Assignment-7

The total marks for submitting this assignment have passed. As per our records you have not submitted this assignment.

1) The phenomenon when an excited atom jumps from an energy state $E_i$ to an energy state $E_f$ ($E_i > E_f$) without any emitted energy being supplied is called __________.

   - Stimulated emission
   - Non-stimulated emission
   - Spontaneous emission
   - None of the above

   7/point

2) What is the frequency of 700 nm wavelength light in Hz?

   - 5.9 x 10^14 Hz
   - 5.9 x 10^15 Hz
   - 5.9 x 10^16 Hz
   - Cannot be determined

   No. The answer is incorrect.

   7/point

3) The energy density of a blackbody radiator over the frequency range of 3 Hz to 6 Hz is given by __________.

   - $E_{\nu} = \frac{2\pi^2}{\nu^4}$
   - $E_{\nu} = \frac{\pi^2}{\nu^4}$
   - $E_{\nu} = \frac{\pi^2}{\nu^4}$
   - $E_{\nu} = \frac{\pi^2}{\nu^4}$

   No. The answer is incorrect.

   7/point

4) For a two-level system, suppose $N_i$ is the population of electron-involving energy state $E_i$, and $N_f$ is the population of electron-involving energy state $E_f$. If $\Delta E = E_f - E_i$ is the energy difference between the two states, the rates $\alpha_i$ and $\alpha_f$ (in s^-1) are the Einstein coefficients of absorption, stimulated emission, and spontaneous emission respectively.

   - $N_i, N_f$ respectively
   - $N_f, N_i$ respectively
   - $N_f, N_f$ respectively
   - $N_i, N_f$ respectively

   No. The answer is incorrect.

   7/point

5) For a two-level system, Einstein's coefficients for absorption and stimulated emission are not exactly equal.

   - True
   - False

   No. The answer is incorrect.

   1/point

6) For a two-level system, in steady state, the ratio of the rate of spontaneous emission $(\alpha_s)$ to the rate of absorption $(\alpha_a)$ at 1 kHz is __________.

   - 0.5
   - 1
   - 0.25
   - 2

   No. The answer is incorrect.

   1/point

7) For a three-level system, if $\nu_0 = 4.5 \times 10^2$, $\nu_1 = 2 \times 10^2$, $\nu_0 = 2 \times 10^2$, the critical value of pump rate $(\alpha_p)$ at which population inversion takes place is approximately __________.

   - 0.5 Hz$^{-1}$
   - 1 Hz$^{-1}$
   - 0.25 Hz$^{-1}$
   - 0.75 Hz$^{-1}$

   No. The answer is incorrect.

   1/point

8) For a three-level system given in Question-7, the effective lifetime of photon is __________.

   - 1.090 s
   - 1.090 ns
   - 0.25 s
   - 0.25 ns

   No. The answer is incorrect.

   1/point

9) In Question-7, if $\nu_0$ and $\nu_1$ are interband, population inversion cannot be sustained.

   - True
   - False

   No. The answer is incorrect.

   1/point

10) For an n-type semiconductor, the majority charge carriers are __________.

    - Electrons
    - Holes

    No. The answer is incorrect.

    1/point