

Chemistry 115 – Exam 3 Study Guide

Study the multiple choice questions in WileyPlus.

Know the definitions/meaning of ionization energy, electron affinity, isoelectronic, orbital, ground state, Hund's rule, Pauli Exclusion Principle, dipole, polar, electronegativity, resonance structures, VSEPR, ionic bond, covalent bond, atmospheric pressure, gas laws, pressure, vapor pressure, Dalton's Law of Partial Pressure

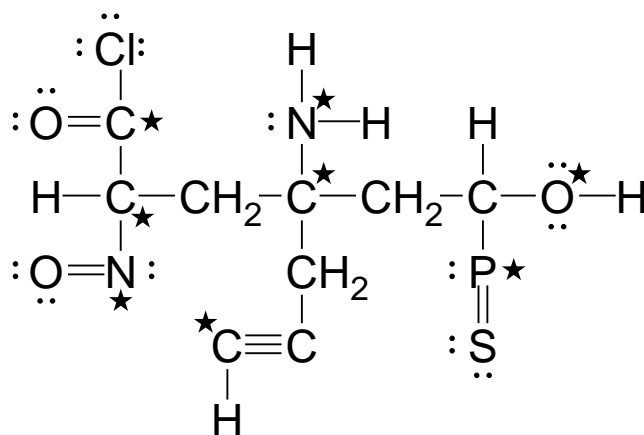
Be able to write ground state electronic configurations of the elements, know the types of sublevels found in atoms and the number of electrons in each, know the arrangement of electrons in the orbitals of atoms (ie know how the orbitals will fill, do electrons pair up first or last? How many electrons in an orbital). Know how to draw Lewis Electron dot structures for simple molecules. (Skeleton structures will be given.) Know how to choose the best resonance structure based on ideal numbers of bonds per atom. Know how to draw a lewis structure for an ion. Know the orbital and molecular geometries. Be able to draw resonance structures where appropriate.

Be able to solve gas problems involving both changing conditions and static conditions. Know how to convert pressure units. Be able to do gas stoichiometry. Be able to answer questions regarding partial pressures of gases.

Below are some problems that may be similar to some of the problems on the exam.

1. How many electrons are there in an orbital? In an s sublevel? A p sublevel? A d sublevel?
2. What is the complete electronic configuration of carbon? Of sulfur? Of manganese?
3. What is the shorthand configuration as predicted by the periodic table of yttrium? Of zinc? Of tungsten?
4. How is the line spectra of an atom produced? (Answer this on an atomic level)
5. How do atomic orbitals fill? If a p sublevel has 4 electrons, which orbitals will they occupy? Draw the sublevel using arrows to represent electrons and show spin based on the direction of the arrow.
6. Explain why each of the following electron configurations for a p sublevel is disallowed.
 - a.

- a. As or Bi
 - b. As or Br
 - c. S or I
 - d. S or Sb
13. Arrange the following elements in order of increasing ionization energy: Te, Pb, Cl, S, Sn
14. Choose the element with larger atoms from each of the following pairs
- a. Al or In
 - b. Si or N
 - c. P or Pb
 - d. C or F
15. Arrange the following elements in order of increasing atomic size: Ca, b, S, Si, Ge, F
16. Arrange the following elements in order of increasing metallic character: Fr. Sb. In, S, Ba, Se
17. Write electron configurations for each of the following ions. What do all of the electron configurations have in common?
- a. Ca^{+2}
 - b. K^+
 - c. S^{-2}
 - d. Br^-
18. Draw Lewis Electron Dot Structures for the following molecules and tell the orbital and molecular geometries for each
- | | |
|---------------------------------|--|
| a. PH_3 | f. Cl_2CO (C is central) |
| b. CBr_4 | g. C_2H_2 |
| c. OF_2 | h. C_2H_4 |
| d. SCl_2 | i. C_2H_6 |
| e. CO_2 (C is central) | j. N_2H_2 |
19. Draw Lewis Electron Dot Structures for the following ions. Include resonance structures as necessary.
- | | |
|-----------------------|------------------------|
| a. CN^{-1} | d. CO_3^{-2} |
| b. NO_2^{-1} | e. NH_4^{+1} |
| c. SO_3^{-2} | f. ClO_3^{-1} |
20. Predict the orbital and molecular geometry around each of the starred atoms in the drawing below:



