

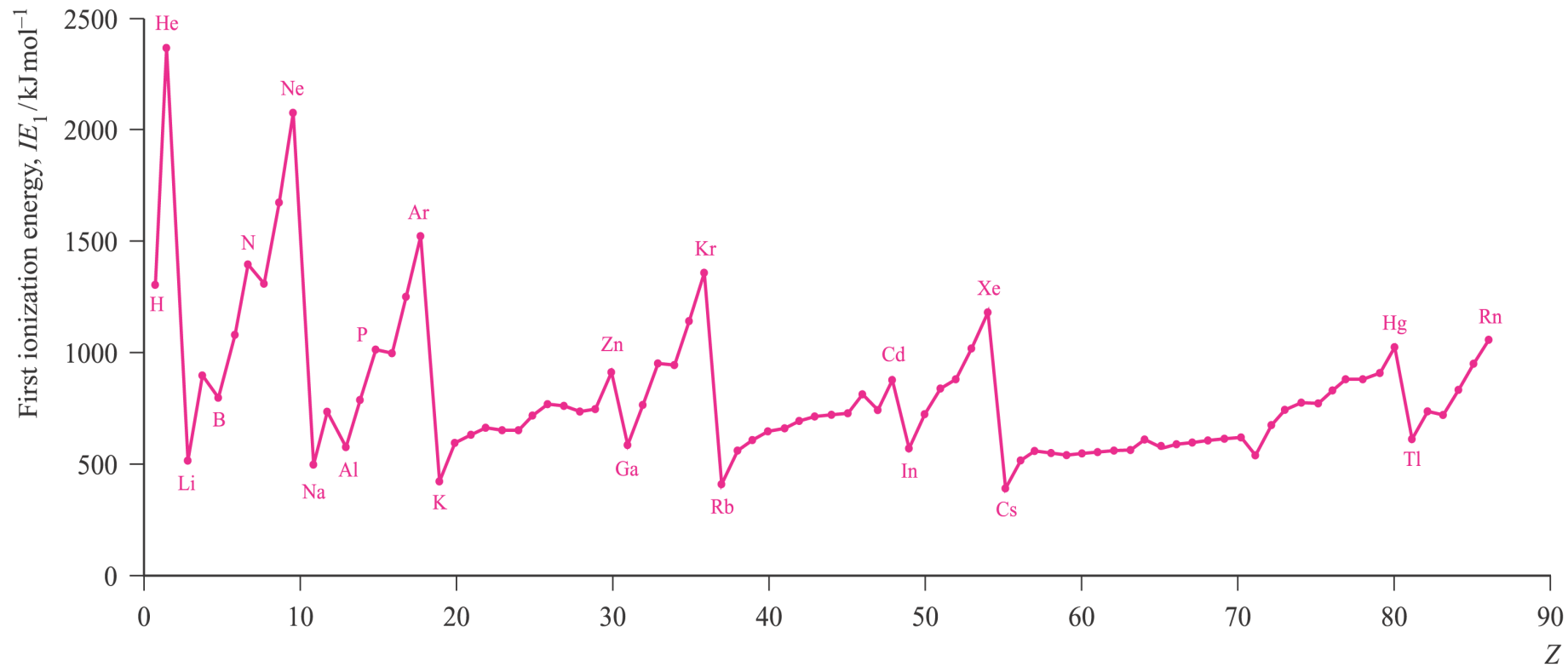
Element	Z	Configuration	Element	Z	Configuration
H	1	1s ¹	Cs	55	[Xe]6s ¹
He	2	1s ²	Ba	56	[Xe]6s ²
			La	57	*[Xe]6s ² 5d ¹
Li	3	[He]2s ¹	Ce	58	*[Xe]6s ² 4f ¹ 5d ¹
Be	4	[He]2s ²	Pr	59	[Xe]6s ² 4f ³
B	5	[He]2s ² 2p ¹	Nd	60	[Xe]6s ² 4f ⁴
C	6	[He]2s ² 2p ²	Pm	61	[Xe]6s ² 4f ⁵
N	7	[He]2s ² 2p ³	Sm	62	[Xe]6s ² 4f ⁶
O	8	[He]2s ² 2p ⁴	Eu	63	[Xe]6s ² 4f ⁷
F	9	[He]2s ² 2p ⁵	Gd	64	*[Xe]6s ² 4f ⁷ 5d ¹
Ne	10	[He]2s ² 2p ⁶	Tb	65	[Xe]6s ² 4f ⁹
			Dy	66	[Xe]6s ² 4f ¹⁰
Na	11	[Ne]3s ¹	Ho	67	[Xe]6s ² 4f ¹¹
Mg	12	[Ne]3s ²	Er	68	[Xe]6s ² 4f ¹²
Al	13	[Ne]3s ² 3p ¹	Tm	69	[Xe]6s ² 4f ¹³
Si	14	[Ne]3s ² 3p ²	Yb	70	[Xe]6s ² 4f ¹⁴
P	15	[Ne]3s ² 3p ³	Lu	71	[Xe]6s ² 4f ¹⁴ 5d ¹
S	16	[Ne]3s ² 3p ⁴	Hf	72	[Xe]6s ² 4f ¹⁴ 5d ²
Cl	17	[Ne]3s ² 3p ⁵	Ta	73	[Xe]6s ² 4f ¹⁴ 5d ³
Ar	18	[Ne]3s ² 3p ⁶	W	74	[Xe]6s ² 4f ¹⁴ 5d ⁴
			Re	75	[Xe]6s ² 4f ¹⁴ 5d ⁵
