

The order of acid strength is:

1. $\text{HNO}_2 > \text{HOCl} > \text{HNO}_3 > \text{NH}_4^+$
2. $\text{HOCl} > \text{HNO}_3 > \text{NH}_4^+ > \text{HNO}_2$
3. $\text{HNO}_3 > \text{NH}_4^+ > \text{HNO}_2 > \text{HOCl}$
4. $\text{HNO}_3 > \text{HNO}_2 > \text{HOCl} > \text{NH}_4^+$

Correct Answer: 4.

Comments to the instructor: You may or may not allow students to use a table of K_a 's, or provide K_a 's as a hint. If students know that HNO_3 is a strong acid, then the choices 1 and 2 may be quickly eliminated.

The order of increasing base strength is:

1. $\text{H}_2\text{O} > \text{NH}_3 > \text{CH}_3\text{CO}_2^- > \text{CN}^-$
2. $\text{NH}_3 > \text{H}_2\text{O} > \text{CH}_3\text{CO}_2^- > \text{CN}^-$
3. $\text{NH}_3 > \text{CN}^- > \text{CH}_3\text{CO}_2^- > \text{H}_2\text{O}$
4. $\text{CH}_3\text{CO}_2^- > \text{NH}_3 > \text{CN}^- > \text{H}_2\text{O}$

Correct Answer: 3.

Comments to the instructor: A table of K_a 's is useful.

The order of increasing acid strength is:

1. $\text{H}_2\text{SO}_4 > \text{HSO}_4^- > \text{H}_3\text{PO}_4 > \text{H}_2\text{PO}_4^- > \text{HPO}_4^{2-}$
2. $\text{HSO}_4^- > \text{H}_2\text{SO}_4 > \text{H}_3\text{PO}_4 > \text{H}_2\text{PO}_4^- > \text{HPO}_4^{2-}$
3. $\text{H}_3\text{PO}_4 > \text{HSO}_4^- > \text{H}_2\text{SO}_4 > \text{H}_2\text{PO}_4^- > \text{HPO}_4^{2-}$
4. $\text{H}_3\text{PO}_4 > \text{H}_2\text{SO}_4 > \text{HSO}_4^- > \text{H}_2\text{PO}_4^- > \text{HPO}_4^{2-}$

Correct Answer: 1.

Comments to the instructor: This should be an easy one, provided the student knows that the first dissociation for H_2SO_4 goes to completion. Common misconceptions include Choice 4 – the more hydrogen ions, the more acidic.