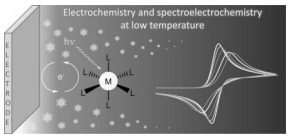
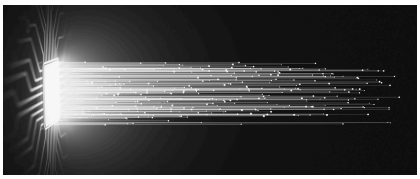


Chemistry 223 Exam II Review
Chapters 15 and 16

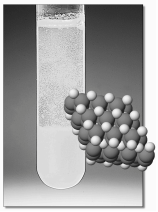


Chemistry 223

Professor Michael Russell

MAR

Last update: 7/6/26



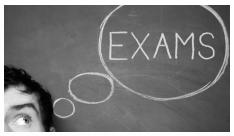
Midterm II

Chapters 15 and 16

- *Bring:* **calculator**, pencil, **"QA I" lab**, **Exam Prep Worksheet II, "QA III" printed lab**, **safety goggles** (no shorts, sandals, etc.)
- 12 multiple choice questions, 4 short answer questions, ~90 minutes in length
- Returned following lab period with "summary sheet" ***Good luck with your studying!***

Let's start the review!

MAR



L1: Mon, 5/17 1:10 PM, AC 2501
L2: Wed, 5/19 1:10 PM, AC 2501

Check with instructor to ensure correct dates and times!

Decide if a precipitate will form when mixing the indicated reagents (all concentrations are 1.0 M).

$KCl(aq) + Pb(NO_3)_2(aq) \rightarrow ?$

A. Yes
B. No
C. Who knows!

MAR

If the solubility of BaF_2 is 3.6×10^{-3}, a reasonable value for K_{sp} for BaF_2 is

A. 3.6×10^{-3}
B. 7.2×10^{-3}
C. 1.1×10^{-2}
D. 1.9×10^{-7}
E. 4.7×10^{-8}

MAR

Which lead salt has the greatest molar solubility in water at 25 °C?

A. $PbCO_3$ $K_{sp} = 1.5 \times 10^{-13}$
B. PbS $K_{sp} = 8.4 \times 10^{-28}$
C. $PbSO_4$ $K_{sp} = 1.8 \times 10^{-4}$

MAR

A solution contains 0.10 M K_2SO_3 and 0.30 M Na_2SO_4. Solid $Ca(NO_3)_2$ is added slowly. Which precipitates first, $CaSO_3$ or $CaSO_4$?

K_{sp} for $CaSO_3 = 1.3 \times 10^{-8}$
K_{sp} for $CaSO_4 = 2.4 \times 10^{-5}$

A. $CaSO_3$
B. $CaSO_4$
C. 42

MAR

$CaSO_3$ precipitates first as Ca^{2+} ions are added to a solution containing 0.10 M K_2SO_3 and 0.30 M Na_2SO_4. What is $[SO_3^{2-}]$ as the $CaSO_4$ begins to precipitate?

$K_{sp}(CaSO_3) = 1.3 \times 10^{-8}$ $K_{sp}(CaSO_4) = 2.4 \times 10^{-5}$

A. 0.10 M
B. 0.30 M
C. 1.6×10^{-4} M
D. 5.4×10^{-4} M
E. 42

MAR

What is the pH of a saturated solution of $Mg(OH)_2$? (K_{sp} ($Mg(OH)_2$) = 5.6×10^{-12})

A. 3.65
B. 8.37
C. 10.35
D. 0.15
E. 11.25

MAR

A solution has $[Pb^{2+}]$ = 0.0012 M and $[Cl^-]$ = 0.010 M. Will $PbCl_2$ precipitate?
K_{sp} ($PbCl_2$) = 1.7×10^{-5}

A. Yes, $PbCl_2$ precipitates
B. No, $PbCl_2$ does NOT precipitate

MAR

Classify the following as ***Lewis*** acids or bases.

BH_3, NH_3, Cl^{1-}, Al^{3+}, Cr^{3+}

A. acid, base, base, acid, acid
B. base, base, base, acid, acid
C. base, acid, acid, base, base
D. acid, base, acid, base, base
E. Public Enemy is #1!

MAR

Which of the following shows the correct formation constant (K_f) equation for $Cr(CN)_6^{3-}$?

