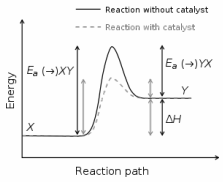
Chemistry 222 Final Exam Review
Chapters 17 and 20

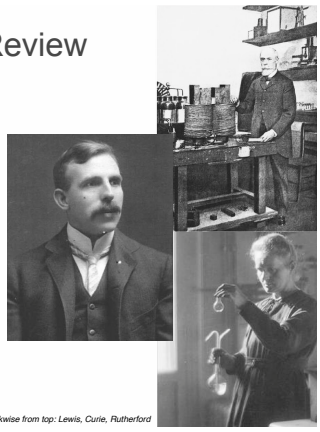


Chemistry 222

Professor Michael Russell

MAR

Last update: 4/27/26



Clockwise from top: Lewis, Curie, Rutherford

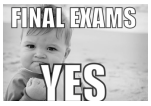
CH 222 Lecture & Lab Final Exams

Lecture Final:

- 24 multiple choice questions and four short answer questions, Chapters 7-11, 17, 20. Bring: **calculator**, pencil, **"Kinetics II"** lab

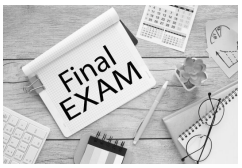
Lab Final: *Take after Lecture Final*

- 5 short answer questions over labs from this term; show work, use **calculator**.



L1: Thurs., July 23, 8:30 AM, AC 1303

Check with instructor to ensure correct dates and times!



Final grades available by Friday night. Final exams not returned.

Good luck with your studying!

Let's start the review!

For the reaction below, what is $\Delta[CH_2O]/\Delta t$ with respect to $\Delta[O_2]/\Delta t$?

$$C_2H_4(g) + O_3(g) \rightarrow 2\ CH_2O(g) + \tfrac{1}{2}\ O_2(g)$$

A. $\Delta[CH_2O]/\Delta t = 2 \bullet \Delta[O_2]/\Delta t$
B. $\Delta[CH_2O]/\Delta t = \frac{1}{4} \bullet \Delta[O_2]/\Delta t$
C. $\Delta[CH_2O]/\Delta t = -4 \bullet \Delta[O_2]/\Delta t$
D. $\Delta[CH_2O]/\Delta t = 4 \bullet \Delta[O_2]/\Delta t$
E. $\Delta[CH_2O]/\Delta t = \Delta[O_2]/\Delta t$

MAR

The reduction of NO with hydrogen produces nitrogen and water.

$$2\ NO + 2\ H_2 \rightarrow N_2 + 2\ H_2O$$

The reaction is second order in NO and third order overall. The rate law for the reaction is

A. Rate = k $[NO][H_2]$
B. Rate = k $[NO][H_2]^2$
C. Rate = k $[NO]^2[H_2]$
D. Rate = k $[NO]^2[H_2]^2$
E. Rate = k $[NO_2][H^+]^3$

MAR

The reduction of NO with hydrogen produces nitrogen and water.

$$2\ NO + 2\ H_2 \rightarrow N_2 + 2\ H_2O$$

The reaction is second order in NO and third order overall. The [NO] is increased by a factor of 5, the rate will increase by a factor of

A. 0
B. 1
C. 5
D. 10
E. 25

MAR

Given the initial rate data for the reaction A + B → C, determine the rate expression for the reaction.

[A] (M)	[B] (M)	Δ[C]/Δt (M/s)
0.10	0.20	40.
0.20	0.20	80.
0.10	0.10	40.

A. $\Delta[C]/\Delta t = 2000[A][B]$
B. $\Delta[C]/\Delta t = 40.[A]^2$
C. $\Delta[C]/\Delta t = 4.0[B]$
D. $\Delta[C]/\Delta t = 400[A]$
E. $\Delta[C]/\Delta t$ = #1[AC/DC]

MAR

For the reaction A → B, the disappearance of A is found to be **second-order**. Which of the following will produce a straight line graph?

A. log [A] vs. time
B. ln [A] vs. time
C. [A] vs. time
D. 1/[A] vs. time
E. $[A]^2$ vs. time

MAR

For the reaction A → B, the disappearance of A is found to be **first-order**. A linear regression analysis of the data yields the equation:

y = -0.00106x + -3.91

What is the value of the rate constant, *k*?

A. -0.00106
B. 0.00106
C. -3.91
D. 3.91
E. 42

MAR

For the reaction A → B the disappearance of A is **first-order** where k = 0.030/min. If we begin with [A] = 0.36 M, what will [A] be after 46 min?

