Answer on Question #77138 - Chemistry - Inorganic Chemistry

Question:

1) What is the selection rule for microwave absorption?

2) write the expression for rotational energy and name various term appearing in it?

3) If the value of rotational constant,B is 10cm^-1 for a diatomic molecule, what is the wave no. Of transition from j=3 to J=4 level?

Solution:

1) The selection rule describes how the probability of a transition from one level to another can not be zero. It has two parts: a rule of gross selection and a certain rule of choice. The coarse selection rule illustrates the characteristic requirements for atoms or molecules for displaying a spectrum of a certain type, such as IR spectroscopy or microwave spectroscopy. As soon as an atom or molecules follow the rule of rough selection, it is necessary for the atom or molecules to apply a special selection rule to determine whether a definite transition in the quantum number can occur or not.

2) The kinetic energy of the rotational motion is the energy of the body, connected with its rotation.

The main kinematic characteristics of the body's rotational motion are its angular velocity (ω) and angular acceleration.

The main dynamic characteristics of rotational motion are the momentum of the *L* relative to the rotation axis *z*, namely:

$L_z = I_z * \omega$

$E_k = I_z * \omega^2/2$

Where

I_z is the moment of inertia of the body relative to the axis of rotation.

3) When a molecule is irradiated with photons of light, it can absorb radiation and undergo an energy transition. The transition energy should be equivalent to the photon energy of the absorbed light, given: E = hv. For a diatomic molecule, the energy difference between the rotational levels (J - J + 1) is determined by the expression:

$$E_{J+1} - E_J = B(J+1)(J+2) - BJ(J=1) = 2B(J+1)$$