Case II

For the transitions

$v=1 \longleftarrow v=0$ and

$j'=0 \longleftarrow j'=1$

$1 \longleftarrow 2$

$2 \longleftarrow 3$

$\Delta j = \pm 1$

In this case taking

$\Delta j = -1$

i.e.

$j' - j'' = -1$

or $j'' = j' + 1$

$$\Delta \bar{\nu} = \bar{\nu_e} + \bar{B}(j' - j'')(-j' + j'' + 1)$$

$$= \bar{\nu_e} + \bar{B}(j' - j' - 1)(j' + j' + 1 + 1)$$

$$= \bar{\nu_e} + \bar{B}(-1)(2j' + 2)$$

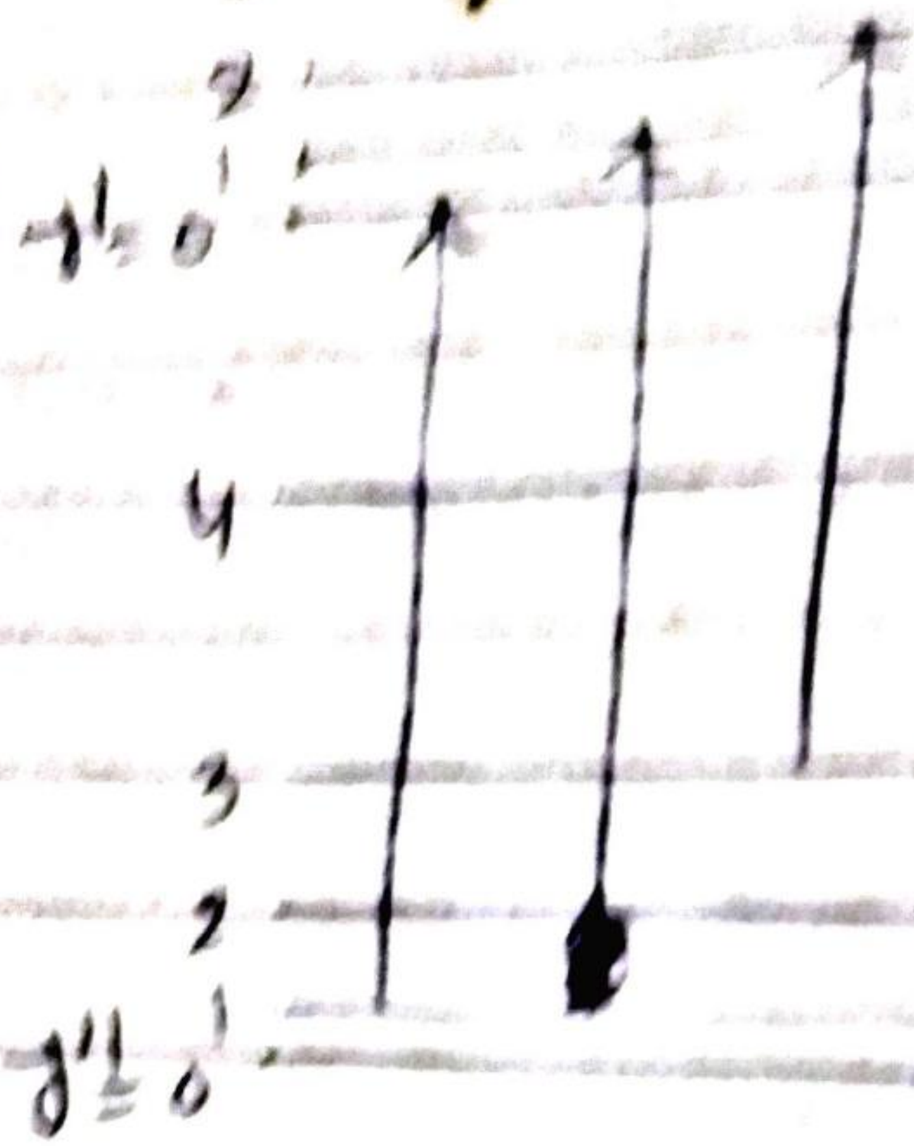
