

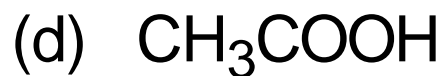
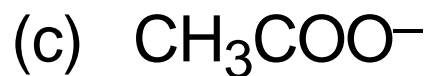
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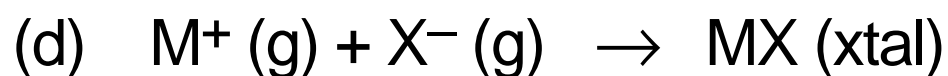
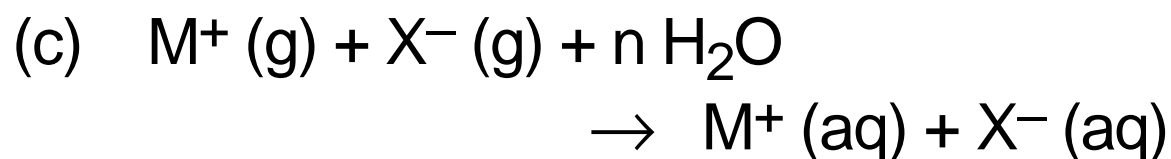
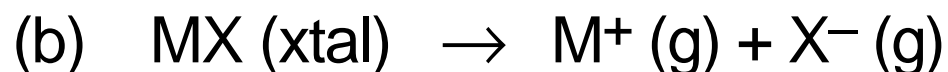
### 3.1-050

Which of the following does not exist in aqueous solution?



### 3.1-111

The lattice energy is  $\Delta H$  for which of the following reactions?



## 3.1-112

The lattice energy is

- (a) always positive
- (b) always negative
- (c) sometimes positive  
& sometimes negative

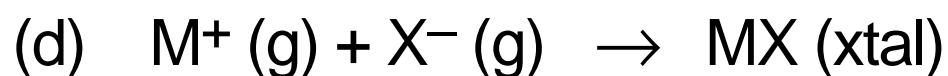
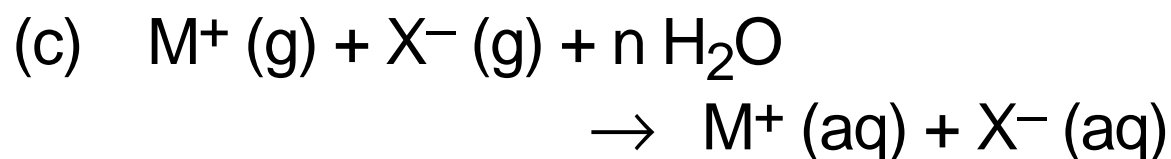
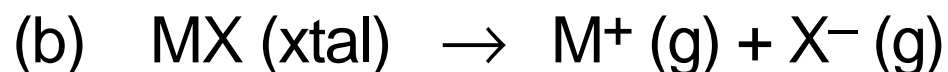
### 3.1-113

A very positive lattice energy

- (a) favors dissolution
- (b) disfavors dissolution
- (c) has no net effect on dissolution

### 3.1-121

The hydration energy is  $\Delta H$  for which of the following reactions?



## 3.1-122

The hydration energy is

- (a) always positive
- (b) always negative
- (c) sometimes positive  
& sometimes negative

## 3.1-123

A very negative hydration energy

- (a) favors dissolution
- (b) disfavors dissolution
- (c) has no net effect on dissolution

### 3.1-131

In which of the following solvents would you expect the solubility of NaCl to be the smallest?

	dielectric constant	dipole moment
(a) diethyl ether	4.335	1.15
(b) acetone	20.7	2.88
(c) chloroform	4.806	1.01

