	
101																		102																	
No																		Lr																	
259.0																		261.0																	
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261.0																		263.0																	
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Mc																		Lv																	
263.0																		265.0																	
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459.																																			

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元素周期表

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

1 H 2 He

3 Li 4 Be 5 B 6 C 7 N 8 O 9 F 10 Ne

11 Na 12 Mg 13 Al 14 Si 15 P 16 S 17 Cl 18 Ar

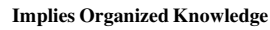
19 K 20 Ca 21 Sc 22 Ti 23 V 24 Cr 25 Mn 26 Fe 27 Co 28 Ni 29 Cu 30 Zn 31 Ga 32 Ge 33 As 34 Se 35 Br 36 Kr

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

55 Cs 56 Ba 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 71 Lu 72 Hf 73 Ta 74 W 75 Re 76 Os 77 Ir 78 Pt 79 Au 80 Hg 81 Tl 82 Pb 83 Bi 84 Po 85 At 86 Rn

87 Fr 88 Ra 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 103 Lr 104 Rf 105 Db 106 Sg 107 Bh 108 Hs 109 Mt 110 Ds 111 Rg 112 Cn 113 Nh 114 Fl 115 Mc 116 Lv 117 Ts 118 Og

119 Uue 120 Uub 121 Uut 122 Uuq 123 Uup 124 Uuh 125 Uuq 126 Uup 127 Uuh 128 Uuq 129 Uup 130 Uuh 131 Uuq 132 Uup 133 Uuh 134 Uuq 135 Uup 136 Uuh 137 Uuq 138 Uup 139 Uuh 140 Uuq 141 Uup 142 Uuh 143 Uuq 144 Uup 145 Uuh 146 Uuq 147 Uup 148 Uuh 149 Uuq 150 Uup 151 Uuh 152 Uuq 153 Uup 154 Uuh 155 Uuq 156 Uup 157 Uuh 158 Uuq 159 Uup 160 Uuh 161 Uuq 162 Uup 163 Uuh 164 Uuq 165 Uup 166 Uuh 167 Uuq 168 Uup 169 Uuh 170 Uuq 171 Uup 172 Uuh 173 Uuq 174 Uup 175 Uuh 176 Uuq 177 Uup 178 Uuh 179 Uuq 180 Uup 181 Uuh 182 Uuq 183 Uup 184 Uuh 185 Uuq 186 Uup 187 Uuh 188 Uuq 189 Uup 190 Uuh 191 Uuq 192 Uup 193 Uuh 194 Uuq 195 Uup 196 Uuh 197 Uuq 198 Uup 199 Uuh 200 Uuq 201 Uup 202 Uuh 203 Uuq 204 Uup 205 Uuh 206 Uuq 207 Uup 208 Uuh 209 Uuq 210 Uup 211 Uuh 212 Uuq 213 Uup 214 Uuh 215 Uuq 216 Uup 217 Uuh 218 Uuq 219 Uup 220 Uuh 221 Uuq 222 Uup 223 Uuh 224 Uuq 225 Uup 226 Uuh 227 Uuq 228 Uup 229 Uuh 230 Uuq 231 Uup 232 Uuh 233 Uuq 234 Uup 235 Uuh 236 Uuq 237 Uup 238 Uuh 239 Uuq 240 Uup 241 Uuh 242 Uuq 243 Uup 244 Uuh 245 Uuq 246 Uup 247 Uuh 248 Uuq 249 Uup 250 Uuh 251 Uuq 252 Uup 253 Uuh 254 Uuq 255 Uup 256 Uuh 257 Uuq 258 Uup 259 Uuh 260 Uuq 261 Uup 262 Uuh 263 Uuq 264 Uup 265 Uuh 266 Uuq 267 Uup 268 Uuh 269 Uuq 270 Uup 271 Uuh 272 Uuq 273 Uup 274 Uuh 275 Uuq 276 Uup 277 Uuh 278 Uuq 279 Uup 280 Uuh 281 Uuq 282 Uup 283 Uuh 284 Uuq 285 Uup 286 Uuh 287 Uuq 288 Uup 289 Uuh 290 Uuq 291 Uup 292 Uuh 293 Uuq 294 Uup 295 Uuh 296 Uuq 297 Uup 298 Uuh 299 Uuq 300 Uup 301 Uuh 302 Uuq 303 Uup 304 Uuh 305 Uuq 306 Uup 307 Uuh 308 Uuq 309 Uup 310 Uuh 311 