Diabetes: A National Epidemic

Carrie Newdigger
Macksville High School
Macksville, KS

Laurie Hayes
Center for Advanced Research and Technology
Clovis, California

In collaboration with Pamela Allweiss, National Center on Chronic Disease Prevention and Health Promotion, Jennifer Williams, Jenifer Kopfman, and Latoria Whitehead, National Center on Birth Defects and Developmental Disabilities, and Rodolfo Valdez, Office of Genomics and Disease Prevention, Centers for Disease Control and Prevention

Disclaimer: The findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of the Centers for Disease Control and Prevention.
**Diabetes: A National Epidemic**

Carrie Newdigger  
Macksville High School  
Macksville, KS

Laurie Hayes  
Center for Adv. Research and Technology  
Clovis, California

**Summary**
This lesson is for a general biology or anatomy and physiology class. The lesson emphasizes the importance of glucose homeostasis in the body, and the effects of type 1 and 2 diabetes on glucose homeostasis by using a classroom enactment of glucose regulation in the body.

**Learning Outcomes**
- Students will graph trends in diabetes and obesity prevalence
- Students will be able to explain the regulation of glucose homeostasis between the bloodstream and cells
- Students will be able to explain the physiological changes that occur in the homeostatic regulation of glucose in diabetic persons

**Materials**
1. Photocopies of data of “The National Epidemic”—one per student
2. Graph papers—two pages per student
3. Photocopies of data of “Obesity: By Body Mass Index”—one per student
4. Photocopies of “Pretest – The National Epidemic”—one per student
5. Photocopy of role-play cards for the “Glucose Regulation Activity”—one per class; each role should be on a different color of paper
6. Site labels for role-play activity
7. A chair for the role-play activity Part C
8. Photocopies of the “Glucose Regulation Worksheet”
9. Photocopies of “6-Trait Writing Rubric”—one per student
10. Papers of two different colors for “Different Diabetes” activity —each student needs one of each color
11. Photocopies of “Complications of Diabetes” —one per student
12. Outline of body to illustrate locations of diabetes complications —one per student
13. Photocopies of “Diabetes Today” requirements and rubric—one per student
14. Newspapers to familiarize students with the layout of such a publication
15. Computers with Internet access
16. Textbooks to use as reference materials

**Total Duration**
5 hours

---

**Procedures**

**Teacher Preparation**
The teacher should prepare photocopies of the “The National Epidemic”, “Obesity: The Other National Epidemic”, and “Glucose Regulation Worksheet” handouts and review the “Glucose Regulation Activity Instructions”. The classroom should be prepared for the role-play activity.
and nametags for each role should be prepared using the instructions contained in the “Glucose Regulation Activity Instructions”.

This lesson can be taught as an introduction to biological regulation, the interconnection of various body systems, and the importance of a healthy lifestyle. For additional information on these topics, visit the Web resources included below.

**Web Resources**

**Title:** CDC's Diabetes Program – FAQs – Basics About Diabetes  
**URL:** [http://www.cdc.gov/diabetes/faq/basics.htm](http://www.cdc.gov/diabetes/faq/basics.htm)  
**Description:** This site contains basic information concerning diabetes and is a source for background knowledge to enhance the discussion following the pretest. It can be used by the teacher for background information.

**Title:** American Diabetes Association  
**URL:** [http://www.diabetes.org](http://www.diabetes.org)  
**Description:** This site contains basic information concerning diabetes and is a source for background knowledge to enhance the discussion following the pretest. It can be used by the teacher for background information.

**Title:** MedlinePlus Interactive Health Tutorials: Diabetes Introduction  
**Description:** This NIH website has an interactive tutorial with useful information about diabetes. The information in the tutorial is also available in a printer-friendly version. This site would be useful for information about diabetes for teachers or students.

**Supplemental Documents**

**Title:** Glucose Regulation Activity Instructions  
**Description:** This document provides instructions for the teacher for the “Glucose Regulation Activity” used in steps 2 and 3 and the conclusion.

**Title:** Venn Diagram Activity Instructions  
**Description:** This document contains instructions for the teacher for the “Venn Diagram Activity” used in the conclusion step.

