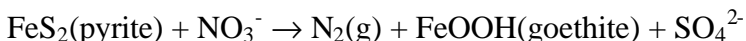


PROBLEM 1:

- Determine quantitatively whether the oxidation of chalcopyrite (CuFeS_2) by oxygen (O_2) to form $\text{Fe}(\text{OH})_3(\text{s})$, Cu^{2+} and SO_4^{2-} will result in acid-mine drainage. In other words, write a balanced *overall* redox reaction. Possibly helpful information in determining the oxidation states of elements in chalcopyrite is that common oxidation states are +1 and +2 for Cu, +2 and +3 for Fe, and -2, -1, and +6 for S.
- If acid is produced, how many moles of H^+ are produced per mole of chalcopyrite oxidized?
- Describe how you would determine whether this reaction proceeds spontaneously in the direction written?

PROBLEM 2:

- Balance the following overall oxidation-reduction reaction



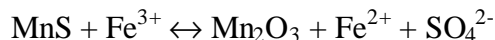
- What are the environmental consequences of the balanced reaction?
- How would you determine whether this reaction is thermodynamically favored or not?

PROBLEM 3:

- Determine quantitatively whether the oxidation of arsenopyrite (FeAsS) by oxygen (O_2) to form $\text{Fe}(\text{OH})_3(\text{s})$, HAsO_3^0 and SO_4^{2-} will result in acid-mine drainage.
- If acid is produced, how many moles of H^+ are produced per mole of arsenopyrite oxidized?
- Does pyrite or arsenopyrite produce more H^+ per mole of solid oxidized?
- What are the environmental consequences of the oxidation of arsenopyrite from mine tailings?

PROBLEM 4:

Balance the following overall redox reaction



Does this reaction generate acid?