Before-class Questions #1:

Question 1: What are the typical Q factors of an electronic transition (a) with Doppler broadening (b) for a metastable excited state in Doppler free spectroscopy?
Answer: (a) 10^6 (b) 10^(15)

Question 2: The decay time is the inverse decay rate --- but should the decay rate be given in Hz or radian/s?
Answer: in radian/s

Question 3: What is the Heisenberg limit for a frequency measurement with n photons and a measurement time of Delta_t?
Answer: delta_omega propto (1/Delta_t *n)

Question 4: How can you create a two level system for light (zero and one photon)?
Answer: add anharmonicity to the harmonic oscillator levels, e.g. by having photons in a cavity with atoms

Question 5: Give at least two properties which make a resonance useful?
Answer: Resonance frequency implies atomic or molecular structure, width provides information about e.g. lifetime or collision time