Parts of Report	Description
Introduction	• One paragraph • States the purpose of the experiment • Includes a hypothesis • One or two other related sentences
Materials	• Lists all of the materials used in the experiment
Procedure	• Treats the eggs carefully • Writes the steps of the experiment in numerical fashion as shown below: *Step 1*: Measure circumference of the egg *Step 2*: Remove the eggshell by soaking egg in vinegar *Step 3*: etc...
Results	• Measurements are accurate • Correct use of metric units • Uses a ruler or the computer for the table
Conclusion	• One or two paragraph discussion of the experiment – What did you learn? – Explain the results – What could you do differently? – Did you have any problems? – Was your hypothesis correct?
Other	• Spelling and grammar • Neatness and professionalism

Introduction

- The introduction of the experiment should be a paragraph. Students state the purpose of the experiment, or explain why the experiment is being done. In this case, the purpose of the experiment is to use the egg as a model for a cell, and to study the movement of water and other substances through the membrane into the egg. The introduction should also contain some sort of hypothesis—students can predict if they think the egg will shrink or swell at all, or make other predictions that might occur to them. The rest of the introduction is devoted to a general discussion of the topic. Encourage individuality by telling students that they can include any comments they would like into the introduction, as long as they are related to the eggcellent experiment in general. Stress the importance of spelling and grammar, as well as keeping the entire write-up neat and professional. If you have an exemplary sample write-up from the previous year, now is the time to show it to your students. If this is the first year you are guiding students through this activity, then stress how important the appearance of the final product is.

Materials

- Students compile a list of all the materials that are used during the entire experiment. Show your students how to save space if they list the materials in two columns, rather than one long running list. Some students might choose to make up a rough copy of the materials and then make a final copy as the experiment winds down when there are no more materials to add to the list.

Materials:

eggs	vinegar
cups	string
etc.	etc.

Activity tip: The write-up can be either done by hand or completed on the computer.

Green tip: Rinse the plastic cups and store them for reuse for next year or for other experiments.

Procedures

- The procedure is a written list of the steps of the experiment. Explain to your students that the procedure should not be written in long, drawn-out sentences, but instead using short phrases. Write the example steps below to give your students an idea of how short the procedure should be. Your students should continue to add to the steps of the procedure as they proceed through the experiment.

Procedure

1. Measure circumference of egg
2. Label cup
3. Soak egg in vinegar for 24 hours
4. Re-measure circumference
5. Etc…

The Results

- The results of an experiment involve making measurements, observations, and collecting data. It's typical to present the results of the experiments in tables (see page 16). In this experiment, students will make a result table that shows the circumference of the egg. Many times, a graph can be made out of the numbers. If your students have knowledge of independent and dependent variables, identify the results of the experiment as the dependent variable. The independent variable of the experiment is defined as what is being changed in the experiment. In this case, the solutions that the egg is soaked in can be identified as the independent variable.

- Students remove the egg from the distilled water and re-measure the circumference. The egg probably will be close in circumference to the previous measurement. Tell your students that in order to swell the egg as much as possible, it should be placed in several changes of water. Eventually the circumference of the egg will be maxed out.

- Discuss how the egg swells from its original size because of the movement of water (and vinegar) into the egg. Keep your discussion simple, as the next topics (diffusion and osmosis) will cover this in more detail. Simply describe how water can move through the membrane, and the egg will shrink or swell depending on which direction the water is moving. The more water that flows into the egg, the bigger the egg will get.

- Students will like it when you break out the food coloring. Tell your students to choose a color to add to the water—tell them the purpose is to discover if the food coloring can go through the membrane. Its best to keep the small bottles of food coloring under your control, or at least caution students to be conservative—a few drops is all that is needed, but students will often dump in a load and make a mess, not to mention waste the food coloring. The table below shows example results up to day four of this experiment.

Day	Solution	Circumference (cm)
1	vinegar	14 (original egg)
2	water	16
3	water + food coloring	16.5
4	corn syrup	Too difficult to measure—shrunk dramatically

The Eggcellent Experiment – The Shrunken Egg

- Now is the time to discuss in detail what is happening to the eggs. Show one of the eggs that has been soaked in corn syrup—your students will observe a truly bizarre-looking egg! The egg looks like a collapsed bag as most of the water has been removed. A good analogy is to relate the appearance of the egg to the deflated balloon. Ask questions and facilitate the discussion so that your class understands why the egg has dramatically shrunk.

Activity tip: A spoon is handy to remove the eggs.

- The sugar concentration is so high in corn syrup that there is almost no water in it. Thus, there is an extremely low concentration of water outside the egg. Since water moves from high to low concentration, the water inside the egg will move to the outside. Tell your students it is impossible to measure the circumference of the collapsed egg.

Don't even think about allowing your students to take out and hold the eggs unless you have a nearby sink for washing hands. Otherwise, everyone's hands will have thick, sticky corn syrup on them and an unimaginable mess is likely to occur. On the other hand, it's cool and fun to hold the sticky egg, so by all means, if you have sink and a lot of paper towels around—let your students get a feel!

- Caution your students using a kind tone about the corn syrup—tell them not to touch anything else until their hands are washed. The sink is also handy to rinse out the cups and fill them with just water. The wonderful reversible thing about this is that the egg will swell right up again. It will take two to three days with water changes to completely re-swell the egg. Once the eggs are plump full of water again, they can be broken open as described below.

The Eggcellent Experiment – The End

- For the grand finale of the eggcellent experiment, the egg can be broken open and its contents examined. An egg that is swollen with water will actually have pressure built up inside. This kind of pressure is called osmotic pressure and if you carefully prick a hole in the membrane, the water will come spurting out. Demonstrate this for your students.

- Don't poke a hole in the egg using a quick thrusting motion. Instead, carefully insert a pin into the egg through the membrane, and then remove the pin. The water inside the egg will come spurting out, in the way air would come rushing out if there were a pinhole in a balloon.

Teaching tip: Children often find this sight hilarious.

- The same pin can be used to rip the egg open. Students can then see that the food coloring has passed through the membrane and indeed has colored the inside of the egg. The yolk remains uncolored. Observe that the yolk is surrounded by its own membrane, and that this membrane has such small pores that it doesn't even let the food coloring inside.

- If you have a large class, it can be a chore to help students clean up (although this should be considered energy well spent). The best way to clean up is to hold a trash can up to the edge of the table and wipe the broken egg right into the trashcan. Be sure students wash their hands after the cleanup. As the culminating piece to the lab write-up, students write a conclusion.

  Cleanup tip: Have plenty of paper towels and disinfectant spray handy.

The Conclusion

- The length of the conclusion is left to the discretion of the teacher. One or two paragraphs is a reasonable length for most students. The conclusion is a discussion of the results of the experiment. Students can comment if their hypothesis was correct, although in any experiment, it's important for children to recognize that if the hypothesis was not correct, this doesn't mean the experiment was a failure. In fact, many times, students learn more when their hypotheses are proved incorrect. Students will find it helpful if you go through the table below to give them ideas as to what they should include in the conclusion. Mention that spelling and grammar count. Don't be afraid of pausing here and giving your students some extra class time to complete their work. Now is a good time to slow down and review before you start the next topic in this manual.

Conclusion

- Summarize the results of the experiment
- Explain the results
- Would the results be the same if the experiment were repeated?
- Suggestions for something different to try
- Improvements, problems encountered
- What did the student learn?
- Was the hypothesis correct?