Uuq 312 Uup 313 Uuh 314 Uuq 315 Uup 316 Uuh 317 Uuq 318 Uup 319 Uuh 320 Uuq 321 Uup 322 Uuh 323 Uuq 324 Uup 325 Uuh 326 Uuq 327 Uup 328 Uuh 329 Uuq 330 Uup 331 Uuh 332 Uuq 333 Uup 334 Uuh 335 Uuq 336 Uup 337 Uuh 338 Uuq 339 Uup 340 Uuh 341 Uuq 342 Uup 343 Uuh 344 Uuq 345 Uup 346 Uuh 347 Uuq 348 Uup 349 Uuh 350 Uuq 351 Uup 352 Uuh 353 Uuq 354 Uup 355 Uuh 356 Uuq 357 Uup 358 Uuh 359 Uuq 360 Uup 361 Uuh 362 Uuq 363 Uup 364 Uuh 365 Uuq 366 Uup 367 Uuh 368 Uuq 369 Uup 370 Uuh 371 Uuq 372 Uup 373 Uuh 374 Uuq 375 Uup 376 Uuh 377 Uuq 378 Uup 379 Uuh 380 Uuq 381 Uup 382 Uuh 383 Uuq 384 Uup 385 Uuh 386 Uuq 387 Uup 388 Uuh 389 Uuq 390 Uup 391 Uuh 392 Uuq 393 Uup 394 Uuh 395 Uuq 396 Uup 397 Uuh 398 Uuq 399 Uup 400 Uuh 401 Uuq 402 Uup 403 Uuh 404 Uuq 405 Uup 406 Uuh 407 Uuq 408 Uup 409 Uuh 410 Uuq 411 Uup 412 Uuh 413 Uuq 414 Uup 415 Uuh 416 Uuq 417 Uup 418 Uuh 419 Uuq 420 Uup 421 Uuh 422 Uuq 423 Uup 424 Uuh 425 Uuq 426 Uup 427 Uuh 428 Uuq 429 Uup 430 Uuh 431 Uuq 432 Uup 433 Uuh 434 Uuq 435 Uup 436 Uuh 437 Uuq 438 Uup 439 Uuh 440 Uuq 441 Uup 442 Uuh 443 Uuq 444 Uup 445 Uuh 446 Uuq 447 Uup 448 Uuh 449 Uuq 450 Uup 451 Uuh 452 Uuq 453 Uup 454 Uuh 455 Uuq 456 Uup 457 Uuh 458 Uuq 459 Uup 460 Uuh 461 Uuq 462 Uup 463 Uuh 464 Uuq 465 Uup 466 Uuh 467 Uuq 468 Uup 469 Uuh 470 Uuq 471 Uup 472 Uuh 473 Uuq 474 Uup 475 Uuh 476 Uuq 477 Uup 478 Uuh 479 Uuq 480 Uup 481 Uuh 482 Uuq 483 Uup 484 Uuh 485 Uuq 486 Uup 487 Uuh 488 Uuq 489 Uup 490 Uuh 491 Uuq 492 Uup 493 Uuh 494 Uuq 495 Uup 496 Uuh 497 Uuq 498 Uup 499 Uuh 500 Uuq 501 Uup 502 Uuh 503 Uuq 504 Uup 505 Uuh 506 Uuq 507 Uup 508 Uuh 509 Uuq 510 Uup 511 Uuh 512 Uuq 513 Uup 514 Uuh 515 Uuq 516 Uup 517 Uuh 518 Uuq 519 Uup 520 Uuh 521 Uuq 522 Uup 523 Uuh 524 Uuq 525 Uup 526 Uuh 527 Uuq 528 Uup 529 Uuh 530 Uuq 531 Uup 532 Uuh 533 Uuq 534 Uup 535 Uuh 536 Uuq 537 Uup 538 Uuh 539 Uuq 540 Uup 541 Uuh 542 Uuq 543 Uup 544 Uuh 545 Uuq 546 Uup 547 Uuh 548 Uuq 549 Uup 550 Uuh 551 Uuq 552 Uup 553 Uuh 554 Uuq 555 Uup 556 Uuh 557 Uuq 558 Uup 559 Uuh 560 Uuq 561 Uup 562 Uuh 563 Uuq 564 Uup 565 Uuh 566 Uuq 567 Uup 568 Uuh 569 Uuq 570 Uup 571 Uuh 572 Uuq 573 Uup 574 Uuh 575 Uuq 576 Uup 577 Uuh 578 Uuq 579 Uup 580 Uuh 581 Uuq 582 Uup 583 Uuh 584 Uuq 585 Uup 586 Uuh 587 Uuq 588 Uup 589 Uuh 590 Uuq 591 Uup 592 Uuh 593 Uuq 594 Uup 595 Uuh 596 Uuq 597 Uup 598 Uuh 599 Uuq 600 Uup 601 Uuh 602 Uuq 603 Uup 604 Uuh 605 Uuq 606 Uup 607 Uuh 608 Uuq 609 Uup 610 Uuh 611 Uuq 612 Uup 613 Uuh 614 Uuq 615 Uup 616 Uuh 617 Uuq 618 Uup 619 Uuh 620 Uuq 621 Uup 622 Uuh 623 Uuq 624 Uup 625 Uuh 626 Uuq 627 Uup 628 Uuh 629 Uuq 630 Uup 631 Uuh 632 Uuq 633 Uup 634 Uuh 635 Uuq 636 Uup 637 Uuh 638 Uuq 639 Uup 640 Uuh 641 Uuq 642 Uup 643 Uuh 644 Uuq 645 Uup 646 Uuh 647 Uuq 648 Uup 649 Uuh 650 Uuq 651 Uup 652 Uuh 653 Uuq 654 Uup 655 Uuh



