

Name: _____ Period: _____ Date: _____

Virtual Lab UCF Draft Lesson Plan

Solving the Source of Strawberry Sabotage

Your grandmother lives in Plant City, Florida, and grows strawberries that are used in the shortcake at the Strawberry Festival each year. Her strawberries have even won prizes.

On Saturday, the phone rings. It's your grandmother. She calls you and needs your help – something is turning all of her strawberries to rotten mush. You love your grandmother very much – you tell her that you will be there in a few hours to find out what is happening to her strawberries.

When you arrive at your grandmother's house you find that her strawberries seem to have a grayish color fuzz on them. You take a picture of the strawberry.



<http://www.nysaes.cornell.edu/pp/pp419/PP419Gallery/OswegoPreTrip/pages/Sap%20beetle%20damage.htm>

You investigate. You find a strange-looking insect around many of the strawberry plants. You get a jar and collect one of the live insects to take home with you. The insect looks like this:



http://www.na.fs.fed.us/spfo/pubs/howtos/ht_nitidulid/nitidulid.htm

You decide to research the unknown insect and find out if it is the culprit, sabotaging her rotten strawberries. Upon arriving home you decide that you need to make as many observations as possible about this unknown insect in order to determine what it is.

1. On the data chart below fill in the information based on diagram A above.

Body Part	Description
Color of body	
Shape of body	
Number of legs	
Number of antennae	

After recording the information you call Dr. McClendon, a scientist at the local university, and asked if she could determine what the insect is based on your description. Dr. McClendon asks you to bring in the insect for further examination in the laboratory.

Optional activity: Find out who Dr. McClendon is (C1)

Upon inspection Dr. Dr. McClendon believes that it is in the *Order Coleoptera* and it is a sap beetle. You are interested in finding out more about the sap beetle. You go to the library and online to find some general information about sap beetles...



Dr. Dorothy McClendon using a light microscope

Optional activity: Use the Sap Beetle information sheet for beginning information and to add your own from library and online research... (C3)

Optional activity: See the student diagram of the Sap Beetle to: 1) see the parts of the beetle; or 2) to then draw your own. (C 4)

After researching the sap beetle you return to Dr. McClendon's laboratory and ask if it is possible to look at the different parts of the sap beetle. Dr. McClendon has many types of microscopes, but she asks if you would like to see the sap beetle under a scanning electron microscope (SEM).

Optional activity: Look at the different views of the beetle on paper before using the SEM. (C 2)

Optional activity: Video -- see how the SEM works. (B 1) 7 minutes

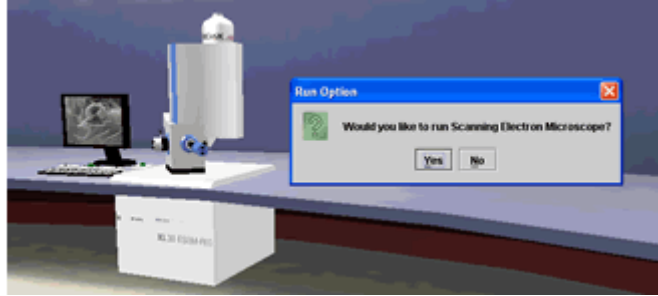
Optional activity: History of the SEM. (C 5)

Optional activity: Video -- see how slides are made. (B 2) 5 minutes

Once the sap beetle is prepared for the SEM you are able to look at it on the monitor. Dr. McClendon tells you that this might be a new species of sap beetle and you want to make sure that you collect as much data as possible on the specimen for identification.

Run the SEM

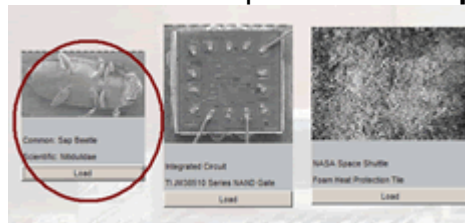
1. Enter the virtual lab.
2. Walk up the stairs to the second floor and around to the back wall.
3. On the middle of the lab table is the Scanning Electron Microscope (SEM).



