

Homework Questions:

1. Which of the following are reasons that you would want to use a quantum sensor? Select all that are true:
  - a. The sample is being damaged at the currently available optical powers that allow the signal to be seen, so lower optical powers are desired.
  - b. The signal can be seen with high power without damaging the sample, and thus even higher powers are wanted in future measurements.
  - c. Signal is not currently observable, thus improved sensitivity is required for the sensor to operate.
  - d. The integration times are very long, and it would improve measurements to have a reduced integration time.
  
2. Which of these statements are true, about the minimum uncertainty states of light?
  - a. The coherent state of light is a special case in which the uncertainty is evenly distributed between the two quadratures.
  - b. For the squeezed state of light, the uncertainty in one quadrature can be reduced at the expense of the uncertainty in the second quadrature being increased.
  - c. For the squeezed state of light, one quadrature can be arbitrarily small without consequence, and thus the system can break the Heisenberg uncertainty principle.
  - d. Both a and b are true.
  
3. What is an unwanted component of a squeezed light source?
  - a. A low-noise laser
  - b. Lossy optical components
  - c. A nonlinear medium