A. $Cr(CN)_3(s) + 3\ CN^{1-}(aq) \rightleftarrows Cr(CN)_6^{3-}(aq)$
B. $Cr(NO_3)_3(s) + 6\ NaCN(aq) \rightleftarrows Cr(CN)_6^{3-}(aq) + 3\ NaNO_3(aq) + 3\ Na^+(aq)$
C. $Cr(CN)_6^{3-}(s) \rightleftarrows Cr^{3+}(aq) + 6\ CN^{1-}(aq)$
D. $Cr(CN)_6^{3-}(aq) \rightleftarrows Cr^{3+}(aq) + 6\ CN^{1-}(aq)$
E. $Cr^{3+}(aq) + 6\ CN^{1-}(aq) \rightleftarrows Cr(CN)_6^{3-}(aq)$

MAR

Barium sulfite is poorly soluble in water with a K_{sp} value of 8.0×10^{-7}. What is $\Delta G°$ at 25 °C?

A. 15.1 kJ/mol•rxn
B. 34.8 kJ/mol•rxn
C. -34.8 kJ/mol•rxn
D. 343 kJ/mol•rxn
E. 42

MAR

Balance the following reaction (pH = 8.37):

$MnO_4^{1-} + I^{1-} \rightarrow MnO_2 + I_2$

A. $MnO_4^{1-} + 2\ I^{1-} \rightarrow MnO_2 + I_2 + O_2^{2-}$

B. $8\ H^{+} + 2\ MnO_4^{1-} + 6\ I^{1-} \rightarrow 2\ MnO_2 + 3\ I_2 + 4\ H_2O$

C. $8\ H_2O + 4\ MnO_4^{1-} + 12\ I^{1-} \rightarrow 4\ MnO_2 + 6\ I_2 + 16\ OH^{1-}$

D. $4\ H_2O + 2\ MnO_4^{1-} + 6\ I^{1-} \rightarrow 2\ MnO_2 + 3\ I_2 + 8\ OH^{1-}$

MAR

What is the strongest reducing agent in the list?

Half-Reaction	*E°(V)*
$Ce^{4+}(aq) + e^- \rightarrow Ce^{3+}(aq)$	+1.61
$Ag^{+}(aq) + e^- \rightarrow Ag(s)$	+0.80
$Hg_2^{2+}(aq) + 2\ e^- \rightarrow 2\ Hg(\ell)$	+0.79
$Sn^{2+}(aq) + 2\ e^- \rightarrow Sn(s)$	-0.14
$Ni^{2+}(aq) + 2\ e^- \rightarrow Ni(s)$	-0.25
$Al^{3+}(aq) + 3\ e^- \rightarrow Al(s)$	-1.66

A. Ce^{4+}

B. Al^{3+}

C. Sn

D. Al

E. Jq

MAR

Will Sn(s) reduce $Ag^{+}(aq)$ to Ag(s)?

Half-Reaction	*E°(V)*
$Ag^{+}(aq) + e^- \rightarrow Ag(s)$	+0.80
$Sn^{2+}(aq) + 2\ e^- \rightarrow Sn(s)$	-0.14

A. Yes

B. No

C. Only if it feels like it

MAR

Determine the equilibrium constant for the following reaction at 25 °C:

$Cl_2(aq) + 2I^{1-}(aq) \rightarrow 2\ Cl^{1-}(aq) + I_2(aq)$ $E° = +0.825$ V

A. 1.31×10^{-28}

B. 8.74×10^{13}

C. 8.03×10^{27}

D. 0.217

E. -1.16×10^{5}

MAR

A **voltaic** cell is created using the information below to be used in Alaska where the average temperature is 5.00 °C. Calculate the expected cell potential under these conditions.

$Al(s) \mid Al^{3+}(aq, 0.0010\ M) \parallel Ni^{2+}(aq, 0.50\ M) \mid Ni(s)$

$Ni^{2+}(aq) + 2\ e^- \rightarrow Ni(s)$	-0.25 V
$Al^{3+}(aq) + 3\ e^- \rightarrow Al(s)$	-1.66 V

A. 1.46 V

B. 1.31 V

C. 1.17 V

D. 0.51 V

E. -1.91 V

MAR

How long must a 2.00 amp current flow through a gold solution to convert 0.0100 mol of Au^{3+} (aq) into Au(s)?

A. 483 s

B. 4.83×10^{4} s

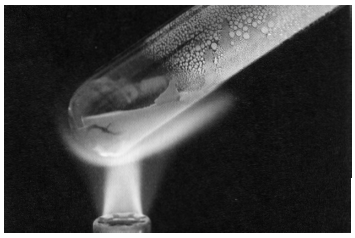
C. 965 s

D. 1450 s

E. 1 zillion s

MAR

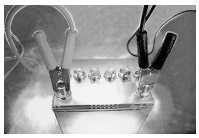
End of Review - *good luck with your studying!*



Need more practice?

- *Practice Problem Sets (Companion and online)*
- *Concept Guides (Companion and online)*
- *Chapter Guides (online)*
- *End of Chapter Problems in Textbook (every other question has answer at end)*

Good luck with your studying!



MAR