12. An atom initially at rest is exposed to a light field consisting of two counter-propagating plane monochromatic waves, one of frequency ω close to (but detuned from) an atomic resonance, and the other of frequency $\omega+\delta\omega$, where $\delta\omega$ is a small increment. Find the values of $\delta\omega$ maximizing the rate of the atom's scattering along the direction of the light propagation. Assume that the scattered atom remains in the ground internal state (i.e. neglect Raman processes). Make numerical estimates for sodium atom and light frequency near the D1 resonance. Such experiment has been recently carried out with atoms in a Bose-Einstein condensate: J. Stenger et al, Phys. Rev. Lett. **82**, 4569 (1999).

13. A monochromatic laser beam excites a high finesse Fabry-Perot cavity. What is the phase of the beam reflected from the cavity as a function of the frequency detuning from a cavity resonance?

14. What is the angular distribution of fluorescence photons from atoms excited in a $J_e=1/2$, $m_e=1/2$ state if the ground state has $J_g=1/2$?