welcome students i am dr pritam patil
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today we are going to learn quantum
numbers and their significance model 11
of unit atomic structure

this module outlines
the types of the quantum numbers, their
rules and some solved
Examples.

from this module the students
are going to learn
the outline of the importance of quantum
Numbers and
they are going to develop the
understanding about the allowed values
of
quantum numbers.
the quantum numbers are
originated
due to schrodinger wave equation and each
quantum number
signifies the specific property of the
Electron.
there are four types of quantum
Numbers principal quantum number, azimuthal
quantum number, magnetic quantum number and spin quantum
number . principal quantum number
it is denoted by letter small n
it can have values from n equal to 1
Till infinity it denotes the main energy
level
or shells it also provides the
information
about the distance of the electron from
the nucleus
and energy of the electron. when n
is one it is first energy level or k
shell when it is two it is second energy
level which is
l shell and so on second is
azumital quantum number it is denoted by
letter
small l it can have values from
0 to n minus 1. the value of azimuthal
quantum number
is governed by the value of principal
quantum number n
it gives the angular momentum of the
electron
it gives the total number of subshells
present in the
shell these subshells are denoted by
letters
s p d f and so on
so when l is 0 it is s subshell
when it is 1 it is p subshell 2
d sub shell for 3 it is f sub shell
and so on then we have
magnetic quantum number it is denoted by

letter
small m it can have values from
minus 1 to plus 1 including
0. the value of magnetic quantum number
is also governed by the value of
azimuthal quantum number l it gives
the total number of orbitals present in
subshell it also gives the orientation
of the orbital
in space so this is given by 2l
plus 1 so when l is 0
we have only one orientation that is
s orbital
last is
spin quantum number it is denoted by
letter
small s it can have only two values
plus half or minus half it denotes
the spin of the electron the spinning
electron behaves as a tiny magnet
and it can orient in two direction
clockwise and anti-clockwise
giving the spin of the electron
these are rules which governs the value
of the quantum numbers
the value of principal quantum number n
cannot be zero
or it cannot be negative value of
azimuthal quantum number
l cannot be same as that of n
value of magnetic quantum number m
cannot be
higher than n and the value of
s can be only plus half or minus half
here is a table which use the value of
quantum numbers
number of shells number of subshells
number of orbitals
and the number of electrons which are
accommodated in this
shape so if n is 1 it is
the first energy level or k shell
so l value will be 0 which indicate that
it is s sub shell and accordingly m will
have only one value
which is zero so there is only one
orientation for
this orbital so there is one orbital
which can accommodate only
two electron when it is n is 2
it is second energy level which means it
is
l shell accordingly l will have
two different values l will be 0 and
l is equal to 1 when l is 0 it is
s subshell so m will have
one value which means there is one
orientation
and there will be one orbital which will
accommodate only two electron
when l is one it is p sub shell
and p sub shell will show three

different orientation
that is p x p y p z
so total number of orbitals which are present in the second shell
are four which can accommodate 8 electrons
then when n is 3 it is third energy level
which is m shell so for this
azimuthal quantum number will have 3 values
l is equal to 0 l is equal to 1 and l is equal to
2 l is 0 means s sub shell
which will show only one orientation with one orbital
l is equal to 1 is p sub shell which will orient
in three different direction giving three orbitals
and l is equal to two is d sub shell
which can orient in five different direction
and we have five different orbitals d orbitals that is d x y d y z
d x z d x square minus y square and d z square so total number of orbitals present in third energy level
are nine which can accommodate 18 electrons
similarly we can write for n equal to 4
which will also include f orbitals so here
are some examples of set of quantum numbers
and you have to solve these to find out whether these set of quantum numbers are permissible or they are not permissible
let us take the first example n equals to 2
l equal to 2 m plus 1
s is plus half so when you solve these examples
first of all you can see the value of spin quantum number
s because it has only two values plus half
and minus half in this example s is plus half
so it is allowed value then you can see the principal quantum
number n which is 2 so it is also allowed value because it can have any positive values
next is l is equal to 2. now you have to see these
azimuthal quantum number azimuthal quantum number
should be less than the principal quantum number

and in this example if you see l is 2
which is same as
principal quantum number so this set of
quantum number is not
allowed let us take the second example
n is equal to 3 l is equal to 1 m is
equal to plus 2
and s is minus half again we'll start
with the spin quantum number
s is minus half which is allowed value
n is 3 which is also allowed
then n is 1 which is less than
n that means it is also allowed then
we'll see the magnetic quantum number
the value is plus 2 now here if you see
l is 1 and m is plus 2 the value of
magnetic quantum number is higher than
the value of
azimuthal quantum number so that set is
also not allowed
these are the references for this module
thank you