Table 2.3

Ionization energies (MJ mol^{-1})[a]

Z	Element	I	II	III	IV	V	VI	VII	VIII	IX	X
1	H	1.3120									
2	He	2.3723	5.2504								
3	Li	0.5203	7.2981	11.8149							
4	Be	0.8995	1.7571	14.8487	21.0065						
5	B	0.8006	2.4270	3.6598	25.0257	32.8266					
6	C	1.0864	2.3526	4.6205	6.2226	37.8304	47.2769				
7	N	1.4023	2.8561	4.5781	7.4751	9.4449	53.2664	64.3598			
8	O	1.3140	3.3882	5.3004	7.4693	10.9895	13.3264	71.3345	84.0777		
9	F	1.6810	3.3742	6.0504	8.4077	11.0227	15.1640	17.8677	92.0378	106.4340	
10	Ne	2.0807	3.9523	6.122	9.370	12.178	15.238	19.999	23.069	115.3791	131.4314
11	Na	0.4958	4.5624	6.912	9.544	13.353	16.610	20.115	25.490	28.934	141.3626
12	Mg	0.7377	1.4507	7.7328	10.540	13.628	17.995	21.704	25.656	31.643	35.462
13	Al	0.5776	1.8167	2.7448	11.578	14.831	18.378	23.295	27.459	31.861	38.457
14	Si	0.7865	1.5771	3.2316	4.3555	16.091	19.785	23.786	29.252	33.877	38.733
15	P	1.0118	1.9032	2.912	4.957	6.2739	21.269	25.397	29.854	35.867	40.959
16	S	0.9996	2.251	3.361	4.564	7.013	8.4956	27.106	31.670	36.578	43.138
17	Cl	1.2511	2.297	3.822	5.158	6.54	9.362	11.0182	33.605	38.598	43.962
18	Ar	1.5205	2.6658	3.931	5.771	7.238	8.7810	11.9952	13.8417	40.760	46.187
19	K	0.4189	3.0514	4.411	5.877	7.976	9.649	11.343	14.942	16.964	48.576
20	Ca	0.5898	1.1454	4.9120	6.474	8.144	10.496	12.32	14.207	18.192	20.3849
21	Sc	0.631	1.235	2.389	7.089	8.844	10.72	13.32	15.31	17.370	21.741
22	Ti	0.658	1.310	2.6525	4.1746	9.573	11.517	13.59	16.26	18.64	20.833
23	V	0.650	1.414	2.8280	4.5066	6.299	12.362	14.489	16.760	19.86	22.24
24	Cr	0.6528	1.496	2.987	4.74	6.69	8.738	15.54	17.82	20.19	23.58
25	Mn	0.7174	1.5091	3.2484	4.94	6.99	9.2	11.508	18.956	21.40	23.96
26	Fe	0.7594	1.561	2.9574	5.29	7.24	9.6	12.1	14.575	22.678	25.29
27	Co	0.758	1.646	3.232	4.95	7.67	9.84	12.4	15.1	17.959	26.6
28	Ni	0.7367	1.7530	3.393	5.30	7.28	10.4	12.8	15.6	18.6	21.66
29	Cu	0.7455	1.9579	3.554	5.33	7.71	9.94	13.4	16.0	19.2	22.4
30	Zn	0.9064	1.7333	3.8327	5.73	7.97	10.4	12.9	16.8	19.6	23.0
31	Ga	0.5788	1.979	2.963	6.2						
32	Ge	0.7622	1.5372	3.302	4.410	9.02					
33	As	0.944	1.7978	2.7355	4.837	6.043	12.31				
34	Se	0.9409	2.045	2.9737	4.1435	6.59	7.883	14.99			
35	Br	1.1399	2.10	3.5	4.56	5.76	8.55	9.938	18.60		
36	Kr	1.3507	2.3503	3.565	5.07	6.24	7.57	10.71	12.2	22.28	
37	Rb	0.4030	2.633	3.9	5.08	6.85	8.14	9.57	13.1	14.5	26.74
38	Sr	0.5495	1.0643	4.21	5.5	6.91	8.76	10.2	11.80	15.6	17.1
39	Y	0.616	1.181	1.980	5.96	7.43	8.97	11.2	12.4	14.11	18.4
40	Zr	0.660	1.267	2.218	3.313	7.86					
41	Nb	0.664	1.382	2.416	3.69	4.877	9.900	12.1			
42	Mo	0.6850	1.558	2.621	4.477	5.91	6.6	12.23	14.8		
43	Tc	0.702	1.472	2.850							
44	Ru	0.711	1.617	2.747							
45	Rh	0.720	1.744	2.997							
46	Pd	0.805	1.875	3.177							
47	Ag	0.7310	2.074	3.361							
48	Cd	0.8677	1.6314	3.616							
49	In	0.5583	1.8206	2.705	5.2						
50	Sn	0.7086	1.4118	2.9431	3.9303	6.974					
51	Sb	0.8316	1.595	2.44	4.26	5.4	10.4				
52	Te	0.8693	1.79	2.698	3.610	5.669	6.82	13.2			
53	I	1.0084	1.8459	3.2							