**Introduction**  
**Duration:** 45 minutes

Begin the lesson by informing students that they are going to become disease detectives and investigate a national epidemic of a mystery disease. Instruct students to create a graph of data contained in the table included in “The National Epidemic”. Do not tell the students what disease is being investigated. After the data is graphed, have the class give hypotheses about what national epidemic is being illustrated. Reveal to students that the mystery disease is type 2 diabetes and explain that diabetes is a disease in which the body does not produce or properly use insulin (a hormone that is needed to convert sugar, starches and other food into energy needed for daily life). Conduct a class discussion about why the number of persons diagnosed with diabetes might be increasing. If student responses do not include a rise in obesity as one of the factors contributing to the rise in type 2 diabetes, then the teacher can prompt them to include it. (Teachers should note that a rise in obesity is only one reason for the rise in numbers of people with diabetes. There may be a number of other reasons, including an aging population, heightened public awareness of the disease, and better detection. Age is also a risk factor for
developing type 2 diabetes.) Assign the students to graph the data from “Obesity: By Body Mass Index”. Again, elicit hypotheses for the reason for the rise in obesity. Refer to the website “Preventing Chronic Disease: January 2005 and April 2005” for suggested hypotheses. Be sure the students notice that the trends are similar. Also stress to the students that the numbers in the first graph (“The National Epidemic”) represent diagnosed diabetes only. The National Institute of Health and Centers for Disease Control and Prevention (CDC) estimates that another one-third of persons with diabetes are unaware that they have the disease.

A quiz created by the International Diabetes foundation can be used to assess students’ prior knowledge of diabetes. The pretest and answer key are available in PDF format at the “Quiz: Test Your Knowledge of Diabetes” website listed in the Web Resources section. Once the students have answered the pretest, go over the answers and supplemental discussion points with them as described in the answer key.

**Web Resources**

**Title:** CDC’s Diabetes Program – Data & Trends – Prevalence of Diabetes  
**Description:** This site maintains data from the National Diabetes Surveillance System and is the source for the number of persons with diagnosed diabetes. It can be used for the source of data to be graphed to determine the “Prevalence of Diabetes”

**Title:** BRFSS Trend Data – Data Display  
**URL:** [http://apps.nccd.cdc.gov/brfss/](http://apps.nccd.cdc.gov/brfss/)  
**Description:** This site maintains data from the Behavioral Risk Factor Surveillance System and is the source for the percentage of obesity of various groups of populations. It can be used for the source of data to be graphed to illustrate the relationship between the number of obese persons and the number of diabetics. The site allows viewers to stratify the data by various factors, including state, gender, and age.

**Title:** Preventing Chronic Disease: January 2005  
**URL:** [http://www.cdc.gov/pcd/issues/2005/apr/04_0038.htm](http://www.cdc.gov/pcd/issues/2005/apr/04_0038.htm)  
**Description:** This site is the publication of Part 1 of a CDC study of childhood obesity and its trend relationship to societal activities including transportation, physical education, and diet. This study can be used as an additional resource for teachers to enhance the discussion about the increase in obesity in the U.S.

**Title:** Preventing Chronic Disease: April 2005  
**URL:** [http://www.cdc.gov/pcd/issues/2005/apr/04_0039.htm](http://www.cdc.gov/pcd/issues/2005/apr/04_0039.htm)  
**Description:** This site is the publication of Part 2 of a CDC study of childhood obesity and its trend relationship to societal activities including transportation, physical education, and diet. This study can be used as an additional resource for teachers to enhance the discussion about the increase in obesity in the U.S.

**Title:** Quiz: Test Your Knowledge of Diabetes  
**URL:** [www.diabetes.ca/files/obesity_quiz.pdf](http://www.diabetes.ca/files/obesity_quiz.pdf)  
**Description:** This quiz created by the International Diabetes Foundation can be used as a pretest to assess students’ prior knowledge of diabetes. It also includes an answer key.

**Title:** CDC’s Diabetes Program – FAQs – Basics About Diabetes  
**URL:** [http://www.cdc.gov/diabetes/faq/basics.htm](http://www.cdc.gov/diabetes/faq/basics.htm)
Description: This site contains basic information concerning diabetes and is a source for background knowledge to enhance the discussion following the pretest. It can be used by the teacher for background information.

**Supplemental Documents**

**Title:** The National Epidemic  
**Description:** This is the data that is to be graphed to introduce the students to the prevalence of diabetes and the increase that is observed. For data after 2004, the teacher can refer to the “CDC's Diabetes Program – Data & Trends – Prevalence of Diabetes” website.