$$= \bar{\nu_e} - 2\bar{B}(j' + 1)$$

$$= \bar{\nu_e} - 2\bar{B}m$$

When, $m = j' + 1$

$j'' = 1, 2, 3$

$j' = 0, 1, 2$



$$\Delta J = -1$$

$$g'' \rightarrow g$$

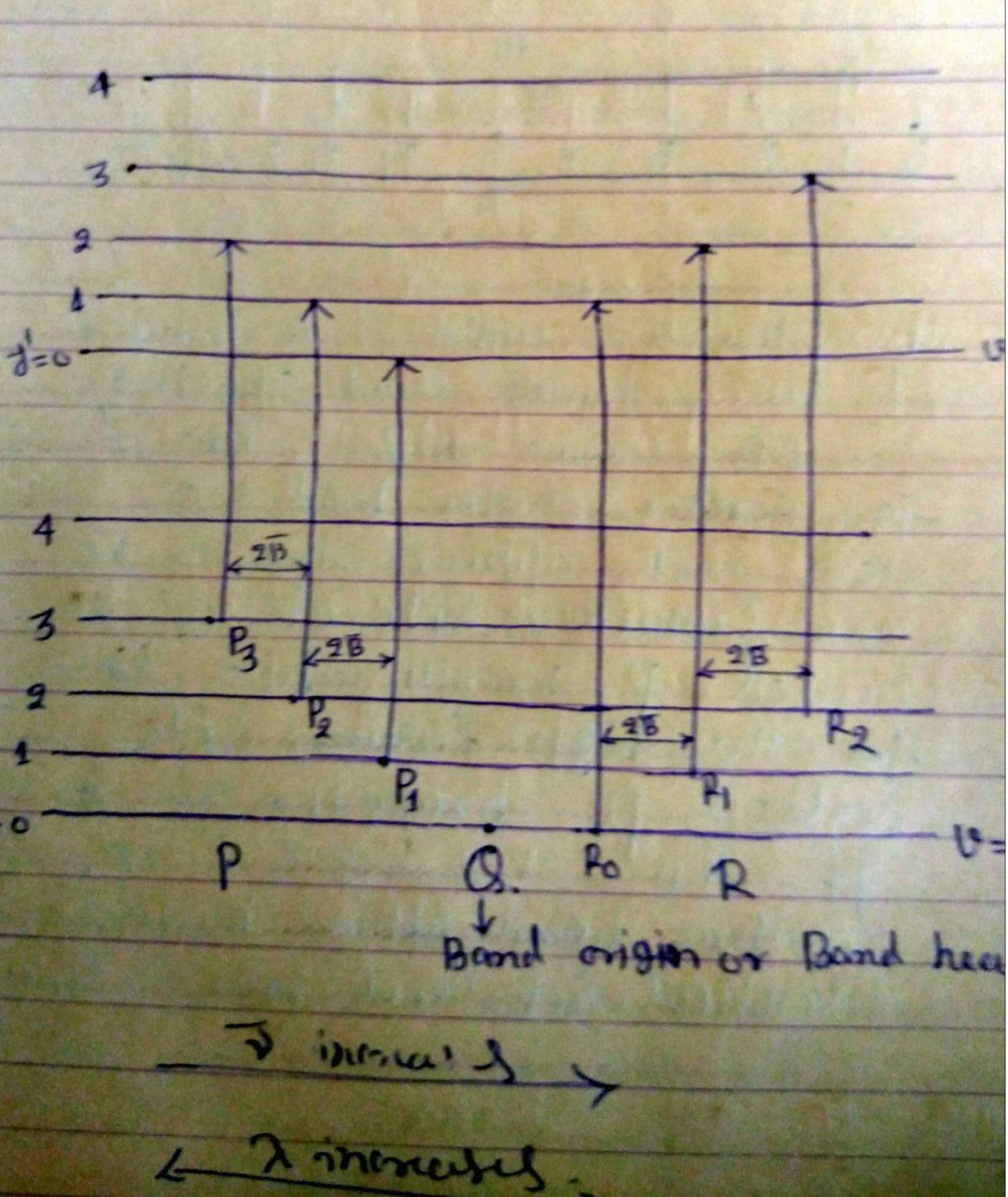
$$g_1 \rightarrow g'' = -1$$

$$g'' = 1 + \frac{1}{}$$

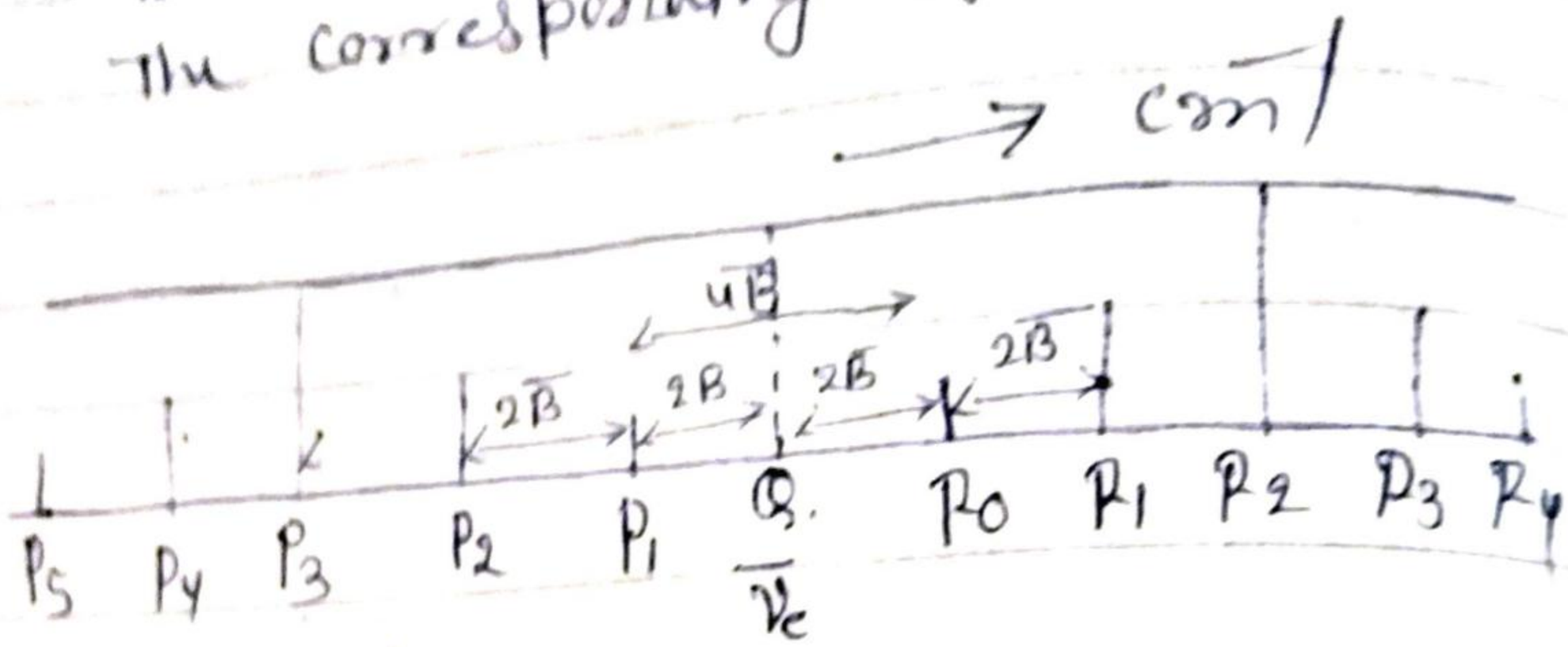
$$\boxed{\Delta \bar{\nu} = \bar{\nu}_e \pm 2\bar{B}m}$$

The following diagram gives transitions between rotational vibrat energy level of a diatomic molec

$\Delta J = -1$ $\Delta J = +1$



The centre of the band is called 'band origin' or band head. The corresponding spectrum is



The spectrum consist of a number of lines having equal spacing of $2B$. since $m \neq 0$, line of the centre of the bond 'Q', does not appear. Lines to be low frequency site of 'Q' are called P-branch while lines to the high frequency site called R-branch. If $\Delta v = \pm 2, \pm 3$ etc. overtone band appear having identical rotational fine structure.