

# Brønsted-Lowry Acids and Bases

1 Identify the hydrogen ion donor(s) and acceptor(s) in each of the following reactions:

	H <sup>+</sup> donors (the acids)	H <sup>+</sup> acceptors (the bases)
a) $\text{HNO}_3(\text{aq.}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_3\text{O}^+(\text{aq.}) + \text{NO}_3^-(\text{aq.})$	_____	_____
b) $\text{C}_2\text{H}_5\text{NH}_2(\text{aq.}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{C}_2\text{H}_5\text{NH}_3^+(\text{aq.}) + \text{OH}^-(\text{aq.})$	_____	_____
c) $\text{CH}_3\text{COOH}(\text{aq.}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{CH}_3\text{COO}^-(\text{aq.}) + \text{H}_3\text{O}^+(\text{aq.})$	_____	_____

2 Write the formulas for the conjugate base of each of the following acids.

a) $\text{H}_2\text{SO}_3$ _____	b) $\text{HCO}_3^-$ _____	c) $\text{NH}_4^+$ _____
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3 Write the formulas for the conjugate acid of each of the following bases.

a) $\text{H}_2\text{O}$ _____	b) $\text{CO}_3^{2-}$ _____	c) $\text{PH}_3$ _____
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4 For each molecule or ion in the table, identify whether it can act as an acid or a base. Put a checkmark under each theory that describes it. There can be more than one theory per compound.

Molecule/ion	Acid or Base	Arrhenius	Brønsted-Lowry	Lewis
$\text{Br}^-$				
$\text{CN}^-$				
$\text{H}_2\text{CO}_3$				
$\text{NH}_3$				
$\text{HNO}_2$				
$\text{Ba}(\text{OH})_2$				
$\text{HCl}$				
$\text{AlCl}_3$				
$\text{Cl}^-$				
$\text{KOH}$				
$\text{IO}_3^-$				
$\text{CH}_3\text{COOH}$				

# Brønsted-Lowry Acids and Bases

## Answers

1 Identify the hydrogen ion donor(s) and acceptor(s) in each of the following reactions:

	H <sup>+</sup> donors (the acids)	H <sup>+</sup> acceptors (the bases)
a) $\text{HNO}_3(\text{aq.}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_3\text{O}^+(\text{aq.}) + \text{NO}_3^-(\text{aq.})$	<u><math>\text{HNO}_3</math></u>	<u><math>\text{H}_2\text{O}</math></u>
b) $\text{C}_2\text{H}_5\text{NH}_2(\text{aq.}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{C}_2\text{H}_5\text{NH}_3^+(\text{aq.}) + \text{OH}^-(\text{aq.})$	<u><math>\text{H}_2\text{O}</math></u>	<u><math>\text{C}_2\text{H}_5\text{NH}_2</math></u>
c) $\text{CH}_3\text{COOH}(\text{aq.}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{CH}_3\text{COO}^-(\text{aq.}) + \text{H}_3\text{O}^+(\text{aq.})$	<u><math>\text{CH}_3\text{COOH}</math></u>	<u><math>\text{H}_2\text{O}</math></u>

2 Write the formulas for the conjugate base of each of the following acids.

a) $\text{H}_2\text{SO}_3$ <u><math>\text{HSO}_3^-</math></u>	b) $\text{HCO}_3^-$ <u><math>\text{CO}_3^{2-}</math></u>	c) $\text{NH}_4^+$ <u><math>\text{NH}_3</math></u>
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3 Write the formulas for the conjugate acid of each of the following bases.

a) $\text{H}_2\text{O}$ <u><math>\text{H}_3\text{O}^+</math></u>	b) $\text{CO}_3^{2-}$ <u><math>\text{HCO}_3^-</math></u>	c) $\text{PH}_3$ <u><math>\text{PH}_4^+</math></u>
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4 For each molecule or ion in the table, identify whether it can act as an acid or a base. Put a checkmark under each theory that describes it. There can be more than one theory per compound.

Molecule/ion	Acid or Base	Arrhenius	Brønsted-Lowry	Lewis
$\text{Br}^-$	base			x
$\text{CN}^-$	base			x
$\text{H}_2\text{CO}_3$	acid	x	x	
$\text{NH}_3$	base			x
$\text{HNO}_2$	acid	x	x	
$\text{Ba}(\text{OH})_2$	base	x		
$\text{HCl}$	acid	x	x	
$\text{AlCl}_3$	acid			x
$\text{Cl}^-$	base			x
$\text{KOH}$	base	x		
$\text{IO}_3^-$	base			x
$\text{CH}_3\text{COOH}$	acid	x		