**Title:** Obesity: The Other National Epidemic  
**Description:** This is the data that is to be graphed to illustrate the nationwide trend in obesity as measured by BMI. For data after 2002, the teacher can refer to the “BRFSS Trend Data – Data Display” website.

**Step 2 Duration: 45 minutes**

Following the pretest, explain that students will further investigate the diabetes epidemic by exploring the relationship between blood glucose levels and insulin. Introduce normal glucose regulation by using the role-play activity described in Part A of the “Glucose Regulation Activity Instructions” document. Assign the students to complete Part A of the “Glucose Regulation Worksheet”. Once Part A of the worksheet is complete, review the answers with students. Assign the students to write a paragraph to explain glucose regulation using the following terms: blood glucose, insulin, glycogen, glucagon, pancreas, tissue cells, muscle, glycogen, and liver. Have the students share their paragraph with a partner and allow the partners to add any missing or inaccurate information. These paragraphs should then be graded using the “6-Trait Writing Model.” Information for this grading rubric can be found at the “6-Trait Writing” website listed in the Web Resources section.

**Web Resources**

**Title:** How Diabetes Works  
**URL:** http://www.howstuffworks.com/diabetes.htm  
**Description:** This site explains how the body uses insulin to control glucose. It includes graphics illustrating the regulation of glucose levels in the bloodstream. The teacher can use this site for background information and as a visual aid for the students during the role-playing exercise.

**Title:** 6-Trait Writing  
**URL:** http://www.kent.k12.wa.us/staff/LindaJancola/6Trait/what.htm  
**Description:** This is a site that describes the use of the 6-Trait writing rubric in the classroom. The teacher should use the information at this site to grade the students’ paragraphs.

**Supplemental Documents**

**Title:** Glucose Regulation Activity Instructions  
**Description:** This document provides detailed instructions for the teacher for the glucose regulation activity. Part A should be used for this step.
Step 3  
Duration: 30 minutes

Now that the students have been introduced to the normal cycle of glucose regulation, introduce the importance of insulin production and receptor affinity in maintenance of this physiological phenomenon. Use Part B of the “Glucose Regulation Activity” to facilitate the class discussion. After completing Part B of the activity, begin the discussion by asking the questions, “What happens to glucose levels when insulin is not available, and how does this affect the cell’s ability to make energy?” Also ask them, “What happens if there is too little glucose in the bloodstream?”, and “What happens if there is too much insulin in the bloodstream?” (Refer to the “Glucose Regulation Activity Instructions” for the answers to these questions.) Assign the questions in Part B of the “Glucose Regulation Worksheet” and review the answers with the students. To further assess the understanding of this topic, have the students write a short description of a physiological scenario in which insulin would be needed and a physiological scenario in which glucose would be needed. They should then trade their scenarios with a partner and have the partners identify which treatment would be recommended and why for each scenario.

Web Resource

Title:  American Diabetes Association  
URL:  http://www.diabetes.org  
Description:  This site contains information about hypoglycemia and hyperglycemia, including the symptoms and treatments for each condition. It can be used by the teacher for background information.

Title:  The National Diabetes Education Program  
URL:  www.cdc.gov/diabetes/ndep or www.ndep.nih.gov  
Description:  This site, created by a joint CDC and NIH program, may be used by the teacher for background information.

Supplemental Documents

Title:  Glucose Regulation Activity Instructions  
Description:  This document provides detailed instructions for the teacher for the glucose regulation activity. Part B should be used for this step.

Title:  Glucose Regulation Worksheet  
Description:  This document is for the students to explain the imbalances in glucose regulation. Part B will be completed in this step.

Title:  Glucose Regulation (Answer Key)  
Description:  This document provides the answers to the “Glucose Regulation Worksheet”.


Conclusion  

Once students understand the mechanism of the maintenance of glucose levels, the teacher should use Part C of the “Glucose Regulation Activity Instructions” to introduce information on type 1 and type 2 diabetes, being sure to emphasize the definition of diabetes (a fasting glucose greater or equal to 126 mg/dl) and the role of obesity as a risk factor for type 2 diabetes. Relate this information to the graphs created in the introduction and the discussion about why these trends exist. Emphasize that there are more children being diagnosed with type 2 diabetes, and have the students provide hypotheses for why this is so. Information concerning the differences between the two types of diabetes can be found on the “Diabetes Information - American Diabetes Association” website listed in the Web Resources section. Use the animation clip on the McGraw-Hill Higher Education website listed in the Web Resources for clarification. Compare and contrast the two types of diabetes using a Venn diagram by following the instructions in the “Venn Diagram Activity Instructions.”

