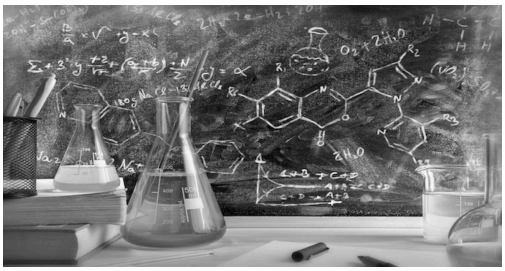
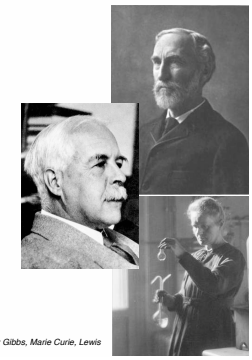
Chemistry 223 Final Exam Review





Chemistry 223

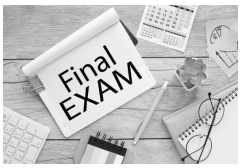
Professor Michael Russell

MAR

Last update: 7/6/26

Clockwise from top: Gibbs, Marie Curie, Lewis

CH 223 Lecture & Lab Final Exams

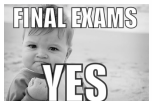


Lecture Final:

- 28 multiple choice questions, covers all chapters. *Bring:* **calculator**, pencil, "**Organic Chemistry**" lab

Lab Final: *Mix of QAI & QAIII labs*

- Work with one lab partner, 2 hours to complete, bring combined flowchart and lab procedures from QAI and QAIII



L1 Lab Final: Mon. 6/7, 1:10 PM AC 2507
L1 Lec Final: Wed, 6/9, 8:45 AM, AC 1303

Check with instructor to ensure correct dates and times!

L2 Lab Final: Wed. 6/9, 1:10 PM AC 2507
L2 Lec Final: Wed, 6/9, 3:20 PM, AC 2501

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

Good luck with your studying!

Let's start the review!

Which statement describes the composition of a neutral atom of iron-58?

A. 26 neutrons, 32 protons, and 26 electrons
B. 32 neutrons, 26 protons, and 26 electrons
C. 26 neutrons, 26 protons, and 32 electrons
D. 26 neutrons, 26 protons, and 26 electrons
E. Not enough information

MAR

Nitrogen and oxygen form a series of oxides with the general formula N_xO_y. One of them has 46.67% N. The empirical formula for this oxide is

A. N_2O
B. NO
C. NO_2
D. N_2O_3
E. N_2O_5

MAR

Ammonia is prepared by the reaction:

$$N_2(g) + 3\,H_2(g) \rightarrow 2\,NH_3(g)$$

If 10.0 mol of N_2 are mixed with 25.0 mol of H_2, the amount of NH_3 produced will be:

A. 20.0 mol NH_3
B. 16.7 mol NH_3
C. 37.5 mol NH_3
D. 25.0 mol NH_3
E. 35.0 mol NH_3

MAR

Which of the compounds below would be the best conductor of electricity in aqueous solution?

A. CH_3CO_2H
B. H_3PO_4
C. NH_3
D. HBr
E. HIO

MAR

Which equation below best represents the balanced net ionic equation for the reaction of potassium hydroxide and iron(II) chloride to give iron(II) hydroxide and potassium chloride?

A. $2\ KOH(aq) + FeCl_2(aq) \rightarrow Fe(OH)_2(s) + 2\ KCl(aq)$
B. $2\ KOH(aq) + FeCl_2(aq) \rightarrow Fe(OH)_2(aq) + 2\ KCl(aq)$
C. $2\ OH^-(aq) + Fe^{2+}(aq) \rightarrow Fe(OH)_2(s)$
D. $K^+(aq) + Cl^-(aq) \rightarrow KCl(aq)$

MAR

Assume you dissolve 6.73 g Na_2CO_3 in enough water to make 250. mL of solution. (Molar mass of Na_2CO_3 = 106 g/mol.) What is the concentration of the sodium carbonate?

A. 26.9 M
B. 0.0635 M
C. 0.254 M
D. 0.762 M
E. 42 M

MAR

What is the oxidation number for Mn in $KMnO_4$?

