ASTR 792 HW 11

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14.2a

The transition probability in general can be written as

$$P(3p \to 1s) = A_{3p->1s}\delta t$$

The two possible transitions from the $3p$ state are

$$3p \to 2s \qquad A_{3p->2s} = 2.245 \cdot 10^7\ s^{-1}$$
$$3p \to 1s \qquad A_{3p->1s} = 1.672 \cdot 10^8\ s^{-1}$$

with wavelengths

$$H\alpha:\ 3p \to 2s \qquad \lambda_{3p->2s} = 656.46\ nm$$
$$Ly\beta:\ 3p \to 1s \qquad A_{3p->1s} = 102.57\ nm$$

The transition probability can be calculated by taking te branching ratios

$$\frac{A_{3p->2s}}{A_{3p->1s}} = \frac{2.245 \cdot 10^7\ s^{-1}}{1.672 \cdot 10^8\ s^{-1}}$$
$$= .135$$

Thus, the probability for emitting $Ly\beta = 1 - .134 = .866$