24. A berry produces a chemical (miraculin) that when eaten results in sour substances tasting sweet. As a result, people have parties where they eat the berries and then eat really sour foods that now taste very, very sweet. On the answer sheet is a possible partial model of the signal transduction pathway in a taste bud on a person’s tongue.

a. Complete the signal transduction pathway in the diagram including the receptor, secondary messengers, and protein synthesis. Note that the neurotransmitter is a protein produced as the result of the signal transduction pathway. (3.5 pts)

b. A knockout is created that removes a receptor from cells in the above system. Provide the
   a. Independent variable (1 pt)
   b. Dependent variable (1 pt)
   c. Results supporting the model (2 pt)
   d. Results supporting the null hypothesis (2 pt)

   a. Complete the table so that for each of the 4 macromolecules you list 2 organelles/components that contain the macromolecule (a total of 8 different organelles/components). Then explain why the organelle/component would have that compound within it. (4 pts)
   b. Draw a cell labeling each of the organelles/components listed in the table you just completed. (2 pts)

26. You are working at a plant making faded blue jeans. An enzyme is used to fade the jeans and one of the engineers wants to increase the speed that the jeans can be processed. To speed up the process the engineer has suggested increasing the temperature to almost boiling. In general, chemical reactions increase when temperatures increase. Do you believe that the reaction will increase? Explain your answer. (2 pts)

27. There are many relevant portions of brewing to the cell biology we have studied. Answer the following questions about key portions of the brewing process (6 pts)

   a. Mashing: the process where starches in grains are converted to sugars. What is the process used to convert starches to sugar? Why does this need to happen before yeast fermentation?

   b. Fermentation: yeast are added to the wort (the sugar solution) produced through mashing. This process occurs in vats which allow gas out but nothing bubbles through. Why would bubbling oxygen through the vat increase the growth of the yeast in the wort? Why wouldn’t the brewers bubble oxygen through the vat?

   c. Bottling: After the sugars have moistly been used by the yeast the beer is bottled. Some brewers add a little wort (sugar mix) to beer just before sealing the bottle. Why might those brewers need thicker, sturdied beer bottles?