

## Quiz 9

Name: \_\_\_\_\_

Total = 10 marks

1. (4 marks) Consider a two level atom.
  - a) Write down the rate of change of the population of atoms occupying the two levels. Define all variables and label the various processes involved i.e. spontaneous emission, absorption, stimulated emission.

*See lecture notes.*

- b) For the case where the two levels have the same degeneracy derive the following equations.

$$B_{12} = B_{21}$$

$$A_{21} = 8 \pi h \nu^3 / c^2 B_{21}$$

*See lecture notes.*

2. (4 marks) Select one laser (YAG, Ar<sup>+</sup>, ArF, Diode, Dye etc.) and find the following.

a) Diagram of energy levels

*See lecture notes.*

b) Diagram of laser components

*See lecture notes*

c) Relevant characteristics

*See lecture notes.*

i. CW or pulsed

ii. Power or Pulse Energy & duration

iii. Wavelength

d) Give an example of an application where the laser is used.

3. (2 marks) Give an important application of nonlinear optics.

*Double or triple infrared lasers to produce visible / UV light where lasers don't readily operate.*