

## Chemistry 223 Final Exam Review

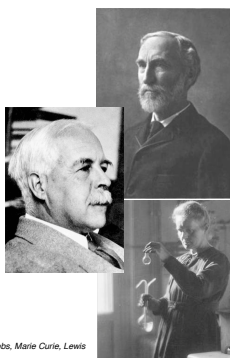


Chemistry 223  
Professor Michael Russell

MAR

Last update:  
6/22

Clockwise from top: Gibbs, Marie Curie, Lewis



MAR

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

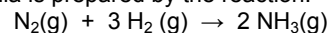
- A. 26 neutrons, 32 protons, and 26 electrons
- B. 32 neutrons, 26 protons, and 26 electrons
- C. 26 neutrons, 26 protons, and 32 electrons
- D. 26 neutrons, 26 protons, and 26 electrons
- E. Not enough information

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.  $N_2O_5$

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Ammonia is prepared by the reaction:



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  $NH_3$

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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.  $HIO$

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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.  $K^+(aq) + Cl^-(aq) \rightarrow KCl(aq)$

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Assume you dissolve 6.73 g  $\text{Na}_2\text{CO}_3$  in enough water to make 250. mL of solution. (Molar mass of  $\text{Na}_2\text{CO}_3 = 106 \text{ g/mol}$ .) 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

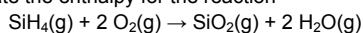
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What is the oxidation number for Mn in  $\text{KMnO}_4$ ?

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

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Calculate the enthalpy for the reaction



using these values:

$$\Delta H_f^\circ[\text{SiH}_4(\text{g})] = +34.3 \text{ kJ/mol};$$

$$\Delta H_f^\circ[\text{SiO}_2(\text{g})] = -910.9 \text{ kJ/mol}; \text{ and}$$

$$\Delta H_f^\circ[\text{H}_2\text{O}(\text{g})] = -241.8 \text{ kJ/mol}$$

- 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.  $ns^2 np^6$

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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

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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

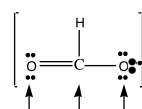
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Which of the following is NOT a correct Lewis dot structure?

- A.  $\text{N}\equiv\text{N}$                       3C.  $\text{H}-\text{C}\equiv\text{N}$
- B.  $[\text{N}\equiv\text{O}]^{\ominus}$                       4D.  $\text{C}\equiv\text{O}$

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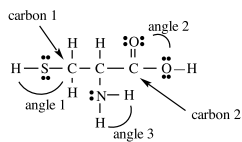
Determine the formal charges for the formate ion:



- Formal charge =  $\frac{\text{valence electrons} - \text{nonbonding electrons} - \frac{1}{2} \text{bonding electrons}}{\text{atom}}$
- A. 0    0    0
- B. +1   -1   -1
- C. +1    0   -1
- D. 0    0   -1

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Cysteine is one of the natural amino acids.



Estimate the values of the indicated angles:

- A. Angle 1 =  $180^\circ$  Angle 2 =  $120^\circ$  Angle 3 =  $109^\circ$
- B. Angle 1 =  $109^\circ$  Angle 2 =  $120^\circ$  Angle 3 =  $109^\circ$
- C. Angle 1 =  $109^\circ$  Angle 2 =  $109^\circ$  Angle 3 =  $109^\circ$

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Which of the following could be an alkene?

- A.  $\text{C}_n\text{H}_{2n+2}\text{O}$
- B.  $\text{C}_n\text{H}_{2n+2}$
- C.  $\text{C}_n\text{H}_{2n}$
- D.  $\text{C}_n\text{H}_{2n-2}$
- E. none of these

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A sample of gas has a volume of 222 mL at 695 mm Hg and  $0^\circ\text{C}$ . What would be the volume of this same sample of gas if it were measured at 333 mm Hg and  $0^\circ\text{C}$ ?

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

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Gas density: Which has the greatest density at  $25^\circ\text{C}$  and 1.00 atm pressure?

- A.  $\text{O}_2$     32 g/mol
- B.  $\text{N}_2$     28 g/mol
- C.  $\text{H}_2$     2 g/mol
- D.  $\text{CO}_2$     44 g/mol
- E. Xe    131 g/mol

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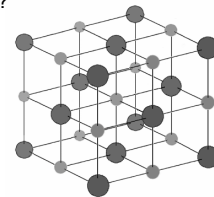
Under what conditions will the ideal gas law be least effective?

- 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

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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



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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

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Erythritol occurs naturally in algae and fungi. A solution of 2.50 g of erythritol in 50.0 g of water freezes at  $-0.762\text{ }^{\circ}\text{C}$ . What is the molar mass of the compound? ( $K_{fp}(\text{H}_2\text{O}) = -1.86\text{ }^{\circ}\text{C}/m$ )

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

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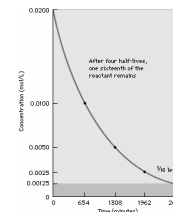
Given the initial rate data for the reaction  $A + B \rightarrow C$ , determine the rate expression for the reaction.

[A] (M)	[B] (M)	$\Delta[C]/\Delta t$ (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.  $\Delta[C]/\Delta t = \#1[AC/DC]$

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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

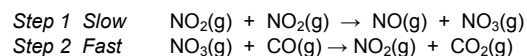
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Radioactive iodine-131 is used to treat hyperthyroidism. It has a half-life of 8.04 days. If you begin with 8.8 micrograms, what mass remains after 32.3 days?

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

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The reaction of  $\text{NO}_2(\text{g})$  and  $\text{CO}(\text{g})$  is thought to occur in two steps.



Which species is acting as a catalyst in this mechanism?

- A.  $\text{NO}_2$
- B.  $\text{NO}$
- C.  $\text{CO}$
- D.  $\text{CO}_2$
- E.  $\text{NO}_3$

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What is the unknown particle in the following nuclear reaction?



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

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



*Need more practice?*

- *Practice Problem Sets (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!*

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