Web Resources

Title: Diabetes Animation  
URL: www.mhhe.com/biosci/genbio/animation_quizzes/graphics/inm5s8c.ram  
Description: This Real player animation from McGraw-Hill Higher Education gives a visual demonstration of the interaction of glucose and insulin in a normal system and in type 1 and 2 diabetes.

Title: Diabetes Information - American Diabetes Association  
URL: http://www.diabetes.org/about-diabetes.jsp  
Description: This site gives detailed information concerning the similarities and differences between type 1 and 2 diabetes. The teacher can use this for background information for the Venn diagram activity.

Title: MedlinePlus Interactive Health Tutorials: Diabetes Introduction  
Description: This NIH website has an interactive tutorial with useful information about diabetes. The information in the tutorial is also available in a printer-friendly version. This site would be useful for information about diabetes for teachers or students.

Supplemental Documents

Title: Glucose Regulation Activity Instructions  
Description: This document provides detailed instructions for the teacher for the glucose regulation activity. Part C should be used for this step.

Title: Glucose Regulation Worksheet  
Description: This worksheet will be completed by students during the glucose regulation activity. Part C will be completed in this step.

Title: Glucose Regulation (Answer Key)  
Description: This document provides the answers to the student worksheet “Glucose Regulation”.

Title: Venn Diagram Activity Instructions
Assessment

The students will be evaluated on their paragraphs of glucose management in step 2 using the 6-Trait writing model. Their description of physiological scenarios requiring insulin and scenarios requiring glucose will be assessed in Step 3. In the conclusion, they will be informally assessed using the “Venn Diagram Activity.”

Modifications

Extensions
Now that the students understand what diabetes is and how diabetes is treated, the students can strengthen their vocabulary skills by translating a list of technical terms for complications of diabetes into more commonly used terms and indicating the location of the complications on a diagram of the human body. This list is found on the “Common Complications of Diabetes Worksheet” included in the Supplemental Documents section. Students can find additional information about these complications and a guide to medical terminology by using the sites listed in the Web resources section.

Web Resource

Title: Type 2 Diabetes Complications
URL: http://www.diabetes.org/type-2-diabetes/complications.jsp
Description: This site from the American Diabetes Association describes the clinical complications associated with type 2 diabetes. Students or teachers can use this site for additional information about each complication.

Title: Type 1 Diabetes Complications
URL: http://www.diabetes.org/type-1-diabetes/complications.jsp
Description: This site from the American Diabetes Association describes the clinical complications associated with type 1 diabetes. Students or teachers can use this site for additional information about each complication.

Title: National Diabetes Information Clearinghouse
Description: This site from the NIH lists the clinical complications associated with diabetes and provides links to further information regarding each condition as well as tips for healthy management. Students or teachers can use this site for additional information about each complication.

Title: U.S. Food and Drug Administration Diabetes Information
URL: http://www.fda.gov/diabetes/related.html
Description: This site lists the clinical complications associated with diabetes and various statistics for each condition. It also provides links to further information about each condition. Students or teachers can use this site for additional information about each complication.

Title: Medical Terminology
URL: http://ec.hku.hk/mt/
Description: This site from the University of Hong Kong shows a list of commonly used medical root words. It can be used by the students as they are deciphering technical terms into common language.

Supplemental Document(s)
Title: Common Complications of Diabetes Worksheet
Description: Students will complete this worksheet by translating the list of technical terms for complications of diabetes into more commonly used terms.

Title: Common Complications of Diabetes Answer Key
Description: This document contains the answer key for the “Common Complications of Diabetes Worksheet”.

When the students have demonstrated an understanding of the scope of the complications of the disease, they will develop a classroom newspaper as detailed in the handout “Diabetes Today Project”. The students will be assigned roles to create and publish a newspaper to educate the community about the characteristics of diabetes, its effects, and prevention tools. The departments and sections of the newspaper should include Headlines (facts, statistics, and latest research), Lifestyle (prevention techniques and ideas for recipes), Opinion (advice columns and letters to the editor), Entertainment (crossword and educational comics), and Advertising (careers and equipment involved in the management of diabetes). After the teacher has proofed the content for accuracy and graded it using the “Rubric for the Diabetes Today Project”, the publication could then be distributed throughout the community in areas such as senior centers, grocery stores, video arcades, places of worship, bowling alleys, schools, sporting events, or at various neighborhood meeting sites.