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The Periodic Table of Dessert

S																		B																	
M	Sa																	A	V	F	O	Lt													
Ck	Cl																	Cl	Cn	Ct	Ss	Cf													
Sm	N	Pn	Ar	Pl	F	W											Mo	Ct	Al	P	Cc														
Hs	Cd	Cl	Mf	An	L	R	Fg											Tm	M	Pj	Mw	Ca	Va												
Bs	Cd	Cf	Mf	An	L	R	Fg											Tm	M	Pj	Mw	Ca	Va												
Bs	Cd	Cf	Mf	An	L	R	Fg											Tm	M	Pj	Mw	Ca	Va												
Bs	Cd	Cf	Mf	An	L	R	Fg											Tm	M	Pj	Mw	Ca	Va												
Mo	G																	Fc	D	J	Gc	Rl													
L	L	O	A	Bs	At	Rb	Bs	Co	Sb																										
Ma	To	B	Wh	Bs	Rm	Cm	Cm	Fr	Cq																										



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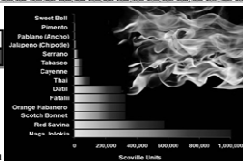
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# Science Fiction Periodic Chart

PERIODIC TABLE OF SCI-FI FILM AND TELEVISION

I II III IV V VI VII VIII IX X XI XII XIII XIV

1 **Tos** **II** **Br**

2 **Tas** **Anh** **█** **█** **█** **█** **█** **█** **█** **█** **█** **█** **█** **█** **█** **Br**

3 **Tng** **Esb** **█** **█** **█** **█** **█** **█** **█** **█** **█** **█** **█** **█** **█** **Br**

4 **Voy** **Fj** **Ani** **Tnn** **Tm** **Tz** **Hal** **Bs** **XFi** **S6m** **Iron** **Tns** **Sol** **Los**

5 **Ds9** **Pm** **As** **Tm2** **Bf** **2061** **Gal** **Mx** **Chin** **Qu** **Go** **M** **Lgn**

6 **Ent** **7c** **Ar** **Tm3** **Tw** **Sft** **2067** **Bsg** **Ric** **Bic** **Si** **Av** **Gam**

7 **Reb** **Sth** **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

8 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

9 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

10 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

11 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

12 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

13 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

14 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

15 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

16 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

17 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

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21 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

22 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

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24 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