K	19	[Ar]4s ¹	Os	76	[Xe]6s ² 4f ¹⁴ 5d ⁶
Ca	20	[Ar]4s ²	Ir	77	[Xe]6s ² 4f ¹⁴ 5d ⁷
Sc	21	[Ar]4s ² 3d ¹	Pt	78	*[Xe]6s ¹ 4f ¹⁴ 5d ⁹
Ti	22	[Ar]4s ² 3d ²	Au	79	*[Xe]6s ¹ 4f ¹⁴ 5d ¹⁰
V	23	[Ar]4s ² 3d ³	Hg	80	[Xe]6s ² 4f ¹⁴ 5d ¹⁰
Cr	24	*[Ar]4s ¹ 3d ⁵	Tl	81	[Xe]6s ² 4f ¹⁴ 5d ¹⁰ 6p ¹
Mn	25	[Ar]4s ² 3d ⁵	Pb	82	[Xe]6s ² 4f ¹⁴ 5d ¹⁰ 6p ²
Fe	26	[Ar]4s ² 3d ⁶	Bi	83	[Xe]6s ² 4f ¹⁴ 5d ¹⁰ 6p ³
Co	27	[Ar]4s ² 3d ⁷	Po	84	[Xe]6s ² 4f ¹⁴ 5d ¹⁰ 6p ⁴
Ni	28	[Ar]4s ² 3d ⁸	At	85	[Xe]6s ² 4f ¹⁴ 5d ¹⁰ 6p ⁵
Cu	29	*[Ar]4s ¹ 3d ¹⁰	Rn	86	[Xe]6s ² 4f ¹⁴ 5d ¹⁰ 6p ⁶
Zn	30	[Ar]4s ² 3d ¹⁰			
Ga	31	[Ar]4s ² 3d ¹⁰ 4p ¹	Fr	87	[Rn]7s ¹
Ge	32	[Ar]4s ² 3d ¹⁰ 4p ²	Ra	88	[Rn]7s ²
As	33	[Ar]4s ² 3d ¹⁰ 4p ³	Ac	89	*[Rn]7s ² 6d ¹
Se	34	[Ar]4s ² 3d ¹⁰ 4p ⁴	Th	90	*[Rn]7s ² 6d ²
Br	35	[Ar]4s ² 3d ¹⁰ 4p ⁵	Pa	91	*[Rn]7s ² 5f ² 6d ¹
Kr	36	[Ar]4s ² 3d ¹⁰ 4p ⁶	U	92	*[Rn]7s ² 5f ³ 6d ¹
			Np	93	*[Rn]7s ² 5f ⁴ 6d ¹
