

CH301 Practice Exam 1 Fall 2009

1. If the average bond energy for the C-H bond in methane is 435 kJ/mol. What frequency of light is needed to break the bond?

- a. 6.67×10^{35} Hz
- b. 1.09×10^{15} Hz
- c. 6.57×10^{38} Hz
- d. 1.09×10^{12} Hz

2. Which of the following statements is incorrect?

- a. The wavelength of light emitted by black body radiators decreases as the temperature of the body increases.
- b. The kinetic energy of electrons ejected by photons increases as the frequency of the incident radiation increases.
- c. The wavelength of matter is inversely proportional to mass.
- d. Photons of any wavelength will eject electrons from metal surfaces.

3. If an electron falls to the energy level $n=1$, and an emission spectrum was observed at 102.3 nm, what energy level did it fall from? $n=$

- a. 2
- b. 3
- c. 4
- d. 5

4. If a particle is in a one-dimensional box of length 200 cm and is in its fourth energy level, at which of the following positions is the particle least likely to be found?

- a. 100 cm
- b. 75 cm
- c. 125 cm

d. 130 cm

5. If the uncertainty in the position of a particle is 2.4 cm, what is the minimum uncertainty in the particles momentum?

a. 2.2×10^{-35} m/s

b. 4.4×10^{-33} m/s

c. 2.2×10^{-33} m/s

d. 4.4×10^{-35} m/s

6. What is the wavelength of a particle with a momentum of $745 \text{ kg}\cdot\text{m/s}$?

a. 9.47×10^{-36} m

b. 8.89×10^{-37} m

c. 1.41×10^{-37} m

d. 2.82×10^{-36} m

7. Consider the species below. All of them will have the same number of $V(r)$ terms in their respective solutions to the Schrodinger equation except for one of them. Which is the odd one out?

a. Ar

b. K^+

c. S^{2-}

d. Sc^+

8. Which of the following quantum number values could apply to the valence electrons of platinum?

a. $n = 5, l = 4, m_l = 3, m_s = -1/2$

b. $n = 5, l = 5, m_l = 3, m_s = 1/2$

c. $n = 5, l = 4, m_l = 2, m_s = -1/2$

d. $n = 6, l = 4, m_l = 2, m_s = 1/2$

9. What is the total number of electrons that could be described by the quantum numbers $n = 5$ and $m_l = 3$?
- 4 electrons
 - 10 electrons
 - 50 electrons
 - 25 electrons
 - 5 electrons
 - 12 electrons

10. Which of the following is an incorrect statement?

- Br⁻ and Rb⁺ have the same electronic configuration.
- The Pauli Exclusion Principle is primarily concerned with the quantum number m_s .
- Because of Hund's rule, nitrogen has one electron in each of its three 2p orbitals.
- The electron configuration of silver, [Kr] 5s¹ 4d¹⁰, is in apparent violation of the Aufbau Principle.

11. Which set of atoms and ions all have the same electronic configuration?

- F⁻, Cl⁻, Br⁻, I⁻
- C, N, O, F
- O²⁻, Mg²⁺, F⁻, Ne
- Ar, Cl⁻, K, Ca²⁺

12. Which of the following species have the same electronic configuration?

- Sn⁴⁺
 - Cd
 - Ag⁺
 - In³⁺
- I, II, III, IV
 - I, III, IV
 - I and IV only
 - II and IV only

e. II and III only

f. none

13. Which of the following species is/are exceptions to the Aufbau order?

I. Nb

II. Sn

III. Rh⁺

a. I

b. II

c. III

d. I and II

e. I and III

f. II and III

g. none

14. Members of which group are commonly found as dications?

a. noble gases

b. halogens

c. lanthanides

d. alkaline earth metals

e. alkali metals

15. The effective nuclear charge (ENC) experienced by an element's 1s electrons (increases/decrease/stays the same) as the atomic number increases and (increases/decreases/stays the same) as a given element is ionized by removing electrons.

a. increases, decreases

b. decreases, decreases

c. stays the same, increases

d. increases, stays the same

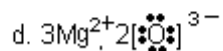
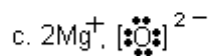
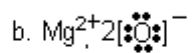
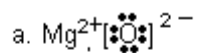
e. stays the same, stays the same

f. decreases, increases

16. Select the appropriate trend and explanation for ionization energy in the periodic table:

17. Rank the following elements in order of increasing electron affinity: Cl, Zn, Li, Cu

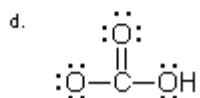
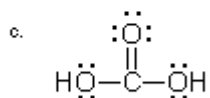
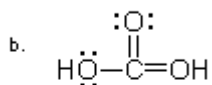
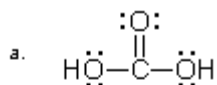
18. Which of the following is the best representation of magnesium oxide?



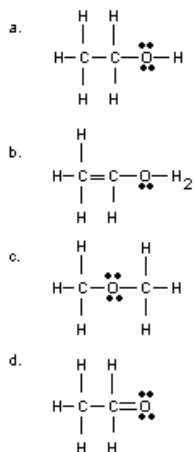
19. Which of the following compounds show resonance?

C₂H₄

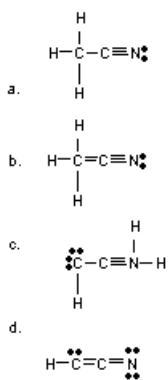
20. Which of the following most represents H₂CO₃



21. Which of the following best represents ethanol, C₂H₆O. (may be more than one correct answer)



22. Which best represents C₂H₃N



23. Which of the following can more than four bonds?

24. Which of the following can never have four bonds?

25. How does nitric oxide, NO, violate the octet rule?

26. Rank from lowest to highest in crystal lattice energy: NaCl, AlF₃, MgO

27. Rank the following in order of increasing difference in electronegativity: H₂O, O₂, NH₃

28. Determine the formal charges for chlorate, ClO₃⁻

29. Determine the correct formal charges for nitrogen and oxygen in

