

Substitute for 9-29:

The five lowest levels of a certain monatomic gas have the values $E_1 = 0$, $E_2 = 3.8 \text{ eV}$, $E_3 = 4.2 \text{ eV}$, $E_4 = 7.2 \text{ eV}$ and $E_5 = 7.6 \text{ eV}$.

- (a) If the temperature is high enough that all levels are occupied and the gas is illuminated with light of wavelength 3100 nm, what transitions can occur by (i) absorption; (ii) stimulated emission; (iii) spontaneous emission?
- (b) Which, if any, of the transitions found in (a) still occur if the temperature is zero?
- (c) Repeat (a) and (b) for a wavelength of 326.3 nm.
- (d) What wavelength or wavelengths of light can produce stimulated emission from state 4?