### Part II: Sickle Cell Disease

Now that you have examined the amino acids that are involved in the change of normal β-globin to the sickle cell form, work with a computer simulation to see how the change from glutamic acid to valine at position six in β-globin affects the hemoglobin protein.

1. Return the Molecular Bench main menu using the home button.
2. Click Browse all Activities in the Featured Activities section.
3. Scroll to the Biology section and click A tour of hemoglobin.
4. Follow the directions below to complete the activity. Do not follow the directions on the Molecular Workbench page.
5. Note that you can use the mouse to grab and rotate the hemoglobin molecule, and you can zoom in and out of the view of the molecule by holding down the shift key and dragging the mouse.
6. Notice there are four subunits, and each is shown as a different color in the model.
7. Make a sketch of the molecule in your laboratory journal.
8. Read the information about hemoglobin in the text box on the right side of the window.
9. Use the buttons (gray boxes) on the right to color the amino acids, show the heme groups, and spotlight the glutamic acid in position six of the β-globin. This is the single amino acid that is changed in the sickle form of the protein.
10. Read the selected-response questions at the bottom of the page.
11. Go to the next page in the simulation by clicking on the blue arrow near the bottom of the window.
12. Note a model of two molecules of β-globin is shown in the window. The two β-globin molecules are sticking together because the glutamic acid at position six has been replaced by valine—the mutation associated with sickle cell disease.
13. As you use the gray buttons to change the view of the hemoglobin molecules, be sure to read the information in the text box.
14. Use the grey button to highlight the “Beta 6 valines.”
15. Notice where the valines are located.
16. Next, use the gray buttons to zoom into the hydrophobic pocket and then to isolate it.
17. To see the atoms of the amino acids in the hydrophobic pocket, click the grey button to see the ball and stick model.
18. Now examine the hydrophobicity of the individual amino acids. Look closely at where the number 6 valine is located and which amino acids it is near.
19. Lastly, zoom out so you can see the two hemoglobin molecules sticking together and examine the valine and hydrophobic regions.
20. Scroll down and read the rest of the information on the page.