25 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

26 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

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33 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

34 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

35 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

36 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

37 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

38 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

39 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

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42 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

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44 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

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47 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

48 **Ar** **Tm3** **Pr** **Lo** **3001** **Ric** **Erh** **Xo** **InJ** **Inv**

49 **Ar** **Tm3</**

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The image displays a periodic table of elements where each element is shaded according to its biological function. The elements are arranged in a circular format, with the central element being Hydrogen (H). The elements are categorized into six groups based on their biological function:

- Major, essential, all life:** Shaded light gray.
- Major cations, all life:** Shaded medium gray.
- Major anions, all life:** Shaded dark gray.
- Essential, trace, all life:** Shaded very dark gray.
- Specialized uses, some life:** Shaded white.
- May be bound, transported, reduced, and/or methylated:** Shaded light gray with a diagonal line.
- Inert or unknown biological function:** Shaded white.

The elements are labeled with their chemical symbols and Roman numerals indicating their group. The elements are arranged in a circular format, with the central element being Hydrogen (H). The elements are categorized into six groups based on their biological function:

**Dietary mineral**

The diagram also includes a smaller periodic table titled "Dietary mineral" which shows the distribution of macrominerals and trace minerals. The legend indicates that elements shaded light gray are macrominerals and elements shaded dark gray are trace minerals.

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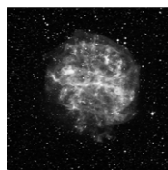
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### Elements > Fe Only From Supernova Events

## Red Giants

## Hot Blue Stars

### \* Supernovas



The screenshot shows the 'Top Heavy Fusion' game interface. At the top, there are two input fields: 'Top Heavy Fusion' and 'elementary fusion'. Below these, there are four reaction buttons: 'merging neutron stars', 'exploding massive stars', 'dying brownish stars', and 'exploding white dwarfs'. The main grid contains various elements and their fusion products, with some cells highlighted in red.

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**63 Known Elements**  
**No Rare (Noble) Gases**

	Ti-50	Zr-50	Y-184
	V-51	Nb-34	Ta-182
	Cr-52	Mo-36	W-186
	Mn-55	Rh-104	Pd-137
	Fe-56	Ru-104	Ir-193
	Ni-Co-59	Pt-196	Os-193
	Cu-64	Au-197	Hg-202
9.0	Mg-24	Zn-66	Cd-112
11	Al-27	7-58	Co-116
12	Si-28	7-76	As-116
14	P-31	As-73	Se-129
16	S-32	Se-74	Te-128
18	Cl-35	Br-80	1-127
23	K-39	Rb-85	Cs-132
	Ca-40	Str-87	Ba-137
	7-61	Ce-92	La-137
	7-66	La-91	
	7-68	Di-95	
	7-75	Th-197	



### Arranged by Atomic Weight

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**Periodic = repeating**

**Elements ordered by Z show “repeating properties”**

**Period: rows ~ similar trends**

**Groups: columns ~ similar chemical properties**

**Groups = chemical families**



Figure 1 shows a periodic table of elements arranged in a 7x19 grid. The columns are labeled 'Group' (1 to 19) and the rows are labeled 'Period' (1 to 7). The elements are represented by their chemical symbols. The grid includes the following elements:

Period \ Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	H	He																	
2	Li	Be	B	C	N	O	F	Ne											
3	Na	Mg	Al	Si	P	S	Cl	Ar											
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
7	Fr	Ra	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		

The elements are color-coded: Metals are in shades of gray, non-metals are in shades of green, and noble gases are in shades of blue. The f-block elements (lanthanides and actinides) are shown at the bottom of the grid, labeled 'Lanthanides' and 'Actinides' respectively.

