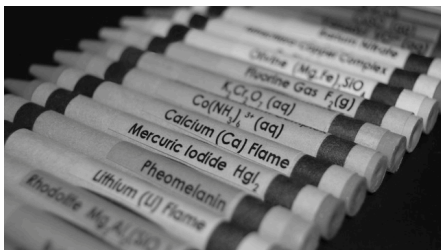


Chemistry 221 Exam I Review Chapters 1, 2 and 3



Chemistry 221
Professor Michael Russell



Last update:
4/27/26

Midterm I

Chapters 1, 2 and 3

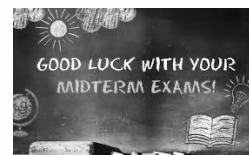
- Bring: calculator, pencil, "Nomenclature" lab, Exam Prep Worksheet I, "ID of Unknown Compound" printed lab (goggles!)
- 12 multiple choice questions, 4 short answer questions, ~90 minutes in length
- Returned following lab period with "summary sheet" **Good luck with your studying!**

Let's start the review!



L1: Mon, 10/19 1:10 PM, AC 2501
L2: Tue, 10/20 8:30 AM, AC 2607
L3: Wed, 10/21 1:10 PM, AC 2501
L4: Fri, 10/23 1:10 PM, AC 2501

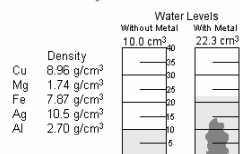
Check with instructor to ensure correct dates and times!



MAR

MAR

A piece of metal with a mass of 33.2 g is immersed in 10.0 mL of water in a graduated cylinder. Determine the identity of the metal.



- A. Cu, 8.96 g/cm³
B. Mg, 1.74 g/cm³
C. Fe, 7.87 g/cm³
D. Ag, 10.5 g/cm³
E. Al, 2.70 g/cm³

MAR

MAR

You are given temperature readings at three locations on Earth: 29 °C, 45 °F, and 256 K. What is the order of increasing temperature? $T(^{\circ}\text{F}) = 1.8 * T(^{\circ}\text{C}) + 32$

- A. 29 °C < 45 °F < 256 K
B. 45 °F < 29 °C < 256 K
C. 256 K < 29 °C < 45 °F
D. 256 K < 45 °F < 29 °C
E. 45 °F < 256 K < 29 °C

Place the following in order of increasing size:
215 mm, 9 cm, 2.3 m, and 0.125 m

- A. 215 mm < 9 cm < 2.3 m < 0.125 m
B. 215 mm < 9 cm < 0.125 m < 2.3 m
C. 9 cm < 215 mm < 0.125 m < 2.3 m
D. 9 cm < 0.125 m < 215 mm < 2.3 m
E. 0.125 m < 9 cm < 215 mm < 2.3 m

MAR

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

When the ion Sr^{2+} forms,

- A. the Sr atom loses 1 electron and now has the same number of electrons as Kr
- B. the Sr atom loses 1 electron and now has the same number of electrons as Xe
- C. the Sr atom loses 2 electrons and now has the same number of electrons as Kr
- D. the Sr atom gains 2 electrons and now has the same number of electrons as Kr
- E. the Sr atom loses 3 electrons and now has the same number of electrons as Kr

MAR

An element (E) has several naturally occurring isotopes, with the following abundances:
 ^{72}E , 54.5% ^{73}E , 15.6% ^{74}E , 29.9%

The most reasonable atomic mass for this element would be

- A. 72.1
- B. 72.8
- C. 73.4
- D. 73.8
- E. 74.0

MAR

How many emission lines are possible considering only the five quantum levels of hydrogen shown below?

- A. 3
- B. 4
- C. 7
- D. 8
- E. 10



MAR

Photons of the highest frequency will be emitted in a transition from the level with $n = \underline{\hspace{1cm}}$ to the level with the $n = \underline{\hspace{1cm}}$.

- A. from $n = 1$ to $n = 2$
- B. from $n = 2$ to $n = 1$
- C. from $n = 3$ to $n = 1$
- D. from $n = 4$ to $n = 1$
- E. from $n = 5$ to $n = 1$



MAR

Calculate the wavelength in nanometers associated with an energy change of 182.3 kJ/mol.

- A. 3.027×10^{-19}
- B. 6.563×10^{-7}
- C. 302.7
- D. 656.3
- E. *billions!*

MAR

What is the observed de Broglie wavelength for an electron (mass = 9.109×10^{-28} g) traveling at a speed of 1.20×10^8 m/s? (*hint: use kg for mass!*)

- A. 6.06×10^{-3} m
- B. 1.17×10^{-5} μm
- C. 3.00×10^8 m
- D. 6.06×10^{-3} nm
- E. none of the above

MAR

Which of the following is NOT a valid set of quantum numbers?

