Remediation Lesson: DNA

SAS Activity
3.01: Structure of DNA, Complementary base pairing

Visit SAS Website and complete attached worksheet.
Time to complete ~ 1 hour

www.Sasinschool.com
Login: Check with your teacher for your school's login.
Quick Launch #5
Please type answers on a separate sheet of paper.

Part 1: Replicating DNA

1. How many strands does the molecule have?
2. Refer to the Component Panel for an illustration of each of the bases that make up DNA, How many different types of nucleotide bases make up the DNA molecule in the DNA viewer?
3. The strands of DNA are held together by base pair combinations found in Table 1 on the Data sheet, Identify all of the bases and which bind to A. Repeat for the other bases (T, G, and C).
4. Click Play at the bottom of the DNA viewer. Watch the animation closely. Click reset; then use the step control to move through the animation a second time and answer the following questions.
    a. What happens to the strands of the original DNA molecule as replication begins and proceeds?
5. Which of the original strands of the DNA molecule serves as a template for replication (top, bottom, or both?)
6. How many nucleotides are added to each new strand of DNA at a time?
7. Examine several instances of A on one of the strands. What nucleotide is added to the new strand at each A?
8. Describe what happens to the DNA once synthesis of the new strand has been completed. What is the last thing that the two new molecules do?
9. Scientists often refer to the DNA structure during the first step of replication. As the replication bubble. Imagine a vertical line running through the middle of the replication bubble. Focus on either the right or the left side. Are the 2 new strands synthesized in the same direction? If not describe how they differ.
10. Now compare both sides of the replication bubble. Does DNA replication occur the same way on both sides? Describe any differences.
11. Observe the replicated, daughter DNA molecules and answer the following questions. (Look at only one molecule- new strand verses original/ old strand). Is the newly synthesized DNA strand identical to, complementary to, or unrelated to the original template? Explain.
12. Describe the DNA molecules after replication in terms of the strands that make them up. Use the terms "old strand" when you refer to the original strands and "new strand" when you refer to the newly synthesized strands.
    a. How do the two new DNA molecules compare to each other.

13. Click reset and then click on the A button in the Component Panel to remove A from the replication process. Play and step through the process again, watching the animation closely. Follow the same procedure for T, G and C. Answer the following questions based on your observations.
    a. What happens when the replication process reaches a point where the missing nucleotide needs to be added to the growing strand?
14. Are the nucleotides that are present added to the growing strands as normal?
15. Can replication substitute a nucleotide for the missing nucleotide? Can replication skip a base? Explain your answer.

Part II- The replication Machinery.

1. Click on The Replication Machinery above the DNA viewer.
2. Refer to the Component panel on the left side of the window to identify each of the structures or components of DNA replication by symbol.
3. Label each component in figure 1 on the DATA sheet.
4. Click play to begin the animation. Observe the animation and answer the following questions:
    a. Is each of the components used during DNA replication?
    b. Is any component used for more than one task, or do they always do one single job?
5. Step through the replication process again. Recall that the 2 strands of DNA are antiparallel, as your answer the following question
    a. Focus on one side of the replication bubble. Do the replication components act on each of the original strands in the same way? Describe any differences.
6. Click reset. Focus your attention on one component at a time as you step through the animation. From your observations, predict a role for each component of the replication machinery.
7. Enter these predictions in column 2 of Table 2.
8. Now verify each of your predictions. To do this select helicase in the component panel for removal. Examine the DNA viewer to verify that helicase was removed. Click on Play. Observe the effect removing helicase has on replication.
9. Briefly summarize your observations in column 3 of table 2.
10. Now select SSP to remove. Examine the DNA Viewer to verify that SSB was removed and that the previous component (helicase) has been restored. Click Play. Repeat with each of the items on the chart.