A. 0
B. +2
C. +4
D. +7
E. +8

MAR

Calculate the enthalpy for the reaction

$$SiH_4(g) + 2\ O_2(g) \rightarrow SiO_2(g) + 2\ H_2O(g)$$

using these values:

$\Delta H^\circ_f[SiH_4(g)] = +34.3$ kJ/mol;

$\Delta H^\circ_f[SiO_2(g)] = -910.9$ kJ/mol; and

$\Delta H^\circ_f[H_2O(g)] = -241.8$ kJ/mol

A. -1187.0 kJ/rxn
B. -1428.8 kJ/rxn
C. -1360.2 kJ/rxn
D. -2218.7 kJ/rxn
E. Not enough information

MAR

The correct general valence electronic configuration for the alkali metals is:

A. ns^1
B. ns^2
C. $ns^2\ np^1$
D. $ns^2\ np^5$
E. $ns^2\ np^6$

MAR

Compare the elements Na, B, Al, and C with regard to the following properties:
Which has the largest atomic radius?

A. Na
B. B
C. Al
D. C
E. Jq

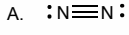
MAR

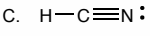
Compare the elements K, B, Al, and N with regard to the following properties:
Which has the largest electronegativity?

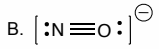
A. K
B. B
C. Al
D. N
E. Jq

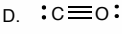
MAR

Which of the following is NOT a correct Lewis dot structure?

A. 

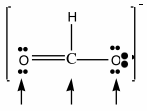
C. 

B. 

D. 

MAR

Determine the formal charges for the formate ion:

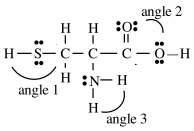


Formal charge = ___ ___ ___

A. 0 0 0
B. +1 –1 –1
C. +1 0 –1
D. 0 0 –1

MAR

Cysteine is one of the natural amino acids.



Estimate the values of the indicated angles:

A. Angle 1 = 180˚ Angle 2 = 120˚ Angle 3 = 109˚
B. Angle 1 = 109˚ Angle 2 = 120˚ Angle 3 = 109˚
C. Angle 1 = 109˚ Angle 2 = 109˚ Angle 3 = 109˚

MAR

Which of the following could be an alkene?

A. $C_nH_{2n+2}O$
B. C_nH_{2n+2}
C. C_nH_{2n}
D. C_nH_{2n-2}
E. none of these

MAR

A sample of gas has a volume of 222 mL at 695 mm Hg and 0 °C. What would be the volume of this same sample of gas if it were measured at 333 mm Hg and 0 °C?

A. 894 mL
B. 463 mL
C. 657 mL
D. 359 mL
E. -155 mL

MAR

Gas density: Which has the greatest density at 25 °C and 1.00 atm pressure?

A. O_2
B. N_2
C. H_2
D. CO_2
E. Xe

MAR

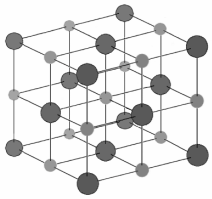
Under what conditions will the ideal gas law be least effective?

A. high temperature and high pressure
B. high temperature and low pressure
C. low temperature and high pressure
D. low temperature and low pressure
E. it works all the time

MAR

In the diagram for NaCl, the smaller blue atoms are Na and the larger green atoms are Cl. How many nearest neighbors of Cl does each Na have?

A. 8
B. 6
C. 4
D. 2
E. 1



MAR

Which water-based solution is expected to have the higher boiling point?

A. 0.10 molal NaCl
B. 0.15 molal sugar
C. both the same
D. not enough information

MAR

Erythritol occurs naturally in algae and fungi. A solution of 2.50 g of erythritol in 50.0 g of water freezes at -0.762 °C. What is the molar mass of the compound? ($k_{fp}(H_2O)$ = -1.86 °C/m)

A. 26.9 g/mol
B. 35.5 g/mol
C. 122 g/mol
D. 224 g/mol
E. 0.0100 g/mol

MAR

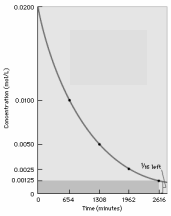
Given the initial rate data for the reaction A + B → C, determine the rate expression for the reaction.

[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

Using the graph, determine the half life of this reaction.



A. 654 minutes
B. 1308 minutes
C. 1962 minutes
D. 2616 minutes
E. 0 minutes

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

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 species is acting as a catalyst in this mechanism?

A. NO_2
B. NO
C. CO
D. CO_2
E. NO_3

MAR

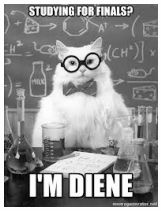
What is the unknown particle in the following nuclear reaction?

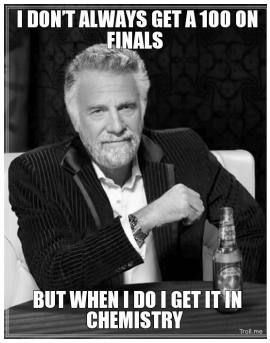
$^{239}_{92}U \rightarrow$ particle + $^{239}_{93}Np$

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

MAR

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