# Worksheet: Acid and Base Strengths

**Q1:** Of the following ions, which is the strongest Brønsted–Lowry base?

A $Cl^-$

B $F^-$

C $Br^-$

D $NO_3^-$

E $HSO_4^-$

**Q2:** Which one out of HOCl, HOClO, $HOClO_2$, and $HOClO_3$ is the strongest acid?

A They are all equally strong acids.

B HOClO

C $HOClO_2$

D HOCl

E $HOClO_3$

**Q3:** Of the compounds HOCl, HOBr, and HOI, which is the strongest acid?

A HOBr

B They are all equally strong acids.

C HOI

D HOCl

**Q4:** Which one out of $BrO_2^-$, $ClO_2^-$, and $IO_2^-$ is the strongest base?

A $ClO_2^-$

B $BrO_2^-$

C They are all equally strong bases.

D $IO_2^-$

**Q5:** Which one out of $BrO^-$, $BrO_2^-$, $BrO_3^-$, and $BrO_4^-$ is the strongest base?

A $BrO_3^-$

B They are all equally strong bases.

C $BrO_2^-$

D $BrO_4^-$

E $BrO^-$

**Q6:** Which one out of $NH_2^-$, $HS^-$, $HTe^-$, and $PH_2^-$ is the strongest base?

A They are all equally strong.

B $HTe^-$

C $NH_2^-$

D $PH_2^-$

E $HS^-$

**Q7:** Which conjugate acid, $(CH_3)_2NH_2^+$ or $(CH_3)_2NH_3^+$, is the stronger acid at 25°C? $K_b$ $(CH_3NH_2) = 4.4 \times 10^{-4}$ and $K_b$ $((CH_3)_2NH) = 5.9 \times 10^{-4}$.

A $(CH_3)_2NH_2^+$

B It is impossible to tell without knowing at what concentrations the acidities of the compounds are measured.

C They are both ammonium ions, and therefore, they are equally strong acids.

D $(CH_3)_2NH_3^+$

**Q8:** A solution has a HCl concentration of 0.10 M and a formic acid (HCOOH) concentration of 0.10 M. Why is the hydronium ion concentration in this solution mainly determined by the concentration of HCl?

A HCl dissociates completely, while HCOOH only partially dissociates.

B HCl reacts with HCOOH, neutralizing it.

C HCOOH does not dissociate at all, so HCl is the only contributor to $[H^+]$.

D HCOOH dissociates to form both hydroxide and hydronium ions, so it has no net effect on $[H^+]$.

**Q9:** Aniline ($C_6H_5NH_2$) is a much weaker base than ammonia ($NH_3$). If the initial concentrations of ammonia and aniline in a solution are both equal to 0.10 M, which of the following statements is true at equilibrium?

A $[OH^-] = [C_6H_5NH_2]$

B $[NH_4^+] = [C_6H_5NH_3^+]$

C $[NH_3] = [C_6H_5NH_2]$

D $[OH^-] = [C_6H_5NH_3^+]$

E $[OH^-] = [NH_4^+]$

**Q10:** Which one out of $NaHSO_3$, $NaHSeO_3$, and $NaHSO_4$ is the strongest acid?

A They are all equally strong acids.

B $NaHSeO_3$

C They are all salts and therefore are not acidic.

D $NaHSO_4$

E $NaHSO_3$

**Q11:** Place the compounds HCl, $PH_3$, and $SH_2$ in order of increasing acid strength.

A $PH_3$, HCl, $SH_2$

B $PH_3$, $SH_2$, HCl

C HCl, $SH_2$, $PH_3$

D HCl, $PH_3$, $SH_2$

E $SH_2$, $PH_3$, HCl

**Q12:** Why is the ionization constant, $K_a$, for $H_2SO_4$ larger than the ionization constant for $H_2SO_3$?

A The O–H bonds in $H_2SO_4$ are more easily broken because the bonding electrons are delocalised over more oxygen atoms.

B The protons of $H_2SO_4$ are more easily removed because they are bonded to a larger number of oxygen atoms.

C The O–H bonds in $H_2SO_4$ are less easily broken because the bonding electrons are delocalised over more oxygen atoms.

D The conjugate base of $H_2SO_4$ is more easily protonated because the negative charge is delocalized over more oxygen atoms.

E The conjugate base of $H_2SO_4$ is less easily protonated because the negative charge is delocalized over more oxygen atoms.