

18.23 This problem calls for us to decide for each of several pairs of semiconductors, which will have the smaller band gap energy and then cite a reason for the choice.

(a) Germanium will have a smaller band gap energy than C (diamond) since Ge is lower in row IVA of the periodic table (Figure 2.6) than is C. In moving from top to bottom of the periodic table,  $E_g$  decreases.

(b) Indium antimonide will have a smaller band gap energy than aluminum phosphide. Both of these semiconductors are III-V compounds, and the positions of both In and Sb are lower vertically in the periodic table (Figure 2.6) than Al and P.

(c) Gallium arsenide will have a smaller band gap energy than zinc selenide. All four of these elements are in the same row of the periodic table, but Zn and Se are more widely separated horizontally than Ga and As; as the distance of separation increases, so does the band gap.

(d) Cadmium telluride will have a smaller band gap energy than zinc selenide. Both are II-VI compounds, and Cd and Te are both lower vertically in the periodic table than Zn and Se.

(e) Cadmium sulfide will have a smaller band gap energy than sodium chloride since Na and Cl are much more widely separated horizontally in the periodic table than are Cd and S.