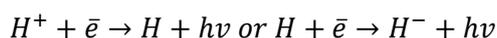


Question #69330, Chemistry / General Chemistry

Question: find the emitted energy of the lowest energy spectrum in the visible field of its atomic spectrum by transitioning electrons to 1 gram hydrogen atom.

Answer: The energy emitted with a gram of hydrogen atoms can be calculate using a Rydberg formula:

$$\nu = RZ^2 \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$$



In our case, n_2 is equal to ∞ and n_1 is equal to one. In turn, the nucleus of a hydrogen atom possesses Z equal to plus one. Thus, the whole formula can be written as:

$$E = h\nu = hR$$

However, it is only one atom of hydrogen. As for 1 gram of hydrogen atoms the formula will be rewritten as follows:

$$E = N_A \frac{m}{M} hR = 6.02 \cdot 10^{23} \text{ mol}^{-1} \cdot \frac{1 \text{ g}}{1 \text{ g} \cdot \text{mol}^{-1}} \cdot 6.62 \cdot 10^{-34} \text{ J} \cdot \text{s} \cdot 1.1 \cdot 10^7 \text{ m}^{-1} = 4.38 \text{ mJ}$$

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