

Table 3.8 Effective Ionic Radii (in Å) for Ions Commonly Found in Minerals\*

I	II	III	IV	V	VI	VII	←Column
<b>Li<sup>+</sup></b> 0.59 [4] 0.74 [6] 0.92 [8]	<b>Be<sup>2+</sup></b> 0.16 [3] 0.27 [4] 0.45 [6]	<b>B<sup>3+</sup></b> 0.11 [4] 0.27 [6]	<b>C<sup>4+</sup></b> -0.08 [3] 0.15 [4] 0.16 [6]	<b>N<sup>5+</sup></b> -0.10 [3] 0.13 [6]	<b>O<sup>2-</sup></b> 1.36 [3] 1.38 [4] 1.40 [6] 1.42 [8]	<b>F<sup>-</sup></b> 1.31 [4] 1.33 [6]	<b>Row 2</b>
<b>Na<sup>+</sup></b> 0.99 [4] 1.02 [6] 1.18 [8] 1.24 [9] 1.39 [12]	<b>Mg<sup>2+</sup></b> 0.57 [4] 0.72 [6] 0.89 [8]	<b>Al<sup>3+</sup></b> 0.39 [4] 0.48 [5] 0.54 [6]	<b>Si<sup>4+</sup></b> 0.26 [4] 0.40 [6]	<b>P<sup>5+</sup></b> 0.17 [4] 0.29 [5] 0.38 [6]	<b>S<sup>2-</sup></b> 1.84 [4] <b>S<sup>6+</sup></b> 0.12 [4] 0.29 [6]	<b>Cl<sup>-</sup></b> 1.81 [6]	<b>3</b>
<b>K<sup>+</sup></b> 1.38 [6] 1.51 [8] 1.55 [9] 1.59 [10] 1.64 [12]	<b>Ca<sup>2+</sup></b> 1.00 [6] 1.12 [8] 1.18 [9] 1.23 [10] 1.34 [12]	<b>Ga<sup>3+</sup></b> 0.47 [4] 0.55 [5] 0.62 [6]	<b>Ge<sup>4+</sup></b> 0.39 [4] 0.53 [6]	<b>As<sup>3+</sup></b> 0.58 [6] <b>As<sup>5+</sup></b> 0.34 [4] 0.46 [6]	<b>Se<sup>2+</sup></b> 1.98 [6]	<b>Br<sup>-</sup></b> 1.96 [6]	<b>4</b>
<b>Rb<sup>+</sup></b> 1.52 [6] 1.61 [8] 1.66 [10] 1.74 [12]	<b>Sr<sup>2+</sup></b> 1.18 [6] 1.26 [8] 1.36 [10] 1.44 [12]	<b>In<sup>3+</sup></b> 0.62 [4] 0.80 [6] 0.92 [8]	<b>Sn<sup>4+</sup></b> 0.69 [6] 0.81 [8]	<b>Sb<sup>3+</sup></b> 0.76 [6] <b>Sb<sup>5+</sup></b> 0.60 [6]	<b>Te<sup>2-</sup></b> 2.21 [6]	<b>I<sup>-</sup></b> 2.20 [6]	<b>5</b>
<b>Cs<sup>+</sup></b> 1.67 [6] 1.74 [8] 1.81 [10] 1.85 [11] 1.88 [12]	<b>Ba<sup>2+</sup></b> 1.35 [6] 1.42 [8] 1.47 [9] 1.52 [10] 1.61 [12]	<b>Pb<sup>2+</sup></b> 1.19 [6] 1.29 [8] 1.35 [9] 1.40 [10]	<b>Pt<sup>2+</sup></b> 0.80 [6]	<b>Bi<sup>3+</sup></b> 0.96 [5] 1.03 [6] 1.17 [8]			<b>6</b>

Transition elements

<b>Ti<sup>4+</sup></b> 0.42 [4] 0.61 [6] 0.74 [8]	<b>V<sup>5+</sup></b> 0.36 [4] 0.46 [5] 0.54 [6]	<b>Cr<sup>3+</sup></b> 0.62 [6] <b>Cr<sup>6+</sup></b> 0.41 [4] 0.55 [6] 0.26 [4]	<b>Mn<sup>2+</sup></b> 0.83 [6] 0.96 [8] <b>Mn<sup>3+</sup></b> 0.65 [6] <b>Mn<sup>4+</sup></b> 0.53 [6]	<b>Fe<sup>2+</sup></b> 0.63 [4] 0.78 [6] 0.92 [8] <b>Fe<sup>3+</sup></b> 0.65 [6] 0.78 [8]	<b>Co<sup>2+</sup></b> 0.74 [6] 0.90 [8]	<b>Ni<sup>2+</sup></b> 0.55 [4] 0.69 [6]	<b>Cu<sup>+</sup></b> 0.46 [2] 0.77 [6] <b>Cu<sup>2+</sup></b> 0.57 [4] 0.65 [5] 0.73 [6]	<b>Zn<sup>2+</sup></b> 0.60 [4] 0.74 [6] 0.90 [8]
<b>Zr<sup>4+</sup></b> 0.72 [6] 0.78 [7] 0.84 [8] 0.89 [9]	<b>Nb<sup>5+</sup></b> 0.64 [6] 0.69 [7] 0.74 [8]	<b>Mo<sup>4+</sup></b> 0.65 [6] <b>Mo<sup>6+</sup></b> 0.41 [4] 0.59 [6]				<b>Rh<sup>4+</sup></b> 0.60 [6] 0.86 [6]	<b>Ag<sup>+</sup></b> 1.16 [6] 1.28 [8]	<b>Cd<sup>2+</sup></b> 0.58 [4] 0.74 [6] 0.90 [8]
<b>Hf<sup>4+</sup></b> 0.71 [6] 0.76 [7] 0.83 [8] 1.22 [9] 1.27 [10]	<b>Ta<sup>5+</sup></b> 0.64 [6] 0.69 [7] 0.74 [8]	<b>W<sup>6+</sup></b> 0.42 [4] 0.51 [5] 0.60 [6]	<b>Re<sup>4+</sup></b> 0.63 [6] <b>Re<sup>5+</sup></b> 0.38 [4] 0.53 [6]					<b>Hg<sup>2+</sup></b> 0.94 [4] 1.01 [6] 1.14 [8]

<b>Th<sup>4+</sup></b> 0.94 [6] 1.05 [8] 1.09 [9] 1.13 [10]	<b>U<sup>4+</sup></b> 0.89 [6] 1.00 [8] <b>U<sup>6+</sup></b> 0.52 [4] 0.73 [6]
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\*Numbers in square brackets are the coordination numbers of the ions. Radii in upright digits are from Shannon (1976). Radii in upright digits are from Pauling (1960), revised and supplemented by Ahrens (1952). For complete references see the reference list at the end of the chapter.