

Thinking Like a Chemist About Unit 5

What are we going to learn today?

Thinking Like a Chemist in the
Context of Solution Equilibrium
Check on your Readiness for Exam

IMPORTANT INFORMATION

HW3 & LM12 due today 9 AM

EXAM 1, Feb 5th 7 – 9 PM

CHECK WEBSITE FOR ROOM ASSIGNMENT

CHECK IN CANVAS FOR ROOM ASSIGNMENT

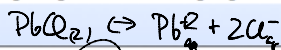
Independent Quiz: Clicker Question 3, NO TALKING!

I have all of these ions in solution,
do I get a precipitate?

This is just equilibrium,
compare Q to K

$K_{sp} = 1.7 \times 10^{-5}$ for $PbCl_2$

I have a solution in which $[Pb^{2+}] = 10^{-2} M$ and $[Cl^-] = 10^{-2} M$



A. some $PbCl_2$ will precipitate $10^{-6} = Q = [Pb^{2+}][Cl^-]^2 = [10^{-2}][10^{-2}]^2$

B. all the $PbCl_2$ will be solution $Q = K$
 $Q = 10^{-6}$ $Q > K$
 $K = 1.7 \times 10^{-5}$ $Q < K$

NO SELECTIVE PRECIPITATION ON TEST

Work through the worksheets. Try your best to understand what is going on!
Platinum Stars on the Line!

POLL: Clicker Question 4

The molar concentration of the CO₂ gas under 2 atm CO₂ pressure is:

- A. Not enough information
- B. .117 M
- C. .234 M
- D. .059 M

$$C_{\text{gas}} = K_H P_{\text{gas}}$$

M (pointing to C_{gas}) *atm* (pointing to P_{gas})

$$K_H = 0.117 \text{ M} \cdot \text{atm}^{-1}$$

The freezing point of the club soda before opening is:

- A. 0° C
- B. 0.44° C
- C. -0.44° C
- D. 0.88° C
- E. -0.88° C

convert from molar → molal

Worked out nicely on key
you should practice that!

in this case I will tell you

.234 M → .236m

$$\Delta T = i K_m = (1)(1.86 \frac{^{\circ}\text{C}}{\text{m}})(.236\text{m})$$

Demonstration

Sodium Acetate Dissolved in Water

The signs for ΔG , ΔS and ΔH for this solution is:

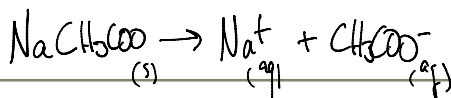
FOR THE DISSOLVING PROCESS

ΔG ΔS ΔH

- A. -, -, -
- B. +, +, +
- C. -, +, -
- D. -, -, +
- E. -, +, +

In the 20 molar sodium acetate solution, the value of Q is:

← before add seed crystal



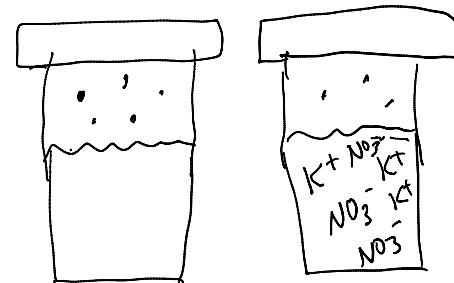
- A. 10
- B. 20
- C. 25
- D. 200
- E. 400

$$K = 25$$

$$Q = [\text{Na}^+][\text{CH}_3\text{COO}^-]$$

$$400 = [20][20]$$

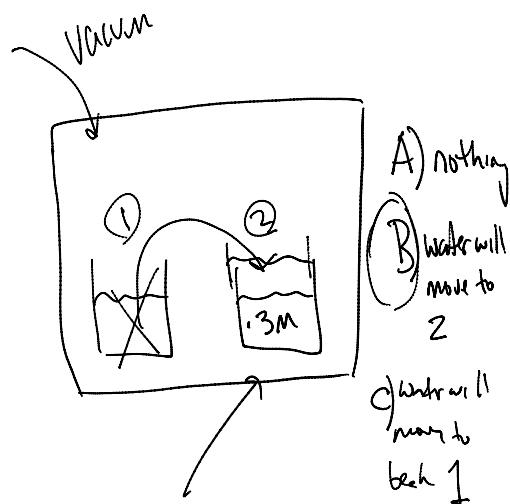
$$Q > K$$



The vapor pressure of the 0.3 M solution is:

25 torr

- A. ~~24.86 atm~~ torr A 24.73 torr
- B. ~~0.14 atm~~ torr B 0.17 torr
- C. ~~25.14 atm~~ torr C 25.17 torr
- D. ~~25.0 atm~~ torr D 25.00 torr

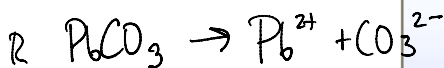


1. Convert allowed Pb^{2+} into molar units

$$\frac{0.15 \text{ mg } Pb^{2+}}{1 \text{ L}} \times \frac{1 \text{ g}}{10^3 \text{ mg}} \times \frac{1 \text{ mol Pb}}{207.2 \text{ g Pb}} = 7.24 \times 10^{-8} \text{ M}$$

The molar concentration of the Pb^{2+} ion in the salsa is:

- A. 0.15 M
- B. 7.14×10^{-14}
- C. 4.93×10^{-13}
- D. 1.11×10^{-14}



R	Some	0	.15
C	-x	+x	+x
E	Some-x	x	.15+x

$$K_{sp} = [Pb^{2+}][CO_3^{2-}] = (x)(.15+x)$$

$$K_{sp} = .15x$$

$$K_{sp} = 7.4 \times 10^{-4}$$

R	$PbCO_3$	Pb^{2+}	CO_3^{2-}
I	Some	0	0
C	-x	+x	+x
E	Some-x	x	x

$$K_{sp} = [Pb^{2+}][CO_3^{2-}]$$

molar conc

What did we learn today?

Dissolution and solubility can be fully explained:
macroscopically
microscopically
thermodynamically.