Rb	37	[Kr]5s ¹	Pu	94	[Rn]7s ² 5f ⁶
Sr	38	[Kr]5s ²	Am	95	[Rn]7s ² 5f ⁷
Y	39	[Kr]5s ² 4d ¹	Cm	96	*[Rn]7s ² 5f ⁷ 6d ¹
Zr	40	[Kr]5s ² 4d ²	Bk	97	[Rn]7s ² 5f ⁹
Nb	41	*[Kr]5s ¹ 4d ⁴	Cf	98	*[Rn]7s ² 5f ⁹ 6d ¹
Mo	42	*[Kr]5s ¹ 4d ⁵	Es	99	[Rn]7s ² 5f ¹¹
Tc	43	[Kr]5s ² 4d ⁵	Fm	100	[Rn]7s ² 5f ¹²
Ru	44	*[Kr]5s ¹ 4d ⁷	Md	101	[Rn]7s ² 5f ¹³
Rh	45	*[Kr]5s ¹ 4d ⁸	No	102	[Rn]7s ² 5f ¹⁴
Pd	46	*[Kr]4d ¹⁰	Lr	103	[Rn]7s ² 5f ¹⁴ 6d ¹
Ag	47	*[Kr]5s ¹ 4d ¹⁰			
Cd	48	[Kr]5s ² 4d ¹⁰	Rf	104	[Rn]7s ² 5f ¹⁴ 7p ¹
In	49	[Kr]5s ² 4d ¹⁰ 5p ¹	Db	105	[Rn]7s ² 5f ¹⁴ 6d ²
Sn	50	[Kr]5s ² 4d ¹⁰ 5p ²	Sg	106	[Rn]7s ² 5f ¹⁴ 6d ³
Sb	51	[Kr]5s ² 4d ¹⁰ 5p ³	Bh	107	[Rn]7s ² 5f ¹⁴ 6d ⁴
Te	52	[Kr]5s ² 4d ¹⁰ 5p ⁴	Hs	108	[Rn]7s ² 5f ¹⁴ 6d ⁵
I	53	[Kr]5s ² 4d ¹⁰ 5p ⁵	Mt	109	[Rn]7s ² 5f ¹⁴ 6d ⁷
Xe	54	[Kr]5s ² 4d ¹⁰ 5p ⁶	Uun	110	[Rn]7s ¹ 5f ¹⁴ 6d ⁹
			Uuu	111	[Rn]7s ¹ 5f ¹⁴ 6d ¹⁰
			Uub	112	[Rn]7s ² 5f ¹⁴ 6d ¹⁰

