UNIT NUMBER 1- TUTORIAL 12- QUANTUM NUMBERS

Choose the best answer.

1.What is the maximum number of electrons found in the :

a) 1^{st} principal energy level b) 2^{nd} principal energy level

c) 3^{rd} principal energy level d) 4^{th} principal energy level

2.The total number of orbitals is associated with the principal quantum number n = 3 is : a) 9 b) 8 c) 5 d) 7

3.Write the **n** and ***l*** value for the symbol $4f^2$ a) 4,2 b) 4,4 c) 4,3 d) 4,5

4.How do you designate the orbitals when $n = 2$ $l = 0$: a) 4s b) 2p c) 2s d) 3p

5.How many electrons are there in *d* orbitals : a) 2 b) 6 c) 10 d) 14

II.Fill in the blanks with the correct response :

6.The number of orbitals with the quantum numbers n=2, l=2 and $m_l = 0$ is

7.The number of orbitals with n=3 and l=1 is

8. m_l values for a ***f*** orbital are

9.The allowed values of l for the shell with n=3 are

10.The maximum number of electrons with quantum numbers with $n = 4$ and $l = 3$ is

III. ANSWER ALL THE QUESTIONS.

11. i) When $n = 3$, the possible values for m_l are

ii) The number of electrons with $n = 4$, $l = 1$ is

12. i) The lowest value of n for which a p subshell can occur is $n =$

ii) How many electrons can occupy any single subshell orbital ?

13.Give the n and l values for the following orbitls

a) 2s b) 5p

c) 4s d) 6f

14.Name the orbitals described by the following quantum numbers

a) n=4, l=0 b) n=3, l=1

c) n=1, l=0 d) n=3, l=2

15.Place the following orbitals in order of increasing energy :

1s, 3s, 4s, 6s, 3d, 4f, 3p, 7s, 5d, 5p

IV. ANSWER ALL THE QUESTIONS.

16. How many electrons are present in 3s, 2p, 4f and 5d orbitals?

17. What are the possible m_L values for the each of the following types orbitals ? a) s,

b) p, c) d, d) f

18. List all possible sets of quantum numbers for n = 3

19.For the following pairs of orbitals,indicate which is higher in energy :

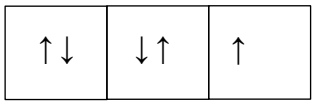
a) 3p or 4p b) 4s or 4d c) 2s or 3d

20.What is the quantum numbers of the last electron placed in potassium ?

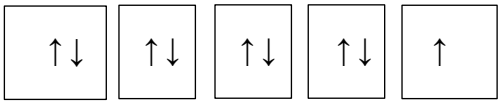
V. ANSWER ALL THE QUESTIONS.

22. i) Write the values for the quantum numbers for the **bold** electron in the following diagram.

a) 3p orbitals



b) 4d orbitals



ii) For each of the following , give the orbital, the allowable *m* values and the number of orbitals

a) $n=3, l=2$
b) $n=6, l=3$
c) $n=7, l=0$

23. Complete the following table :

n	*l*	*m*	Sub energy level
		0	3d
4	1	0	
			2s
		-2	5d

24. State the four quantum numbers, then explain the possible values they may have and what they represent.

25. State the number of possible electrons described by the following quantum numbers

a. n = 3, l = 0
b. n = 3, l = 1
c. n = 3, l = 2, ml = -1
d. n = 5, l = 0, ml -2, ms -1/2

26. Give the n and l values for the following orbitals

a. 1s b. 3s c. 2p d. 4d e.5f

27. What is the m_l values for the following types of orbitals?

a. s
b. p c.d
d. f

28. How many possible orbitals are there for n =

a. 4 b. 6

29. Write the complete set of quantum numbers that represent the **valence electrons** for the following elements:

a. He

b. V

c. Ni

d. Cu

e. Br

30. Write the electron configurations for the elements above.

He
V
Ni

Cu
Br

31. Without referring to a text, periodic table, or handout, deduce the maximum number of electrons that can occupy an:

a. s orbital ___ b. the subshell of p orbitals _____ c. the subshell of d orbitals ___

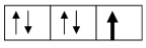
d. the subshell of f orbitals____ e. the subshell of g orbitals____

32. How many electrons can inhabit all of the n=4 orbitals?

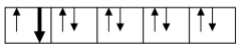
33. Fill in the blanks with the correct response:

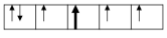
1. The number of orbitals with the quantum numbers n=3, l=2 and m_l = 0 is _____.
2. The subshell with the quantum numbers n=4, l=2 is _____.
3. The m_l values for a d orbital are _____.
4. The allowed values of l for the shell with n=2 are _____.
5. The allowed values of l for the shell with n=4 are _____.
6. The number of orbitals in a shell with n=3 is _____
7. The number of orbitals with n=3 and l=1 is _____.
8. The maximum number of electrons with quantum numbers with n=3 and l=2 is ____.
9. When n=2, l can be ____.
10. When n=2, the possible values for m_l are _____.
11. The number of electrons with n=4, l=1 is ____.
12. The subshell with n=3 and l=1 is designated as the __ ___ subshell.
13. The lowest value of n for which a d subshell can occur is n=_____.

34. Write the values for the quantum numbers for the **bold** electron in the following diagrams:

a. 3p orbitals 

b. 5s 

c. 4d orbitals 

d. 3d orbitals 

How many electrons can occupy any single subshell orbital? __

35. a.What is the value of ***l*** for a 4f electron?

b. What is the orbital designation for an electron in the 3rd shell and p sublevel?

c. What are the possible values of ml for a 5d electron?
d. What is the maximum number of electrons in the 3rd energy level?
e. How many orbitals have the following quantum numbers: n =4, l = 2, ml = -2?