

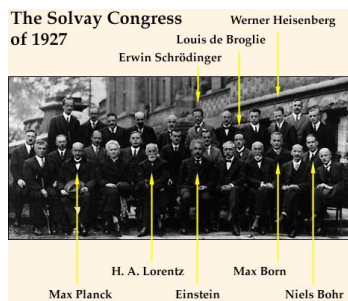
## Chemistry 221 Final Exam Review

### Chapter 6



**Chemistry 221**  
**Professor Michael Russell**

Last update:  
MAR 4/29/24



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

- A. 3 \_\_\_\_\_  $n=5$   
 B. 4 \_\_\_\_\_  $n=4$   
 C. 7 \_\_\_\_\_  $n=3$   
 D. 8 \_\_\_\_\_  $n=2$   
 E. 10 \_\_\_\_\_  $n=1$

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  $n = 1$

\_\_\_\_\_  $n=5$   
 \_\_\_\_\_  $n=4$   
 \_\_\_\_\_  $n=3$   
 \_\_\_\_\_  $n=2$   
 \_\_\_\_\_  $n=1$

The emission line having the longest wavelength corresponds to a transition from the level with  $n = \underline{\hspace{1cm}}$  to the level with  $n = \underline{\hspace{1cm}}$ .

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

\_\_\_\_\_  $n=5$   
 \_\_\_\_\_  $n=4$   
 \_\_\_\_\_  $n=3$   
 \_\_\_\_\_  $n=2$   
 \_\_\_\_\_  $n=1$

Excited H atoms emit *visible light* when electrons fall from higher levels to  $n = 2$  (this is called the Balmer series of lines). If green light comes from the transition from  $n = 4$  to  $n = 2$ , is the light from the  $n = 3$  to  $n = 2$  transition expected to be red or blue?

- A. Red  
 B. Blue  
 C. ultramagnetic

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

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

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

- A.  $6.06 \times 10^{-3}$  m
- B.  $1.17 \times 10^{-5}$  fm
- C.  $3.00 \times 10^8$  m
- D.  $6.06 \times 10^{-3}$  nm
- E. none of the above

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

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

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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

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If an electron subshell has 7 orbitals, what is the  $\ell$  value for this subshell?

- A. two
- B. three
- C. four
- D. five
- E. seven

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What type of orbital has 2 nodal planes?

- A. s
- B. p
- C. d
- D. f
- E. g

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Which of the following orbitals has 2 spherical nodes?

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

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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]

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What neutral element has the electron configuration  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2$ ?

- A. Zn
- B. Ca
- C. Ge
- D. Ni
- E. H

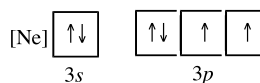
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The electron configuration for neutral tin is:

- 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! :)

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What neutral element has the following electron configuration?



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

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What neutral element has the electron configuration [Xe]  $4f^{14} 5d^{10} 6s^2 6p^2$ ?

- A. Hf
- B. Lu
- C. Pb
- D. Sn
- E. Jq

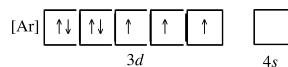
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What is the electronic configuration of  $P^{3-}$ ?

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

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What ion corresponds to the following electron configuration?



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

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Which of the following ions is diamagnetic?

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

MAR

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

- A. [Ar] 3d<sup>8</sup>  
B. [Kr] 4s<sup>2</sup> 3d<sup>6</sup>  
C. [Ar] 4s<sup>2</sup> 3d<sup>6</sup>  
D. [Kr] 3d<sup>8</sup>  
E. [He]

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

- A.  $[\text{Kr}] 5s^2 5p^2 4d^{10}$   
 B.  $[\text{Kr}] 5s^2 4d^{10}$   
 C.  $[\text{Kr}] 5s^2 5p^2 4d^8$   
 D.  $[\text{Kr}] 5p^2 4d^{10}$   
 E.  $[\text{He}] 2s^2 2p^2$

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

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

MAR

Compare the elements Na, B, Al, and C with regard to the following properties:  
Which has the largest (most negative) electron affinity?

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

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Which of the following groups of elements is arranged correctly in order of increasing first ionization energy?

- A.  $\text{Mg} < \text{C} < \text{N} < \text{F}$
- B.  $\text{N} < \text{Mg} < \text{C} < \text{F}$
- C.  $\text{Mg} < \text{N} < \text{C} < \text{F}$
- D.  $\text{F} < \text{C} < \text{Mg} < \text{N}$
- E. I need Google to answer this question

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**End of  
Review -  
Good luck  
with your  
final exams!**

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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