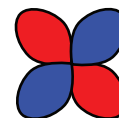
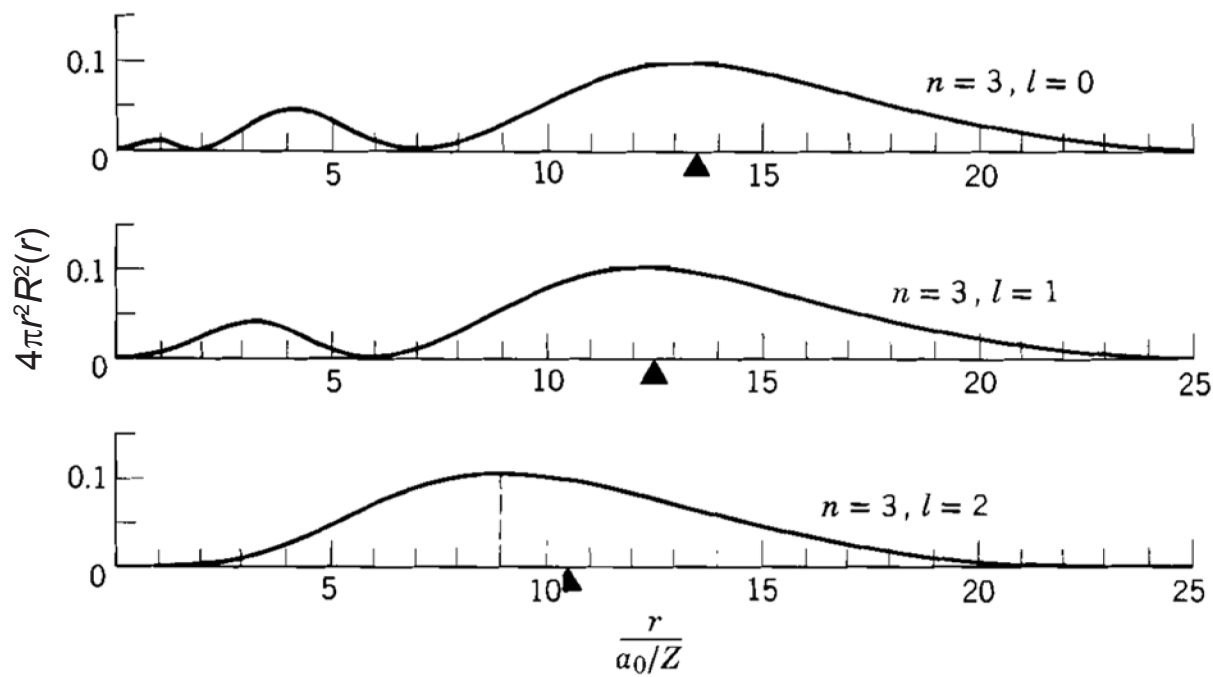
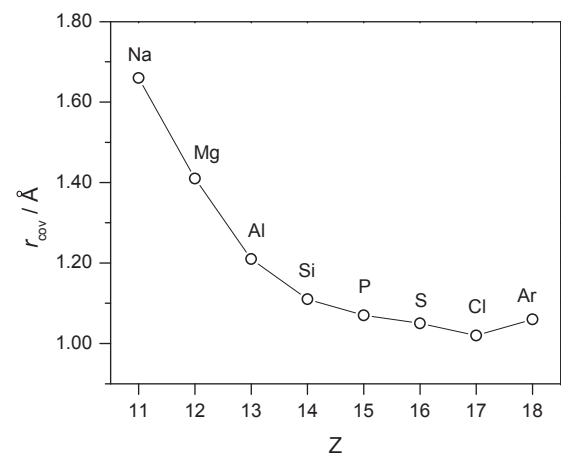
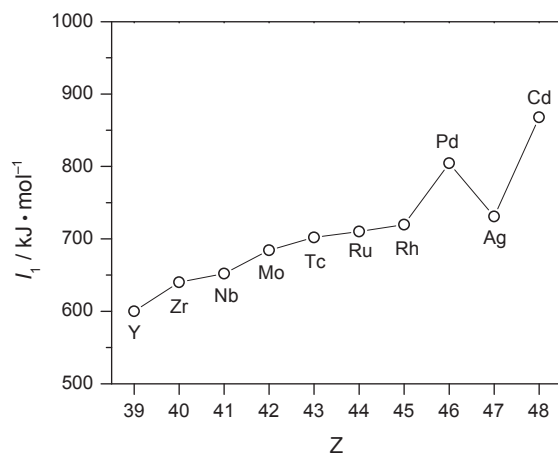
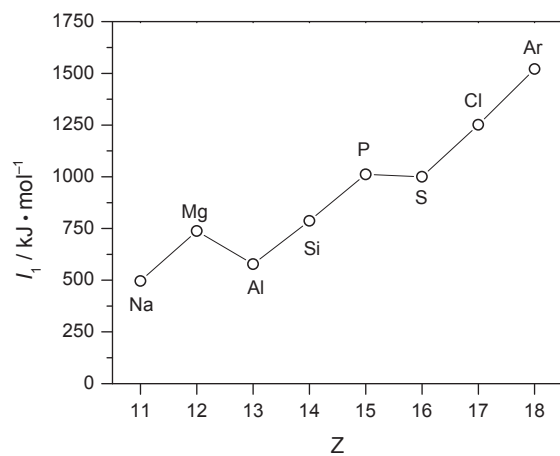
s-block elements**d-block elements****p-block elements**

