South Pasadena • AP Chemistry

Name _____
Period ___ Date ___/___/___

7 • Atomic Structure

QUANTUM NUMBER PRACTICE

1. Summarize:
   The principal quantum number, ***n***, can have the values of: ___ ___ ___ ___ ___, etc.
   The angular momentum quantum number, ℓ, can have integer values from _____ to _____.
   The magnetic quantum number, m_ℓ, can have integer values from _____ to _____.

2. When n = 3, ℓ can have values of _____.
   For the 3d orbital, ℓ has a value of ___.

   When n = 4, ℓ can have values of _____.
   For the 4p orbital, ℓ has a value of ___.

   When n = 2, ℓ can have values of _____.
   For the 2s orbital, ℓ has a value of ___

3. Summarize:

orbital	s	p	d	f
value of ℓ				

4. There are five 4d orbitals. List the quantum numbers for each orbital.

n	ℓ	m_ℓ

Questions from the textbook (answers in the book)

5. Rank the following orbitals in the H atom in order of increasing energy: 3s, 2s, 2p, 4s, 3p, 1s, and 3d. [Check answer in book #76]

6. How many orbitals in an atom can have the following quantum number or designation?

   a) 3p
   b) 4p
   c) $4p_x$
   d) 6d
   e) 5d
   f) 5f
   g) ***n*** = 5
   h) 7s

7. Answer the following questions as a summary quiz on the chapter. [Check answer in book #78]
   a) The quantum number ***n*** describes the _____ of an atomic orbital.
   b) The shape of an atomic orbital is given by the quantum number ____.
   c) A photon of orange light has _____ (less or more) energy than a photon of yellow light.
   d) The maximum number of orbitals that may be associated with the set of quantum numbers n=4 and ℓ =3 is ____.
   e) The maximum number of orbitals that may be associated with the quantum number set n=3, ℓ =2, and m_ℓ = -2 is ___.
   f) Label each of the orbital pictures found in question 78 (page 329)with the appropriate letter:
   g) When n=5, the possible values of ℓ are _____.
   h) The maximum number of orbitals that can be assigned to the n=4 shell is ____.

8. Suppose you live in a different universe where a different set of quantum numbers is required to describe the atoms of that universe. These quantum numbers have the following rules:

N, principal	1, 2, 3, … ∞
L, orbital	= N
M, magnetic	-1, 0, +1

   How many orbitals are there altogether in the first three electron shells? [Check answer in book #80]

9. Assume an electron is assigned to the 1s orbital in the H atom. Is the electron density zero at a distance of 0.40 nm from the nucleus?___ (See *A Closer Look: Atomic Orbitals*)