- A. $n = 4, \ell = 1, m_\ell = -1, m_s = +1/2$
- B. $n = 6, \ell = 5, m_\ell = 0, m_s = -1/2$
- C. $n = 2, \ell = 2, m_\ell = +1, m_s = +1/2$
- D. $n = 3, \ell = 2, m_\ell = -2, m_s = -1/2$
- E. $n = 1, \ell = 0, m_\ell = 0, m_s = +1/2$

MAR

For a certain orbital, $n = 3, \ell = 1$, and $m_\ell = -1$. What type of orbital is this?

- A. 3d
- B. 3s
- C. 3p
- D. 4d
- E. 1f

MAR

Which of the following orbitals has 2 spherical nodes?

- A. 1s
- B. 2p
- C. 3d
- D. 3p
- E. 4p

MAR

The electron configuration for neutral chlorine is

- A. $1s^2 2s^2 2p^6 3s^5$
- B. $1s^2 2s^2 2p^6 3s^2 3p^5$
- C. $1s^2 2s^2 2p^5$
- D. $1s^2 2s^2 2p^6 3s^2 3p^6$
- E. [Xe]

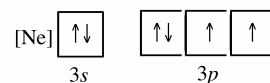
MAR

The electron configuration for neutral tin is:

- A. [Ne] $4s^2 3d^{10} 4p^2$
- B. [Ar] $4s^2 3d^{10} 4p^2$
- C. [Kr] $5s^2 4d^{10} 5p^2$
- D. [Xe] $5s^2 4d^{10} 5p^2$
- E. [Uuo] or [Og]
 $Z = 118!$:)

MAR

What neutral element has the following electron configuration?



- A. Cl
- B. S
- C. Be
- D. Ti
- E. Jq

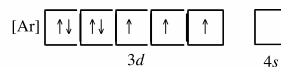
MAR

What is the electronic configuration of P^{3-} ?

- A. $[\text{Ne}] 3s^2 3p^6$
- B. $[\text{Ne}] 3s^2 3p^3$
- C. $[\text{Ne}] 3s^2$
- D. $[\text{Ne}] 3p^6$
- E. $[\text{Ne}]$

MAR

What ion corresponds to the following electron configuration?



- A. Fe^{3+}
- B. Rh^{3+}
- C. Co^{2+}
- D. Ni^{2+}
- E. Li^{1+}

MAR

Which of the following ions is **diamagnetic**? Which of the following ions is **most paramagnetic**? (*Two answers on this question, enter either answered in iClicker to receive credit*)

- A. Ti^{2+}
- B. V^{2+}
- C. Mg^{2+}
- D. Cr^{2+}
- E. none are diamagnetic

MAR

Which of the following is the correct electronic configuration for the nickel(II) ion?

- A. $[\text{Ar}] 3d^8$
- B. $[\text{Kr}] 4s^2 3d^6$
- C. $[\text{Ar}] 4s^2 3d^6$
- D. $[\text{Kr}] 3d^6$
- E. $[\text{He}]$

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

Which of the following is expected to have the largest radius?

- A. P^{3-}
- B. Cl^-
- C. S^{2-}
- D. Ar
- E. need a table to determine

MAR

Which compound formula and name in the list is NOT correct?

- A. CaSO_4 , calcium sulfate
- B. NaNO_3 , sodium nitrate
- C. MgI_2 , magnesium iodide
- D. NH_4PO_4 , ammonium phosphate
- E. NH_3 , ammonia

MAR

Which compound in the list is NOT ionic?

- A. LiCl , lithium chloride
- B. SO_2 , sulfur dioxide
- C. AlF_3 , aluminum fluoride
- D. $\text{Ba}(\text{NO}_3)_2$, barium nitrate
- E. NaHCO_3 , sodium hydrogen carbonate

MAR

Sodium oxalate has the formula $\text{Na}_2\text{C}_2\text{O}_4$. Based on this information, the formula for iron(III) oxalate is

- A. FeC_2O_4
- B. $\text{Fe}(\text{C}_2\text{O}_4)_2$
- C. $\text{Fe}(\text{C}_2\text{O}_4)_3$
- D. $\text{Fe}_2(\text{C}_2\text{O}_4)_3$
- E. $\text{Fe}_3(\text{C}_2\text{O}_4)_2$

MAR

You have 0.25 mol of each of the following elements. Which one has the largest mass?

- A. Fe
- B. Al
- C. Zn
- D. Ca
- E. C

MAR

Calculate the average mass of one chromium atom.

- A. 8.634×10^{-23} g
- B. 6.626×10^{-34} g
- C. 6.022×10^{-23} g
- D. 51.996 g
- E. too small to calculate accurately

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

