

**TABLE 3.13**  
**Thermochemical (average) bond energies (in kilocalories per mole)†**

|       |     |       |     |       |     |
|-------|-----|-------|-----|-------|-----|
| As—As | 40  | Ge—Ge | 38  | S—S   | 64  |
| As—F  | 116 | Ge—F  | 113 | S—Cl  | 65  |
| As—Cl | 74  | Ge—Cl | 81  | S—Br  | 51  |
| As—Br | 61  | Ge—Br | 67  | S—H   | 88  |
| As—H  | 71  | Ge—I  | 51  | Sb—Sb | 34  |
| As—O  | 79  | Ge—H  | 69  | Sb—Cl | 75  |
| B—B   | 79  | Ge—O  | 86  | Sb—Br | 63  |
| B—F   | 154 | Ge—N  | 61  | Sb—H  | 61  |
| B—Cl  | 106 | N—N   | 38  | Se—Se | 38  |
| B—Br  | 88  | N=N   | 100 | Se—Cl | 58  |
| B—I   | 65  | N≡N   | 226 | Se—H  | 73  |
| B—H   | 91  | N—F   | 67  | Si—Si | 46  |
| B—O   | 125 | N—Cl  | 45  | Si—Ge | 42  |
| C—C   | 83  | N—H   | 93  | Si—F  | 143 |
| C=C   | 147 | N—O   | 39  | Si—Cl | 96  |
| C≡C   | 194 | N=O   | 142 | Si—Br | 79  |
| C—F   | 117 | O—O   | 34  | Si—H  | 76  |
| C—Cl  | 78  | O=O   | 119 | Si—O  | 111 |
| C—Br  | 65  | O—F   | 51  | Si—N  | 80  |
| C—I   | 57  | O—Cl  | 49  | Si—S  | 54  |
| C—H   | 99  | O—H   | 111 | Si—C  | 73  |
| C—O   | 86  | P—P   | 47  | Sn—Sn | 36  |
| C=O   | 174 | P—F   | 119 | Sn—Cl | 75  |
| C—N   | 73  | P—Cl  | 79  | Sn—Br | 64  |
| C=N   | 147 | P—Br  | 64  | Sn—H  | 60  |
| C≡N   | 213 | P—H   | 77  | Sn—C  | 50  |
| C—S   | 114 | P—O   | 88  |       |     |

† 1 kcal = 4.1840 kJ

## Thermochemical Bond Energies of Representative Elements