1. (30pts) Concept Questions. Try to be concise, and correct!
   a. What is a Vibrational Relaxation?
   b. What is an Internal Conversion?
   c. What is an Intersystem Crossing?

2. (40pts) The average human with a body weight of 70 kg has a blood volume of 5.00 L. The Henry’s law constant for the solubility of N\(_2\) in water is \(9.04 \times 10^4\) bar at 298 K. Assume that this is also the value of the Henry’s law constant for blood and that the density of blood is 1.00 kg L\(^{-1}\).
   (a) Calculate the number of moles of N\(_2\) absorbed in this amount of blood in air of composition of 80\% N\(_2\) at sea level, where the pressure is 1 bar, and at a pressure of 50 bar.
   (b) Assume that a driver was breathing compressed air at a pressure of 50 bar and then was suddenly brought to the sea level. What volume of N\(_2\) gas was released as bubbles in the diver’s bloodstream?

3. (30pts) On the surface of Mars, a mean atmospheric is 600 Pa, and the air mostly consists of carbon dioxide. The mole fraction of CO\(_2\) in Martian air is 0.9532, whereas the mole fraction of O\(_2\) in only 0.0013. If a Martin sea were to exist, what would be the molalities of CO\(_2\) and O\(_2\) solutions in Martian water at 298 K?