Additional Questions:

1. Explain the importance of the determination of blood glucose:

   Diabetes is of particular importance with regards to blood sugar levels. Blood sugar levels that are too high can lead to many long term adverse health effects, such as blindness, coma, abdominal pain, and build up of sugars in many tissues. Short term adverse health effects include: nausea, headaches, dry-mouth, and frequent urination. The importance of this cannot be overstated, blood sugar is critical to basic homeostasis and is extensively regulated throughout the body, particularly in the kidneys and liver. The rudimentary proper responses to blood glucose levels include production of insulin after consumption of sugars and the breakdown of glycogen when blood sugar is too low.

2. Explain how you would utilize FRET to determine dissolved glucose levels:

   FRET would be able to determine the concentration of dissolved glucose by measuring the change in fluorescence of the sample when the ligand changes to glucose. This could be performed as such:

   a. Create a fluorescent labelled dextran that competes with glucose on the protein Concanavalin A (ConA)
   b. Create a set of samples containing various concentrations of glucose in a set amount of ConA and labelled dextran
   c. Create a calibration curve of the fluorescence vs concentration of glucose

d. Use this calibration curve to determine the concentration of an unknown sample of reagents
e. Run the unknown sample multiple times to acquire sufficient data to obtain a satisfactory confidence interval for the concentration of glucose

3. Describe the challenges of applying the Wearable Enzymatic Alcohol Biosensor technology to glucose detection:

   Several aspects of this idea seem promising like the ability to acquire funding (diabetes is common and funding is often available) as well as the similarity of the oxidation mechanisms. Yet, the first challenge I noticed with applying the concept to the glucose oxidase reaction is the availability of a signaling molecule that could be measured that also travels through cell membranes and out of the body. At first, I thought of formaldehyde, but then I remembered that formaldehyde is a waste product of many different biological processes that would fluctuate throughout the day. Another problem is the fact that glucose oxidase also catalyzes reactions with other reducing sugars such as mannose and fructose. Not only would these sugars vary with diet, but they further complicate a system that needs to be simple (there are many emerging blood sugar monitoring devices. Overall this might be able to work, but I believe a few adjustments will need to be made to the concepts and the technology.