12.11 (a) We are first of all asked to cite, for $FeTiO_3$, which type of interstitial site the Fe^{2+} ions will occupy. From Table 12.3, the cation-anion radius ratio is

$$\frac{r_{Fe^{2+}}}{r_{O^{2-}}} = \frac{0.077\ \text{nm}}{0.140\ \text{nm}} = 0.550$$

Since this ratio is between 0.414 and 0.732, the Fe^{2+} ions will occupy octahedral sites (Table 12.2).

(b) Similarly, for the Ti^{4+} ions

$$\frac{r_{Ti^{4+}}}{r_{O^{2-}}} = \frac{0.061\ \text{nm}}{0.140\ \text{nm}} = 0.436$$

Since this ratio is between 0.414 and 0.732, the Ti^{4+} ions will also occupy octahedral sites.

(c) Since both Fe^{2+} and Ti^{4+} ions occupy octahedral sites, no tetrahedral sites will be occupied.

(d) For every $FeTiO_3$ formula unit, there are three O^{2-} ions, and, therefore, three octahedral sites; since there is one ion each of Fe^{2+} and Ti^{4+}, two-thirds of these octahedral sites will be occupied.