To obtain values in electron volts, multiply table values by 10.364

Table 2.3 *(Continued)*

Ionization energies (MJ mol^{-1})[a]

Z	Element	I	II	III	IV	V	VI	VII	VIII	IX	X
54	Xe	1.1704	2.046	3.10							
55	Cs	0.3757	2.23								
56	Ba	0.5029	0.96526								
57	La	0.5381	1.067	1.8503	4.820						
58	Ce	0.528	1.047	1.949	3.543						
59	Pr	0.523	1.018	2.086	3.761	5.552					
60	Nd	0.530	1.034	2.13	3.900	5.790					
61	Pm	0.536	1.052	2.15	3.97	5.953					
62	Sm	0.543	1.068	2.26	4.00	6.046					
63	Eu	0.547	1.085	2.40	4.11	6.101					
64	Gd	0.592	1.17	1.99	4.24	6.249					
65	Tb	0.564	1.112	2.11	3.84	6.413					
66	Dy	0.572	1.126	2.20	4.00	5.990					
67	Ho	0.581	1.139	2.20	4.10	6.169					
68	Er	0.589	1.151	2.19	4.11	6.282					
69	Tm	0.5967	1.163	2.284	4.12	6.313					
70	Yb	0.6034	1.175	2.415	4.22	6.328					
71	Lu	0.5235	1.34	2.022	4.36	6.445					
72	Hf	0.654	1.44	2.25	3.21	6.596					
73	Ta	0.761									
74	W	0.770									
75	Re	0.760									
76	Os	0.84									
77	Ir	0.88									
78	Pt	0.87	1.7911								
79	Au	0.8901	1.98								
80	Hg	1.0070	1.8097	3.30							
81	Tl	0.5893	1.9710	2.878							
82	Pb	0.7155	1.4504	3.0815	4.083	6.64					
83	Bi	0.7033	1.610	2.466	4.37	5.40	8.62				
84	Po	0.812									
85	At										
86	Rn	1.0370									
87	Fr										
88	Ra	0.5094	0.97906								
89	Ac	0.49	1.17								
90	Th	0.59	1.11	1.93	2.78						
91	Pa	0.57									
92	U	0.59									
93	Np	0.60									
94	Pu	0.585									
95	Am	0.578									
96	Cm	0.581									
97	Bk	0.601									
98	Cf	0.608									
99	Es	0.619									
100	Fm	0.627									
101	Md	0.635									
102	No	0.642									

[a] Moore, C. E. *Ionization Potentials and Ionization Limits Derived from the Analyses of Optical Spectra*, NSRDS-NBS 34; National Bureau of Standards: Washington, DC; 1970 and personal communication. Data for the lanthanides and actinides from Martin, W. C.; Hagan, L.; Reader, J.; Sugar, J. J. *Phys. Chem. Ref. Data* **1974**, *3*, 771 and Sugar J. *J. Opt. Soc. Am.* **1975**, *65*, 1366.