Web Resource(s)
Title: American Diabetes Association
URL: http://www.diabetes.org
Description: This site describes the characteristics of diabetes and its research, ideas for nutritional recipes, prevention, and management. Students can use it for researching their newspaper section.

Title: National Diabetes Information Clearinghouse
Description: This site gives an overview of the disease, identifies treatments, complications, and statistics. Students can use this site for researching their newspaper section.

Title: U.S. Food and Drug Administration Diabetes Information
URL: http://www.fda.gov/diabetes/
Description: This site discusses questions and answers related to diabetes, the equipment and behaviors associated with its management, and complications of the disease. Students can use this site for researching their newspaper section.

Title: CDC’s Diabetes Program – FAQs – Basics About Diabetes
URL: http://www.cdc.gov/diabetes/faq/basics.htm
Description: This site gives an overview of frequently asked questions about diabetes, including its characteristics, symptoms, types, risk factors, treatments, prevention methods, and cures being investigated. Students can use this site for researching their newspaper section.
Supplemental Documents

Title: Diabetes Today Project
Description: This document describes requirements for the Diabetes Today project.

Title: Rubric for the Diabetes Today Project
Description: This is the grading rubric for the section of the newspaper that each student developed.

Other Modifications

In the introduction, the students could write a paragraph comparing the trends of the graphs and include various hypotheses raised during the class discussion.

During the role-playing activity, the students could graph the relative amounts of glucose and insulin in the bloodstream over time on a multidata line graph.

To improve time management, the teacher could do the role-playing activity described in Steps 3 and the conclusion (Parts B and C) together and have the students complete the worksheet on their own, then do the assessments the following day in class.

To save time, or for students at lower levels, the teacher could give the students graphs of the data rather than completing the graphing activity in class.

For upper level students, the teacher could emphasize that nearly 33% of the diabetes cases are undiagnosed (some people don’t know that they have diabetes), and the students could add this proportion of people to their data to further emphasize the magnitude of the epidemic during the graphing activity in the introduction.

For lower levels, the students could draw a diagram of the normal and diabetic blood glucose management rather than writing paragraphs in Step 2.

During the role-playing activity, students with physical limitations can observe or play glucagon molecules in the simulation, as it requires little activity.

To help in classroom management, the roles of students in the “Glucose Regulation Activity” can be substituted with Legos© or other interlocking pieces. Rather than labeling areas of the room, have poster board with the various sites of glucose regulation (liver, pancreas, bloodstream, and cells) labeled in a diagram. The various “participants” in the activity could be represented with different colors of Legos©, such as yellow for insulin, blue for glucose. The role of glucagon would not have to be represented. As the glucose is stored in the liver, the students could lock together the glucose pieces; as the insulin transports the glucose to the cell or liver, the insulin and glucose could interlock until the destination is reached, then insulin is free to “escort” another glucose molecule. To simulate the inability of a cell to bind with insulin, a piece of tape could be put over the insulin Lego© “bumps” so that it cannot connect to another piece.

For lower level students, the list of complications associated with diabetes could be translated to common terms for the students and then the locations of their effects could be drawn onto a body outline.
The teacher could assign groups for the *Diabetes Today* extension based on abilities, interests, or leadership of students.

**Education Standards**

**National Science Education Standards**

**LIFE SCIENCE, CONTENT STANDARD C:**
As a result of their activities in grades 9-12, all students should develop understanding of
- The cell
- Molecular basis of heredity
- Biological evolution
- Interdependence of organisms
- **Matter, energy, and organization in living systems**
- Behavior of organisms

**SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES, CONTENT STANDARD F:**
As a result of activities in grades 9-12, all students should develop understanding of
- **Personal and community health**
- Population growth
- Natural resources
- Environmental quality
- Natural and human-induced hazards
- Science and technology in local, national, and global challenges
A National Epidemic

