

**CHEM 35**  
**General Chemistry**  
**Quiz #6**

November 3, 2000

Name: Solution Key

1. If the electron in a hydrogen atom undergoes a transition from  $n=4$  to  $n=1$ , is energy *absorbed* or *emitted*? Briefly explain.

Since the ENERGY of the orbital **increases with increasing  $n$** ,  $E_{n=4} > E_{n=1}$  and so a transition from the HIGHER energy level to the LOWER energy level will result in the **EMISSION** of energy from the atom (in the form of a photon).

2. Name the subshell corresponding to the following set of quantum numbers:  $n=4$ ,  $l=3$ ,  $m_l=2$ .

The subshell is determined by the value of the *azimuthal* QN ( $l$ ):

$l = 0$ , s-orbitals

$l = 1$ , p-orbitals

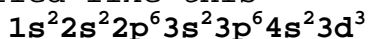
$l = 2$ , d-orbitals

**$l = 3$ , f-orbitals**

So, the subshell is the set of seven **4f-orbitals** (the  $m_l$  value specifies a particular orbital in the subshell).

3. Vanadium is a transition metal ( $Z=23$ ). What is its ground state electron configuration?

23 electrons get filled like this:



Remember: fill the 4s *before* the 3d (groups 1A and 2A before the *transition metals*)

4. Carbon's ground state has two electrons in the 2p-orbitals. Are their spins paired or unpaired? Explain.

There are *three* p-orbitals; **Hund's Rule** says that the lowest energy configuration will result when electrons are placed first into *separate orbitals* and have the *same spin*. So, the two electrons will be **unpaired** (each in a different orbital).