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10	Group 11	Group 12	Group 13	Group 14	Group 15	Group 16	Group 17	Group 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	57–71 La–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	89–103 Ac–Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Uub						

f-block elements

Lanthanoids	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
Actinoids	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





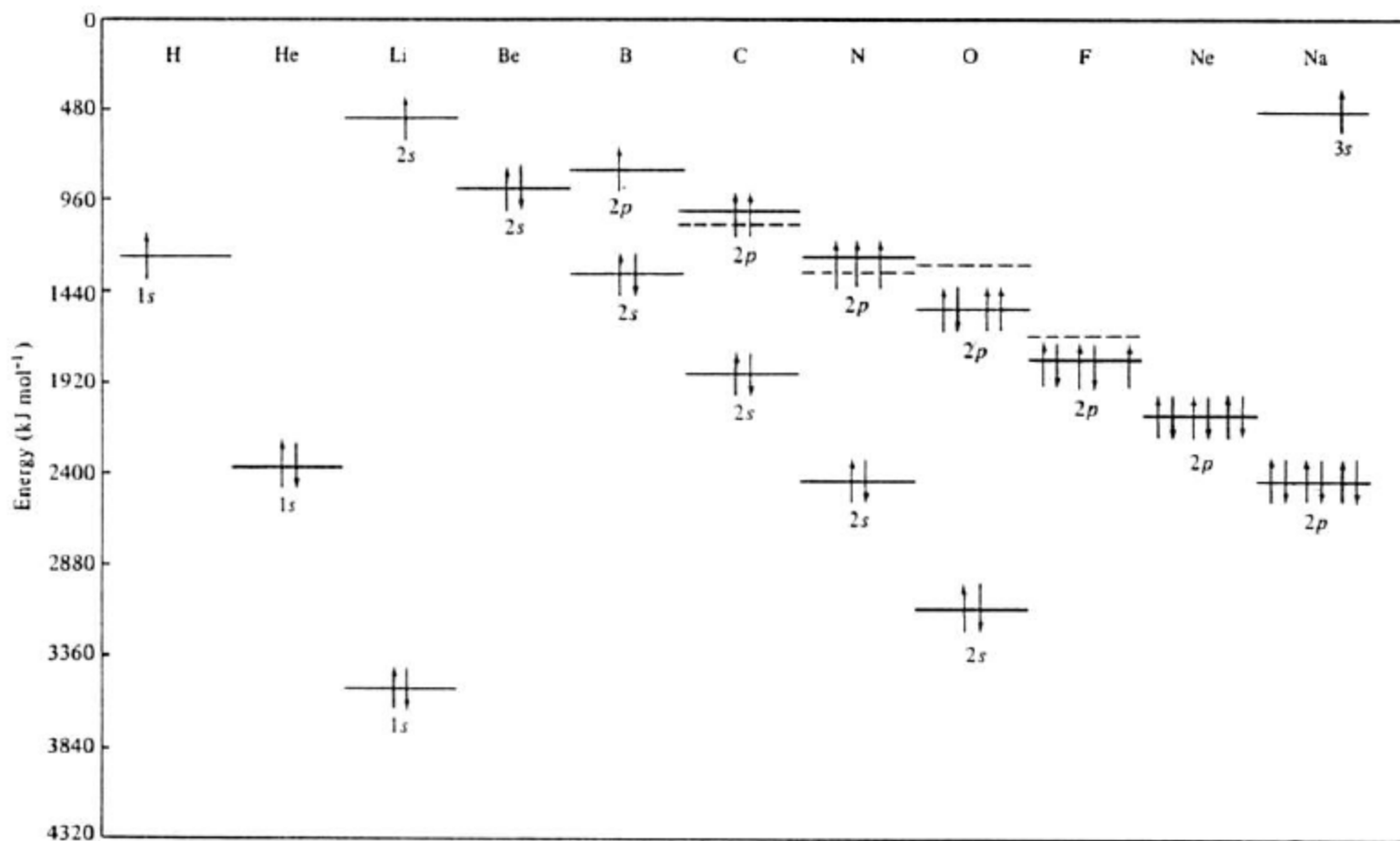
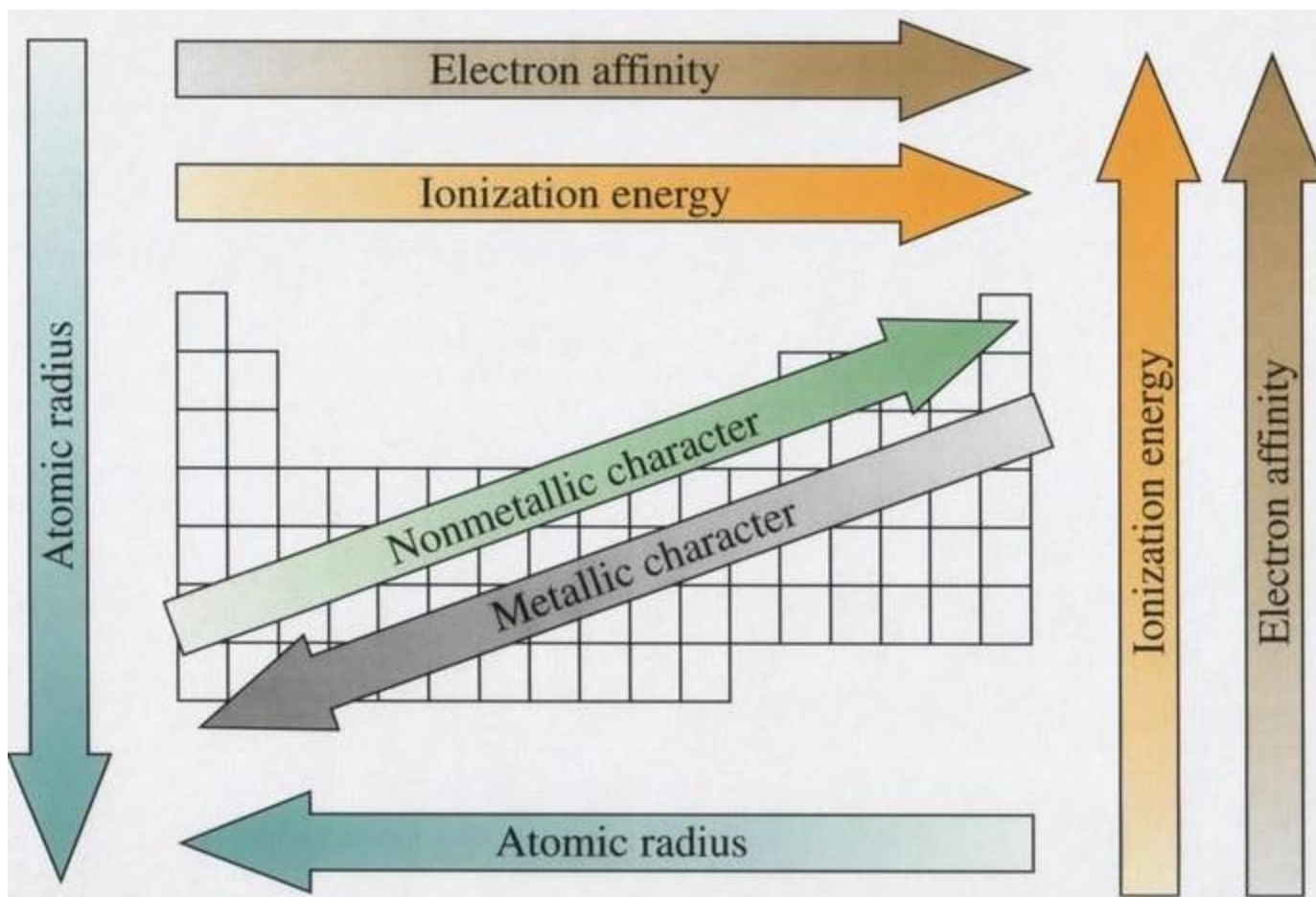


