10. (a) Let the quantum numbers of the pair in question be n and $n+1$, respectively. Then $E_{n+1} - E_n = E_1(n+1)^2 - E_1 n^2 = (2n+1)E_1$. Letting

$$E_{n+1} - E_n = (2n+1)E_1 = 3(E_4 - E_3) = 3(4^2 E_1 - 3^2 E_1) = 21E_1 \ ,$$

we get $2n+1 = 21$, or $n = 10$.

(b) Now letting

$$E_{n+1} - E_n = (2n+1)E_1 = 2(E_4 - E_3) = 2(4^2 E_1 - 3^2 E_1) = 14E_1 \ ,$$

we get $2n+1 = 14$, which does not have an integer-valued solution. So it is impossible to find the pair of energy levels that fits the requirement.