

### 3.6: Discussion Questions

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- Discuss periodic trends in the Lewis acidity of metal ions.
  - Explain what we mean by hard and soft acids and bases, using specific examples.
  - Explain why hard and soft should not be equated with electrostatic and covalent.
  - According to HSAB theory Cu and Zn are classified as intermediate acids while Cd is classified as soft. The base  $(\text{CH}_2)_4\text{O}$  is considered hard while  $(\text{CH}_2)_4\text{S}$  is soft. Using E and C numbers for  $\text{Cd}[\text{N}(\text{Si}(\text{CH}_3)_3)_2]$  and  $\text{ZnTPP}$  calculate the enthalpies for these two acids interacting with  $(\text{CH}_2)_4\text{O}$  and  $(\text{CH}_2)_4\text{S}$  and show that the HSAB model correctly predicts which base interacts more strongly with which acid. Do the same comparison using  $\text{Cu}(\text{HFacac})_2$  as the acid and show that HSAB fails to predict which base interacts more strongly. How are these results related to the Cramer-Bopp plot that show one property or one parameter cannot be used to rank Lewis acid or base strength?
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