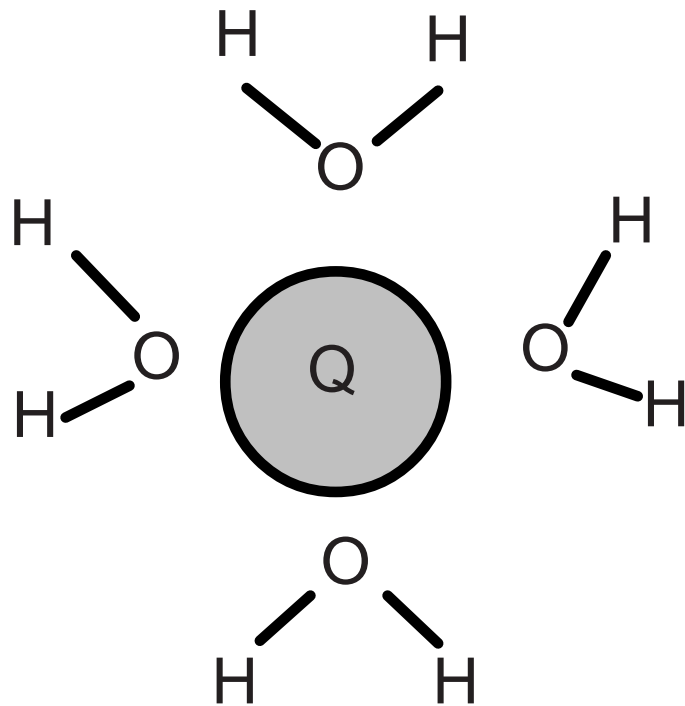
### 3.1-132

In which of the following solvents would you expect the solubility of NaCl to be the largest?

	dielectric constant	dipole moment
(a) glycerol	42.5	2.56
(b) acetone	20.7	2.88
(c) nitromethane	35.87	3.46
(d) benzene	2.284	0

### 3.1-210

If a snapshot of Q in water looks like



the charge on Q must be

- (a) positive
- (b) negative
- (c) zero

## 3.1-220

Which can be hydrated more effectively?

- (a) a cation
- (b) an anion

### 3.1-230

In an ionic solid, each ion is surrounded by counterions. In aqueous solution, these counterions are replaced to the extent possible by the partial charges on neighboring water molecules. The effectiveness of this replacement for divalent cations will generally be

(a) more than      (b) less than      (c) similar to  
that for monovalent cations.

Other things being equal, the effectiveness of the replacement for divalent cations will be

(a) more than      (b) less than      (c) similar to  
that for divalent anions.

The effectiveness of the replacement will be greatest for which of the following?

- |                        |                        |
|------------------------|------------------------|
| (a) $\text{SO}_4^{2-}$ | (b) $\text{SO}_3^{2-}$ |
| (c) $\text{CO}_3^{2-}$ | (d) $\text{S}^{2-}$    |

For which will the replacement be least effective?

## 3.1-250

Which of the following electrolytes is soluble in water?

- (a)  $\text{Al}(\text{NO}_3)_3$  alone
- (b)  $\text{ZnCO}_3$  alone
- (c)  $\text{NiS}$  alone
- (d) all of them

### 3.1-270

Which of the following statements is correct?

- (a) One can prepare a 0.1 M aqueous solution of any strong electrolyte.
- (b) All non-electrolytes have low solubility in water.
- (c) A 6.0 M solution of a weak electrolyte cannot be prepared.
- (d) A significant number of strong electrolytes have low solubility in water.

### 3.1-310

Which of the following aqueous solutions will conduct electricity most effectively?

- (a) 0.5 M NaCl
- (b) 0.5 M sucrose
- (c) 0.5 M acetic acid
- (d) none is exceptional in this regard

Which will conduct electricity least effectively?

### 3.1-320

Which of the following solutions has the lowest freezing point?

- (a) 0.1 *m* sucrose                      (b) 0.1 *m* NaCl  
(c) 0.2 *m* glucose                      (d) 0.1 *m* NiCl<sub>2</sub>

### 3.1-330

NaCl is often added to water to speed up cooking. Given that the rates of many reactions roughly double when the temperature is increased by  $10^{\circ}\text{C}$ , how much NaCl would I have to add to a kg of cooking water to hope to halve the cooking time? (The boiling point elevation constant of water is  $0.5 \text{ kg K mol}^{-1}$ .)

- (a) 5 mol                      (b) 10 mol  
(c) 20 mol                    (d) 283 mol

### 3.1-340

When NaOAc dissolves in water, some of the  $\text{OAc}^-$  protonates. When HOAc dissolves in water, some of the HOAc deprotonates. Which of these proton transfer reactions affects the colligative properties of the solution?

- (a)  $\text{OAc}^-$  protonation
- (b) HOAc deprotonation
- (c) both
- (d) neither

### 3.1-510

What is the concentration of  $\text{Ba}^{2+}$  when 20 mL of 0.1 M  $\text{Ba}(\text{NO}_3)_2$  and 10 mL of 0.2 M  $\text{KNO}_3$  are mixed?

