

Chem 111**10:10a section****Evening Exam #2**

This exam is composed of 25 questions. Go initially through the exam and answer the questions you can answer *quickly*. Then go back and try the ones that are more challenging to you and/or that require calculations.

As discussed on the course syllabus, honesty and integrity are absolute essentials for this class. In fairness to others, dishonest behavior will be dealt with to the full extent of University regulations.

$$E = h\nu = \frac{hc}{\lambda}$$

$$1 \text{ mL} = 1 \text{ cm}^3$$

$$\text{Hz} = \text{s}^{-1}$$

$$h = 6.626 \times 10^{-34} \text{ J s}$$

$$c = 2.998 \times 10^8 \text{ m s}^{-1}$$

$$N = 6.022 \times 10^{23} \text{ mol}^{-1}$$

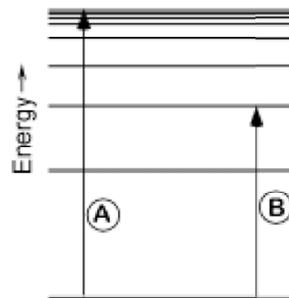
- Which radiation below has the shortest wavelength (don't use your calculator!)?
 - blue light (6.8×10^{14} Hz)
 - green light (6.0×10^{14} Hz)
 - red light (4.5×10^{14} Hz)
 - microwaves (2.4×10^9 Hz)
 - x-rays (5.0×10^{18} Hz)
- A local AM radio station broadcasts at an energy of 5.55×10^{-31} . Are the units of this number likely:
 - kJ/atom
 - kJ/mole
 - kJ/photon
 - kJ/song played
- Calculate the frequency at which the above radio station is broadcasting.
 - 1.39 MHz
 - 838 KHz
 - 1.39 KHz
 - 838 Mhz
 - Cant' tell

4. Consider the diagram at right. The transition labeled A is *best* described as :

- 1) emission 2) absorption
3) ionization 4) electron capture

5. In the same diagram, the energy of transition B is *best* described as:

- 1) absorption energy 2) emission energy
3) ionization energy 4) electron affinity



6. The principle quantum number n specifies:

- 1) orbital orientation 2) subshell orbital shape
3) transition probability 4) orbital karma
5) energy and distance from nucleus

7. The angular momentum quantum number l specifies:

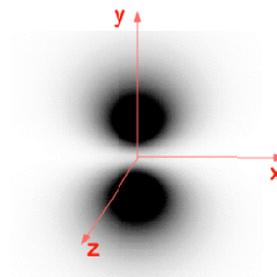
- 1) orbital orientation 2) subshell orbital shape
3) transition probability 4) orbital karma
5) energy and distance from nucleus

8. The magnetic quantum number m_l specifies:

- 1) orbital orientation 2) subshell orbital shape
3) transition probability 4) orbital karma
5) energy and distance from nucleus

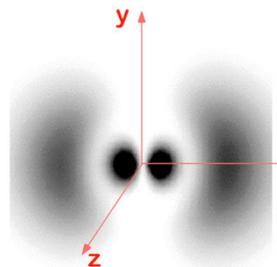
9. The orbital depicted at right is what type of orbital?

- 1) $3d_z$ 2) $2p_x$
3) $3p_x$ 4) $2p_y$ 5) $3p_y$



10. The orbital depicted at right is what type of orbital?

- 1) $3d_z$ 2) $2p_x$
3) $3p_x$ 4) $2p_y$ 5) $3p_y$



11. The correct spectroscopic notation for phosphorous (P) is:
- 1) $1s^2 2s^2 2p^6 3s^2 3p^2$
 - 2) $1s^2 2s^2 2p^6 3s^2 3p^3$
 - 3) $1s^2 2s^2 2p^6 3s^2 3p^4$
 - 4) $1s^2 2s^2 2p^6 3s^2 3p^5$
 - 5) $1s^2 2s^2 2p^6 3s^2 3p^6$
12. The correct spectroscopic notation for phosphorous ion (P^{2-}) is:
- 1) $1s^2 2s^2 2p^6 3s^2 3p^2$
 - 2) $1s^2 2s^2 2p^6 3s^2 3p^3$
 - 3) $1s^2 2s^2 2p^6 3s^2 3p^4$
 - 4) $1s^2 2s^2 2p^6 3s^2 3p^5$
 - 5) $1s^2 2s^2 2p^6 3s^2 3p^6$
13. If an element with the valence configuration $4s^2 3d^7$ loses 2 electron(s), these electron(s) would be removed from the following **subshell(s)**.
- 1) 4s
 - 2) 3d
 - 3) 4s and 3d
 - 4) 3p
 - 5) 4p
14. If an element with the valence configuration $4s^1 3d^5$ loses 2 electron(s), these electron(s) would be removed from the following **subshell(s)**. Think carefully about this one!
- 1) 4s
 - 2) 3d
 - 3) 4s and 3d
 - 4) 3p
 - 5) 4p
15. Which of the following elements has the greatest difference between the first and second ionization energies?
- 1) Na
 - 2) Si
 - 3) P
 - 4) Mg
 - 5) Cl
16. Which molecule below does not exist?
- 1) BeF_2
 - 2) CaF_3
 - 3) MgO
 - 4) KCl
 - 5) $BeCl_2$
17. Which of the following correctly compares atomic sizes?
- 1) $Li < B < C < N < Ne$
 - 2) $O < N < C < Be < Ne$
 - 3) $Ne < Li < B < C < N$
 - 4) $Ne < O < N < C < Be$
 - 5) none of the above
18. Which of the following correctly compares ionic/atomic sizes?
- 1) $Mg^{2+} < Na^+ < Ne < O < C$
 - 2) $Ne < Mg^{2+} < Na^+ < O < C$
 - 3) $Ne < O < C < Mg^{2+} < Na^+$
 - 4) $C < O < Ne < Na^+ < Mg^{2+}$
 - 5) none of the above

19. The molecule HF can be thought of as having both ionic and covalent character. Given that statement, which of the following is likely to best describe the charge on each atom?

	H	F
1)	+1.0	-1.0
2)	+0.7	-0.7
3)	0.0	0.0
4)	-0.7	+0.7
5)	-1.0	+1.0

20. Which of the following is most likely to be the correct assignment of effective nuclear charges for a 2s electron in each of the atoms below?

	B	C	N	O	F
1)	2.58	3.22	3.85	4.49	5.13
2)	5.13	4.49	3.85	3.22	2.58
3)	3.58	4.22	4.85	5.49	6.13
4)	6.13	5.49	4.85	4.22	3.58

21. The CO bond in the molecule CH₂O is best described as a:

- | | |
|-------------------------------|----------------|
| 1) ionic bond | 2) single bond |
| 3) double bond | 4) triple bond |
| 5) the molecule doesn't exist | |

22. Draw the Lewis structure for **NO₂⁺**

Your resulting molecule has a total of:

- | | |
|-----------------------------------|-----------------------------------|
| 1) Two single bonds | 2) Two double bonds |
| 3) One single and one double bond | 4) One double and one triple bond |
| 5) Two triple bonds | |