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## PERIODIC TABLE OF THE ELEMENTS

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## TABLE OF PERIODIC PROPERTIES OF THE ELEMENTS

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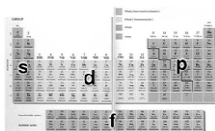
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[illegible]

**Column Labels:**  
**A & B**  
**Numerals**



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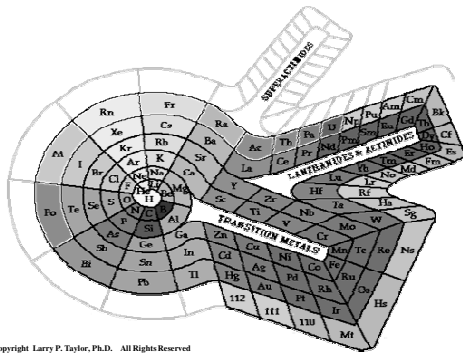
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### A Circular Periodic Table



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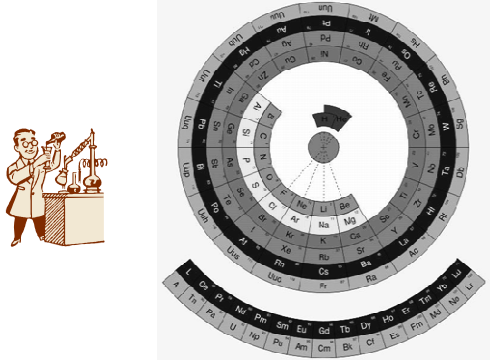
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### Another Circular Periodic Table



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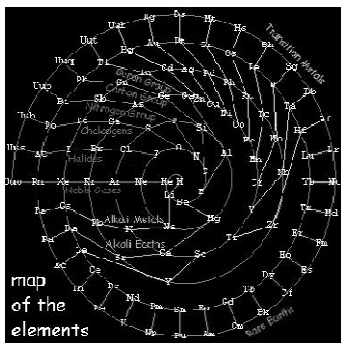
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### Elemental Spiral Map



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### Periodic Table - Hexes

Periodic table gets a makeover

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### Periodic Table - Planar

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### Periodic Table - Pyramid

† For the names of elements 104-112, see Table 27.

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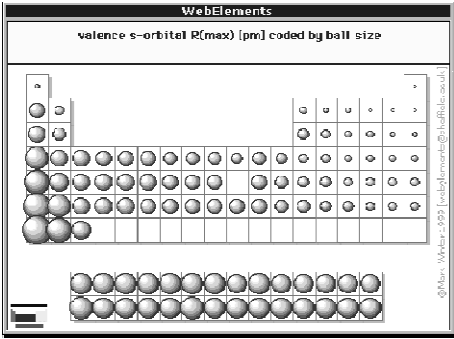
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### The Periodic Table- Atomic Size



Atomic size increases as you descend within a family

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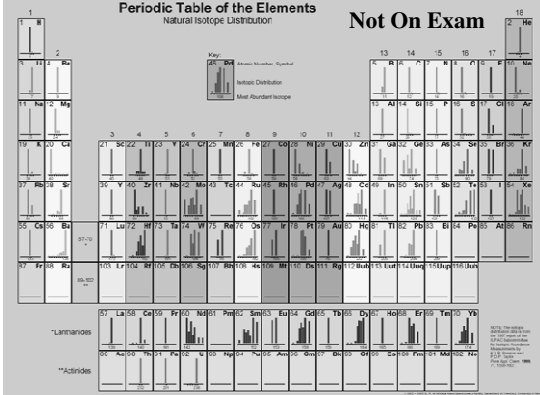
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### Periodic Table of the Elements

Natural isotope Distribution



Not On Exam

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### The Periodic Table Notation

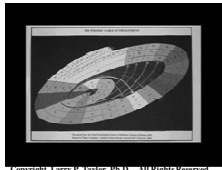
Placement of data at publisher's option

Mass  
Always greater

**16** ← Z

**S** ← Symbol

**32.07** ← AMU (weighted)



*Isotope information not given*

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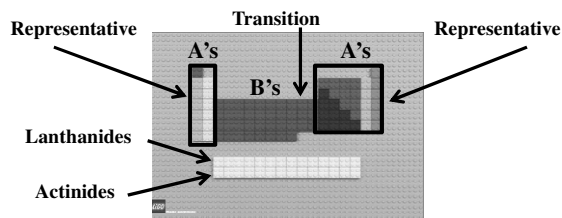
## The Periodic Table

**Representative Elements: “A” groups (Edges)**

**Transition Elements: “B” groups (Middle)**

**Lanthanides: #58 - #71 (Bottom - upper)**

**Actinides: #90 - #103 (Bottom - lower)**



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## The Periodic Table - Families