Fig. 2.12 Relative orbital energies of the elements hydrogen to sodium. Solid lines indicate *one-electron orbital energies*. Dashed lines represent experimental ionization energies, which differ as a result of electron–electron interactions.



Atomic Radius

31 270



picometers (pm)

1	31															270										18
H 37																										He 31
2	picometers (pm)															13	14	15	16	17						
Li 152	Be 112																B 85	C 77	N 75	O 73	F 72	Ne 71				
Na 186	Mg 160	3	4	5	6	7	8	9	10	11	12	Al 143	Si 118	P 110	S 103	Cl 100	Ar 98									
K 227	Ca 197	Sc 162	Ti 147	V 134	Cr 128	Mn 127	Fe 126	Co 125	Ni 124	Cu 128	Zn 134	Ga 135	Ge 122	As 120	Se 119	Br 114	Kr 112									
Rb 248	Sr 215	Y 180	Zr 160	Nb 146	Mo 139	Tc 136	Ru 134	Rh 134	Pd 137	Ag 144	Cd 151	In 167	Sn 140	Sb 140	Te 142	I 133	Xe 131									
Cs 265	Ba 222	La 187	Hf 159	Ta 146	W 139	Re 137	Os 135	Ir 136	Pt 138	Au 144	Hg 151	Tl 170	Pb 146	Bi 150	Po 168	At 140	Rn 140									
Fr 270	Ra 220	Ac --	Rf --	Db --	Sg --	Bh --	Hs --	Mt --	Uun --	Uuu --	Uub --	113 --	Uuq --	115 --	116 --	117 --	118 --									

Ce --	Pr --	Nd --	Pm --	Sm --	Eu --	Gd --	Tb --	Dy --	Ho --	Er --	Tm --	Yb --	Lu --
Th --	Pa --	U --	Np --	Pu --	Am --	Cm --	Bk --	Cf --	Es --	Fm --	Md --	No --	Lr --

Electronegativity

0.7

4



Pauling scale

1	0.7										4							18			
H 2.1																					He ..
Pauling scale																					
Li 1.0	Be 1.5											B 2.0	C 2.5	N 3.0	O 3.5	F 4.0	Ne --				
Na 0.9	Mg 1.2	3	4	5	6	7	8	9	10	11	12	Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0	Ar --				
K 0.8	Ca 1.0	Sc 1.3	Ti 1.5	V 1.6	Cr 1.6	Mn 1.5	Fe 1.8	Co 1.8	Ni 1.8	Cu 1.9	Zn 1.6	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8	Kr 3.0				
Rb 0.8	Sr 1.0	Y 1.2	Zr 1.4	Nb 1.6	Mo 1.8	Tc 1.9	Ru 2.2	Rh 2.2	Pd 2.2	Ag 1.9	Cd 1.7	In 1.7	Sn 1.8	Sb 1.9	Te 2.1	I 2.5	Xe 2.6				
Cs 0.7	Ba 0.9	La 1.1	Hf 1.3	Ta 1.5	W 1.7	Re 1.9	Os 2.2	Ir 2.2	Pt 2.2	Au 2.4	Hg 1.9	Tl 1.8	Pb 1.9	Bi 1.9	Po 2.0	At 2.2	Rn --				
Fr 0.7	Ra 0.9	Ac 1.1	Rf --	Db --	Sg --	Bh --	Hs --	Mt --	Uun --	Uuu --	Uub --	113 --	114 --	115 --	116 --	117 --	118 --				

Ce 1.1	Pr 1.1	Nd 1.1	Pm 1.2	Sm 1.2	Eu 1.1	Gd 1.2	Tb 1.2	Dy 1.2	Ho 1.2	Er 1.2	Tm 1.2	Yb 1.2	Lu 1.3
Th 1.3	Pa 1.5	U 1.7	Np 1.3	Pu 1.3	Am 1.3	Cm 1.3	Bk 1.3	Cf 1.3	Es 1.3	Fm 1.3	Md 1.3	No 1.5	Lr --