21. Classify each of the following molecules as polar or non-polar. What kinds of intermolecular forces would be present in each?
- | | |
|-------------------|-------------------|
| a. CO | c. HBr |
| b. F ₂ | d. N ₂ |
22. The pressure of air inside a purple balloon is 2.19 atmospheres. Calculate the pressure of the air in units of torr? In kilopascals? In PSI?
23. Why do we experience pain in our ears during changes in altitude?
24. Explain why scuba divers should not hold their breath as they ascend to the surface.
25. A snorkeler with a lung capacity of 6.3 L inhales a lungful of air at the surface, where the pressure is 1.0 atm. The snorkeler then descends to a depth of 2 m, where the pressure increases to 3.5 atm. What is the volume of the snorkeler's lungs at this depth? (Assume constant temperature.)
26. A balloon with an initial volume of 3.2 L at a temperature of 35°C is warmed to 55°C. What is its volume at the final temperature?
27. A 0.53 mol sample of helium gas occupies a volume of 5.25 L. What is the volume of 0.31 mol of helium under the same conditions?
28. The pressure of Freon gas in an aerosol can is 6.25 atm at 25°C. What is the new pressure of the gas if the temperature is increased to 75°C?
29. A large balloon fashioned to look like a mole is designed for the Macy's Thanksgiving Day Parade. If the volume of the balloon is 835 L after the addition of 588 moles of helium, how many more moles of helium must be added to fill the balloon to its final volume of 2953 L?
30. If a package of potato chips contains 0.132 L of air on the ground where the atmospheric pressure is 760 torr, what is the pressure in the airplane if the volume increases to 0.243 L after takeoff?
31. The balloon in problem 25 will burst if the volume exceeds 3200 L. If 2953 L of helium are put into the balloon at a temperature of 5°C, how high can the temperature go before the mole will burst?
32. A sample of a gas with an initial volume of 53.2 L at a pressure of 4.21 atm and a temperature of 52°C is compressed to a new volume of 27.4 L at a temperature of 73°C. What is the new pressure of the gas?

33. A sample of a gas with an initial volume of 84.3 L at a temperature of 96°C and a pressure of 352 torr is allowed to expand to a volume of 295 L and the pressure is increased to 420 torr. What will be the new temperature of the gas?
34. What is the volume occupied by 0.253 mol of nitrogen gas at a temperature of 37°C and a pressure of 3.54 atm?
35. What is the pressure in atmospheres of a 3.66 L sample of methane gas containing 34.2 grams of methane at a temperature of 22°C?
36. How many moles of argon gas are required to fill a 3.22 L bottle at a pressure of 382 torr and a temperature of 34°C?
37. A fuel tank is filled with 6459.3 grams of propane gas (C₃H₈) at a pressure of 31.5 atm. If the volume of the tank is 12.5 L, what is the temperature of the gas in °C?
38. A gas mixture contains each of the following gases at the indicated partial pressure. N₂ (285 torr), O₂ (539 torr), and H₂ (377 torr). What is the total pressure of the mixture?
39. If chromium(II) chloride reacts with calcium metal to form calcium chloride and chromium metal, write the balanced chemical equation for the reaction and tell which element is more active.
40. If silver metal will not react with a solution of magnesium chloride, tell which metal is more active.
41. Given the following activity series
Ca > Cu > Ni
Will a sample of copper metal react with nickel(II) chloride?
Will a sample of copper metal react with calcium chloride?
42. Write and balance the following double displacement reactions
- KCl + NaNO₃ →
 - K₂CO₃ + HCl →
 - Li₃PO₄ + MgBr₂ →
 - H₂SO₄ + LiF →