- (a) (0.1 M)                      (b) 2 (0.1 M)  
(c)  $(1/3)(0.1 \text{ M})$               (d)  $(2/3)(0.1 \text{ M})$

What is the concentration of  $\text{NO}_3^-$ ?

- (a) (0.1 M) + (0.2 M)  
(b) 2 (0.1 M) + (0.2 M)  
(c)  $[2 (0.1 \text{ M}) + (0.2 \text{ M})]/3$   
(d)  $[2 (0.2 \text{ M}) + (0.2 \text{ M})]/3$

### 3.1-520

When  $\text{CaCO}_3$  is dissolved in  $\text{HNO}_3$ , all the  $\text{CO}_2$  produced escapes into the air. Which of the following is the balanced net ionic equation for this reaction?

- (a)  $\text{CaCO}_3 (\text{s}) + 2 \text{HNO}_3 (\text{aq}) \rightarrow$   
 $\text{CO}_2 (\text{g}) + \text{Ca}(\text{NO}_3)_2 (\text{aq})$
- (b)  $\text{CaCO}_3 (\text{s}) + \text{HNO}_3 (\text{aq}) \rightarrow$   
 $\text{CO}_2 (\text{g}) + \text{Ca}^{2+} (\text{aq}) + (\text{NO}_3)^- (\text{aq})$
- (c)  $\text{CaCO}_3 (\text{s}) + 2 \text{HNO}_3 (\text{aq}) \rightarrow$   
 $\text{CO}_2 (\text{g}) + \text{H}_2\text{O} (\text{l})$   
 $+ \text{Ca}^{2+} (\text{aq}) + 2 (\text{NO}_3)^- (\text{aq})$
- (d)  $\text{CaCO}_3 (\text{s}) + 2 \text{H}^+ (\text{aq}) \rightarrow$   
 $\text{CO}_2 (\text{g}) + \text{H}_2\text{O} (\text{l}) + \text{Ca}^{2+} (\text{aq})$

### 3.1-530

If equal volumes of 0.07 M  $\text{Ba}(\text{NO}_3)_2$  and 0.11 M  $\text{K}_2\text{SO}_4$  are mixed, white  $\text{BaSO}_4$  precipitates. Assuming that the reaction goes to completion, what is the concentration of  $\text{SO}_4^{2-}$  remaining in the solution?

- |            |            |
|------------|------------|
| (a) 0 M    | (b) 0.02 M |
| (c) 0.04 M | (d) 0.07 M |

What is the concentration of  $\text{Ba}^{2+}$  remaining in the solution?

- |            |            |
|------------|------------|
| (a) 0 M    | (b) 0.02 M |
| (c) 0.04 M | (d) 0.07 M |

### 3.1-540

How many mL of 0.1250 M  $\text{HNO}_3$  is required to completely neutralize 25.00 mL of 0.1080 M  $\text{Ba}(\text{OH})_2$ ?

- (a)  $(25.00) (0.1080) / (0.1250)$
- (b)  $(25.00) (0.1250) (2) / (0.1080)$
- (c)  $(25.00) (0.1080) (2) / (0.1250)$
- (d)  $(25.00) (0.1080) / (2) (0.1250)$

### 3.1-550

When solutions of iron(III) nitrate and sodium hydroxide are mixed, a red-brown gelatinous precipitate of iron (III) hydroxide is formed.

Which of the following mixtures of 0.1 M stock solutions will produce the largest precipitate of iron(III) hydroxide?

- (a) 20 mL of  $\text{Fe}(\text{NO}_3)_3$  and 80 mL of NaOH
- (b) 25 mL of  $\text{Fe}(\text{NO}_3)_3$  and 75 mL of NaOH
- (c) 33 mL of  $\text{Fe}(\text{NO}_3)_3$  and 67 mL of NaOH )
- (d) 50 mL of  $\text{Fe}(\text{NO}_3)_3$  and 50 mL of NaOH

### 3.1-560

What is the maximum number of millimoles of lanthanum oxalate,  $\text{La}_2(\text{C}_2\text{O}_4)_3$ , that can be precipitated by mixing 30.00 mL of 0.08 M  $\text{La}(\text{NO}_3)_3$  with 20.00 mL of 0.12 M  $\text{Na}_2\text{C}_2\text{O}_4$ ?

- (a) 0.8      (b) 1.2      (c) 2.4      (d) 4.8