

THE QUARKS CUP

Summary of Elements Which Violate Madelung's Rule

Case	Element	Electron Configuration predicted by Madelung's rule	Actual electron configuration
1	chromium 24 Cr	[Ar] 3d ⁴ 4s ²	[Ar] 3d ⁵ 4s ¹
2	copper 29 Cu	[Ar] 3d ⁹ 4s ²	[Ar] 3d ¹⁰ 4s ¹
3	chromium 41 Nb	[Kr] 4d ³ 5s ²	[Kr] 4d ⁴ 5s ¹
4	molybdenum 42 Mb	[Kr] 4d ⁴ 5s ²	[Kr] 4d ⁵ 5s ¹
5	ruthenium 44 Ru	[Kr] 4d ⁶ 5s ²	[Kr] 4d ⁷ 5s ¹
6	rhodium 45 Rh	[Kr] 4d ⁷ 5s ²	[Kr] 4d ⁸ 5s ¹
7	palladium 46 Pd	[Kr] 4d ⁸ 5s ²	[Kr] 4d ¹⁰
8	silver 47 Ag	[Kr] 4d ⁹ 5s ²	[Kr] 4d ¹⁰ 5s ¹
9	lanthanum 57 La	[Xe] 4f ¹ 6s ²	[Xe] 5d ¹ 6s ²
10	cerium 58 Ce	[Xe] 4f ² 6s ²	[Xe] 4f ¹ 5d ¹ 6s ²
11	gadolinium 64 Gd	[Xe] 4f ⁸ 6s ²	[Xe] 4f ⁷ 5d ¹ 6s ²
12	platinum 78 Pt	[Xe] 4f ¹⁴ 5d ⁸ 6s ²	[Xe] 4f ¹⁴ 5d ⁹ 6s ¹
13	gold 79 Au	[Xe] 4f ¹⁴ 5d ⁹ 6s ²	[Xe] 4f ¹⁴ 5d ¹⁰ 6s ¹
14	actinium 89 Ac	[Rn] 5f ¹ 7s ²	[Rn] 6d ¹ 7s ²
15	thorium 90 Th	[Rn] 5f ² 7s ²	[Rn] 6d ² 7s ²
16	protactinium 91 Pa	[Rn] 5f ³ 7s ²	[Rn] 5f ² 6d ¹ 7s ²
17	uranium 92 U	[Rn] 5f ⁴ 7s ²	[Rn] 5f ³ 6d ¹ 7s ²
18	neptunium 93 Np	[Rn] 5f ⁵ 7s ²	[Rn] 5f ⁴ 6d ¹ 7s ²
19	curium 96 Cm	[Rn] 5f ⁸ 7s ²	[Rn] 5f ⁷ 6d ¹ 7s ²
20	lawrencium 103 Lr	[Rn] 5f ¹⁴ 6d ¹ 7s ²	[Rn] 5f ¹⁴ 7s ² 7p ¹
21	darmstadtium 110 Ds	[Rn] 5f ¹⁴ 6d ⁸ 7s ²	[Rn] 5f ¹⁴ 6d ⁹ 7s ¹
22	roentgenium 111 Rg	[Rn] 5f ¹⁴ 6d ⁹ 7s ²	[Rn] 5f ¹⁴ 6d ¹⁰ 7s ¹

Note: argon 18 Ar, [Ar] = 1s² 2s² 2p⁶ 3s² 3p⁶

Krypton 36 Kr, [Kr] = 1s² 2s² 2p⁶ 3s² 3p⁶ 3d¹⁰ 4s² 4p⁶

Xenon 54 Xe, [Xe] = 1s² 2s² 2p⁶ 3s² 3p⁶ 3d¹⁰ 4s² 4p⁶ 4d¹⁰ 5s² 5p⁶

Radon 86 Rn, [Rn] = 1s² 2s² 2p⁶ 3s² 3p⁶ 3d¹⁰ 4s² 4p⁶ 4d¹⁰ 5s² 5p⁶ 4f¹⁴ 5d¹⁰ 6s² 6p⁶