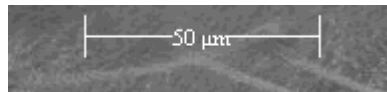
4. Using the mouse **double left click** on the monitor for the SEM.
5. A run option box will appear with the question: "Would you like to run Scanning Electron Microscope?" Click "**yes**"
6. The next screen will show four boxes. Click on the lower right hand box that is labeled: "**Run the SEM**"



7. Click on the "**load**" button for the sample labeled "**Sap Beetle**"



8. At the top middle of the screen you will see a **scale bar** with units measured in micrometers (μm).



9. Take the mouse arrow and place it over one the bar (you will see the hand symbol). While holding down on the **right click** button move the bar down so that it is laying over the sap beetle specimen.
10. Now move the mouse arrow to one end of the bar and hold down the **right click** button and move the bar so it increases and decreases in size.
11. You have now learned how to use the measurement bar for the SEM.
12. Use the Information sheet provided and the sap beetle specimen on the Virtual Lab SEM to complete the following lab activity.

Part I: Measuring your specimen

1. Click on the magnification box on the right hand side of the screen and select a magnification of **14**.



2. Move the scale bar so that one end is at the posterior of the beetle and the other end is at the anterior. If placed correctly the bar will be showing the length of the sap beetle.
3. What is the length of the sap beetle at a magnification of 14? (Remember your units!) _____
4. Change the magnification to 113 and once again center the bar to measure the length of the sap beetle.
5. What is the length of the sap beetle at a magnification of 113? (Remember your units!) _____
6. Has the length of the sap beetle changed with a change in magnification? **Why or Why not?** _____

7. What units are you measuring the sap beetles length with? _____
8. Measure the width of the sap beetles body in the thorax region.
9. What is the width of the thorax? (Remember your units!) _____
10. Does the length of your specimen fall into the range that is noted on the sap beetle information sheet? _____

Part 2: Comparison of Appendages

11. On the information that you found at the library it stated that the antennas had 11 segments with the last three forming a club. You now need to compare this data with your specimen.
12. At the anterior end of the sap beetle locate the antenna that is towards the top of your screen.

13. Increase the magnification to 225.
14. How many segments make up the antennae of the sap beetle? _____
- _____
15. Does your answer to #14 compare with the information given on the sap beetle information sheet?
- _____
16. Do the last 3 segments form a club at the end of the antenna? _____
- _____
17. Use the measurement bar to measure the length of the club portion (last 3 segments) of the antennae.
18. Length of the club portion: _____
19. What units did you just use to measure the length of the club of the antennae? _____
- _____
20. How many micrometers equals 1 millimeter? _____
- _____
21. Using the length of the club portion, convert the length to millimeters. Show your work in the box.

22. What is the scientific notation for this number? _____
- _____
23. What is the abbreviation for micrometers? _____
24. Measure the length of one other appendage on the sap beetle.
 What appendage did you measure? _____
 What was the length of this appendage? _____
- _____

Part 3: Scientific Inquiry

You have compared the features of your specimen to the information gathered on sap beetles and are sure that this is the culprit to your grandmother's trouble with her strawberries. However, in your study of the sap beetle specimen on the SEM you have found that it appears to have hairs on its body and you want to know what they are for and why they appear to be the same size and distance apart. You discuss the hairs that you have found with Dr. Collins and she tells you that they possibly have a sensory function for the sap beetle, but that not much research has been conducted concerning it. She asks if you would like to take part in researching the characteristics of the hairs. You decide to use the SEM to answer the following question: "Are the hairs on the sap beetles body the same length?"

25. Before you begin to observe the hairs: What is your prediction to this question? _____

26. Explain a procedure for determining the size of the hairs on the sap beetle. (List your procedure in steps). _____

27. Construct a data table for your raw data.

--

28. Follow your procedure to collect your data and place it in the data table above.

29. What is the range of measurements that you collected in the data table? _____

30. Calculate the average length of the hairs in your data table. Average Length (don't forget the units!): _____

31. Based on the data that you collected was your prediction supported or not supported? Why? _____

Part 4: Conclusion

32. If you were to measure a specimen of a sap beetle in your classroom, what metric unit would you use? _____

33. Would you use the same metric unit to measure an appendage on the sap beetle? Why or why not? _____

34. Explain why the use of metric units smaller than a millimeter are necessary for scientific study? _____

35. Is this a Sap Beetle? Why or why not.... Support your answer with information that you gathered and learned in the lab. _____

36. You have read that "The sap beetle is attracted to any fruit that is damaged or cracked that exposes the juices. The sap beetle will eat sections or holes in the fruit. The sap beetle can also carry organisms from berry to berry that will cause the fruit to rot." Should your Grandmother use insecticides or chemicals to kill the beetle? Why or why not? _____