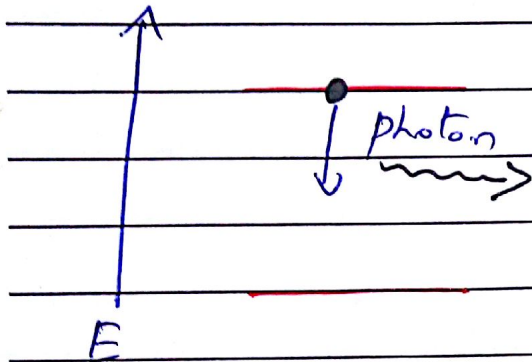


Selection rules for electronic transitions:

- * If a photon of light of the right frequency is absorbed by an electron, the electron jumps to a higher energy state.
- * Conversely, if the electron releases a photon of light, it will jump to a lower energy state.



- * Certain transitions are more likely to occur than others.
- * The ones that have a high probability of occurring are called the **allowed transitions** while the ones that are less likely to take place are called **forbidden transitions**.
- * In Quantum mechanics, a set of rules exists known as the selection rules that tells us the allowed transitions:-

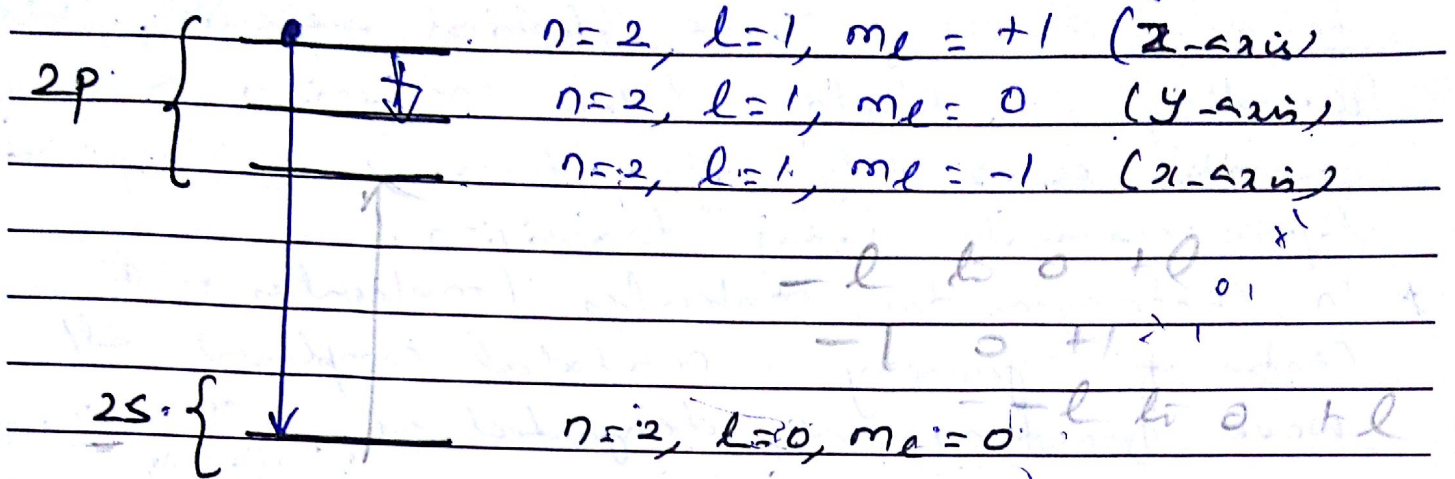
$$\textcircled{1} \Delta l = \pm 1$$

$$\textcircled{2} \Delta m_l = 0, \pm 1$$

- * These rules tell us that the electron cannot jump between two orbitals that differ by more than one orbital quantum number.

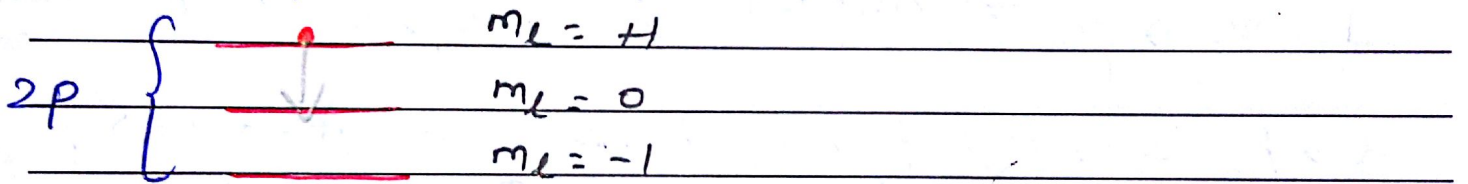
Suppose an e^- is found in the 2p orbital of hydrogen.

Date :



* From the selection rules, the electron can jump from any one of the 2p orbitals to the 2s orbital.

* But notice that the electron cannot jump between the three 2p orbitals because in such a case $\Delta l = 0$.



Spin selection rule (for transition metal complexes)

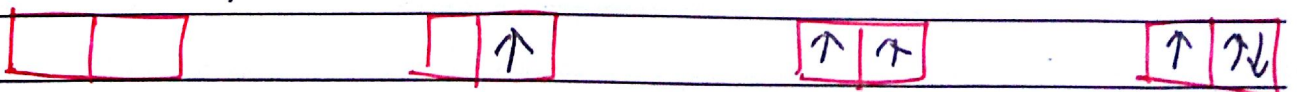
Transition may occur only between two energy states of same spin multiplicity. (There should not be any change in spin multiplicity)

Allowed $\Delta S = 0$

Forbidden $\Delta S \neq 0$

In $[Mn(H_2O)_6]^{2+}$
 $Mn \rightarrow d^5$ stable
 Forbidden

Allowed



d^3



Date :

Laporte Selection rule (Orbital Selection rule)

* According to electric dipole mechanism, a transition occurs only when there is a change in dipole moment during transition.

* In centrosymmetric molecules (molecules with centre of symmetry - octahedral complexes), all wave functions are designated as **g** or **u** (gerade) (ungerade)

* d and s (are symmetric) \rightarrow g
p and f (are asymmetric) \rightarrow u

* Transition which takes place from

$g \rightarrow u$
 $u \rightarrow g \Rightarrow$ Allowed ; $g \rightarrow g$
 $u \rightarrow u \Rightarrow$ forbidden

$d \rightarrow p$, $s \rightarrow f$, $p \rightarrow d$, $p \rightarrow s$ are ALLOWED.

$d \rightarrow d$, $p \rightarrow p$, $d \rightarrow s$ are FORBIDDEN.