A. 0.091 M
B. 0.18 M
C. 0.31 M
D. 0.25 M
E. 0.50 M

MAR

Radioactive gold-198 is used in the diagnosis of liver problems. The half-life of the isotope is 2.7 days. If you begin with 5.6 mg of the isotope, how many days does it take 5.6 mg of gold to become 0.70 mg?

A. 2.0 days
B. 2.7 days
C. 5.4 days
D. 8.1 days
E. 10.8 days

MAR

The reaction of $NO_2(g)$ and CO(g) is thought to occur in two steps:

Step 1 Slow $NO_2(g) + NO_2(g) \rightarrow NO(g) + NO_3(g)$
Step 2 Fast $NO_3(g) + CO(g) \rightarrow NO_2(g) + CO_2(g)$

Which of the following rate laws would correspond to this mechanism?

A. Rate = $k[NO_2][CO]$
B. Rate = $k[NO_2]$
C. Rate = $k[NO_2]^2$
D. Rate = k[CO]
E. Rate = $k[CO]^2$

MAR

Use the rate laws below to determine which reaction is most likely to occur in a single step:

A. $2\ NO_2(g) + F_2(g) \rightarrow 2\ NO_2F(g)$ Rate = $k[NO_2][F_2]$
B. $H_2(g) + Br_2(g) \rightarrow 2\ HBr(g)$ Rate = $k[H_2][Br_2]^{1/2}$
C. $NO(g) + O_2(g) \rightarrow NO_2(g) + O(g)$ Rate = $k[NO][O_2]$
D. $NO_2(g) + CO(g) \rightarrow NO(g) + CO_2(g)$ Rate = $k[NO_2]$

MAR

Which statement is incorrect?

A. A catalyst provides an alternative mechanism for a reaction
B. A catalyst is regenerated in a reaction
C. A reaction involving a catalyst yields more product
D. A catalyst speeds up the forward and reverse reactions
E. Catalysts are cool! :)

MAR

How many neutrons and protons are there in the radioisotope ^{60}Co that is used in cancer therapy?

A. 60 neutrons and 27 protons
B. 27 neutrons and 60 protons
C. 33 neutrons and 27 protons
D. 27 neutrons and 33 protons
E. 0 neutrons and 0 protons

MAR

What is the unknown particle in the following nuclear reaction?

$^{239}_{92}U \rightarrow$ particle + $^{239}_{93}Np$

A. alpha
B. beta
C. gamma
D. neutron
E. positron

MAR

What is the unknown particle in the following nuclear reaction?

$^{207}_{84}Po \rightarrow$ particle + $^{207}_{83}Bi$

A. alpha
B. beta
C. gamma
D. neutron
E. positron

MAR

What new nucleus is produced in the following nuclear reaction?

$^{41}_{20}Ca + {}^{0}_{-1}e \rightarrow ?$

A. $^{41}_{21}Sc$
B. $^{42}_{19}K$
C. $^{41}_{19}K$

MAR

Which of the following nuclei has the highest binding energy per nucleon?

A. ^{7}Li
B. ^{59}Ni
C. ^{4}He
D. ^{232}Th
E. ^{0}Jq

MAR

Calculate the **binding energy per mol of nucleons (E_b) for carbon-12**. *Helpful values:*
- 1 proton = 1.007825 g/mol
- 1 neutron = 1.008665 g/mol
- carbon-12 = 12.000000 g/mol
- 2.998 x 10^8 m/s = c

A. 7.411 x 10^8 kJ
B. 8.893 x 10^9 kJ
C. 1.482 x 10^9 kJ
D. -0.098940 kJ
E. 0.0001 x 10^8 kJ

MAR

Radioactive iodine-131 is used to treat hyperthyroidism. It has a half-life of 8.04 days. If you begin with 8.8 micrograms, what mass remains after 32.3 days?

A. 4.4 micrograms
B. 2.2 micrograms
C. 1.1 micrograms
D. 0.54 micrograms
E. 0.23 micrograms

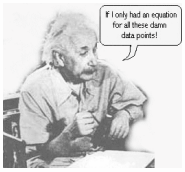
MAR

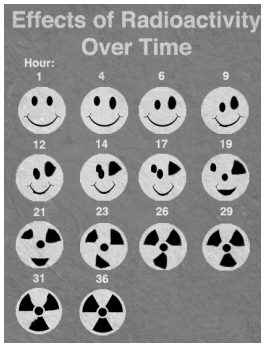
Gallium citrate, containing radioactive ^{67}Ga, is used as a tumor-seeking agent. It has a half-life of 78.2 hours. How long will it take for a sample of gallium citrate to decay to 15% of its original activity?

A. 86.5 hours
B. 157 hours
C. 214 hours
D. 235 hours
E. 150 seconds

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