**Group 1A (1): Alkali Metals**

**Group 2A (2): Alkaline Earths**

**Group 7A (17): Halogens**

**Group 8A (18): Noble (Inert, Rare) Gases**



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## 3 Categories: of Elements

**Metals**  
(left of staircase)

**Metalloids**  
(staircase)

**Nonmetals**  
(right of staircase)

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## Metals - Left Side Periodic Table

Metallic shine or luster

Flexible

Solids (mostly) @ room temp

Ductile - can be drawn into wires

Malleable - can be pounded into thin sheets

Conduct heat & electricity



## Metals

Most Elements (> 80)

Beyond Iron:

“Heavy Metals”

More Metallic

Periodic Table of the Elements

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## Nonmetals - Right Side Periodic Table

No shine ~ variable colors

Brittle, hard (when solid)

Mostly gases @ room temperature

Not malleable

Not ductile

Poor conductors



More Non-metallic

Periodic Table of the Elements

## Non-Metals

17 or 18 Elements

At has some metallic,  
some metalloid, and  
mostly halide properties

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## Metalloids (Semi-Metals) – “Staircase”

Properties (metallic or nonmetallic) depend on environment

Semi-conductors

good conductor at high T

poor conductor at low T

B Boron

Si Silicon

Ge Germanium

As Arsenic

Sb Antimony

Te Tellurium

Po Polonium ?

At Astatine ??

6, 7, or 8 Elements

At on some, Most consider At a halide



## Staircase

Periodic Table of the Elements

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Group 1A (1):alkali metals  
Group 2A (2):alkaline earths  
Group 7A (17): halogens  
Group 8A (18): noble (inert, rare) gases  
Representative (1-2;13-18) : The “A” Groups (the Edges)  
Transition Metals (3-12): The “B” Groups (the Center)  
Metalloids: “Staircase” → B, Si, Ge, As, Sb, Te, Po  
Lanthanides = upper, of lower rows  
Actinides = lower, of lower row

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Common Elements								
Atomic Number	Symbol	Element	Atomic Number	Symbol	Element	Atomic Number	Symbol	Element
1	H	Hydrogen	11	Na	Sodium	19	K	Potassium
2	He	Helium	14	Si	Silicon	29	Cu	Copper
3	Li	Lithium	15	P	Phosphorus	30	Zn	Zinc
4	B	Boron	16	S	Sulfur	35	Br	Bromine
5	C	Carbon	17	Cl	Chlorine	36	Kr	Krypton
6	N	Nitrogen	18	Ar	Argon	37	Sr	Strontium
7	O	Oxygen	19	K	Potassium	40	Sa	Sr
8	F	Fluorine	20	Ca	Calcium	43	Ti	Titanium
9	F	Fluorine	21	Ca	Calcium	46	Ba	Barium
10	Ne	Neon	23	Mn	Manganese	60	Pb	Lead
11	Na	Sodium	26	Fe	Iron	82	Hg	Mercury
12	Mg	Magnesium	27	Co	Cobalt			

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## Slightly Extreme Learning Aids



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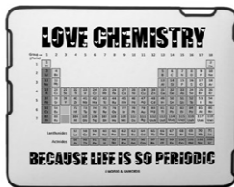
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Sodium 11 Na 22.99	Sodium 11 Na 22.99	Sodium 11 Na 22.99	Sodium 11 Na 22.99	Sodium 11 Na 22.99	Sodium 11 Na 22.99
Magnesium 12 Mg 24.30	Magnesium 12 Mg 24.30	Magnesium 12 Mg 24.30	Magnesium 12 Mg 24.30	Magnesium 12 Mg 24.30	Magnesium 12 Mg 24.30
Aluminum 13 Al 26.98	Aluminum 13 Al 26.98	Aluminum 13 Al 26.98	Aluminum 13 Al 26.98	Aluminum 13 Al 26.98	Aluminum 13 Al 26.98
Silicon 14 Si 28.09	Silicon 14 Si 28.09	Silicon 14 Si 28.09	Silicon 14 Si 28.09	Silicon 14 Si 28.09	Silicon 14 Si 28.09

how they REALLY  
made the  
periodic table

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