Carrie Newdigger and Laurie Hayes, CDC’s 2006 Science Ambassador Program

Using the following data, make a line graph to illustrate the trend of a national epidemic. Be sure to title your graph and label the X and Y axes.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of persons diagnosed with the disease (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>5.8</td>
</tr>
<tr>
<td>1981</td>
<td>5.8</td>
</tr>
<tr>
<td>1982</td>
<td>5.8</td>
</tr>
<tr>
<td>1983</td>
<td>5.9</td>
</tr>
<tr>
<td>1984</td>
<td>6.1</td>
</tr>
<tr>
<td>1985</td>
<td>6.4</td>
</tr>
<tr>
<td>1986</td>
<td>6.6</td>
</tr>
<tr>
<td>1987</td>
<td>6.6</td>
</tr>
<tr>
<td>1988</td>
<td>6.5</td>
</tr>
<tr>
<td>1989</td>
<td>6.4</td>
</tr>
<tr>
<td>1990</td>
<td>6.7</td>
</tr>
<tr>
<td>1991</td>
<td>7.0</td>
</tr>
<tr>
<td>1992</td>
<td>7.6</td>
</tr>
<tr>
<td>1993</td>
<td>7.8</td>
</tr>
<tr>
<td>1994</td>
<td>8.3</td>
</tr>
<tr>
<td>1995</td>
<td>8.2</td>
</tr>
<tr>
<td>1996</td>
<td>8.5</td>
</tr>
<tr>
<td>1997</td>
<td>10.3</td>
</tr>
<tr>
<td>1998</td>
<td>10.5</td>
</tr>
<tr>
<td>1999</td>
<td>11.1</td>
</tr>
<tr>
<td>2000</td>
<td>12.0</td>
</tr>
<tr>
<td>2001</td>
<td>12.9</td>
</tr>
<tr>
<td>2002</td>
<td>13.6</td>
</tr>
<tr>
<td>2003</td>
<td>14.3</td>
</tr>
<tr>
<td>2004</td>
<td>14.7</td>
</tr>
</tbody>
</table>
Trends Data: Obesity by Body Mass Index

Diabetes: A National Epidemic
Carrie Newdigger and Laurie Hayes, CDC’s 2006 Science Ambassador Program

Using the following data, make a line graph to illustrate the trend of another national epidemic. Be sure to title your graph and label the X and Y axes.

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent of population that is classified as obese (BMI &gt; 30.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>11.6</td>
</tr>
<tr>
<td>1991</td>
<td>12.6</td>
</tr>
<tr>
<td>1992</td>
<td>12.6</td>
</tr>
<tr>
<td>1993</td>
<td>13.7</td>
</tr>
<tr>
<td>1994</td>
<td>14.4</td>
</tr>
<tr>
<td>1995</td>
<td>15.8</td>
</tr>
<tr>
<td>1996</td>
<td>16.8</td>
</tr>
<tr>
<td>1997</td>
<td>16.6</td>
</tr>
<tr>
<td>1998</td>
<td>18.3</td>
</tr>
<tr>
<td>1999</td>
<td>19.7</td>
</tr>
<tr>
<td>2000</td>
<td>20.1</td>
</tr>
<tr>
<td>2001</td>
<td>21</td>
</tr>
<tr>
<td>2002</td>
<td>22.1</td>
</tr>
</tbody>
</table>

**Glucose Regulation Activity Instructions**

Diabetes: A National Epidemic
Carrie Newdigger and Laurie Hayes, CDC’s 2006 Science Ambassador Program

**Background information:**
Glucose is a simple sugar that fuels all the cells of the body. Glucose is absorbed by the intestines from the food that we eat and is distributed all over the body through the bloodstream. It is important for the body to have a steady level of glucose even between mealtimes. The brain is a major consumer of glucose and it needs a steady supply of it. Our bodies rely on insulin and glucagon, two hormones produced by the pancreas, to achieve a constant level of glucose. When we eat food, glucose is absorbed by the intestines and the level of glucose in the bloodstream rises. (The level of glucose in the blood is also called the blood sugar or blood glucose level.) When there is a high level of glucose in the blood, insulin is secreted by the pancreas. Insulin helps move glucose from the bloodstream into cells by functioning as a key that unlocks receptors on the cell. Once the receptors are unlocked by insulin, glucose can enter the cell and is used by the cell to make energy. Insulin also stimulates the formation of glycogen. Glycogen molecules are long chains of glucose molecules that can be stored in the liver and released when the level of glucose in the blood is low. When blood glucose is low, for example when a person hasn’t eaten for a long time or is sleeping, glycogen can be converted back to glucose by the hormone glucagon. Glucagon is released by the pancreas when blood glucose is low. Glucagon helps raise blood glucose by converting glycogen back to glucose and by stimulating gluconeogenesis, a process that the body uses to make glucose by intermediate compounds in other metabolic pathways. However, the storage of glucose as glycogen is limited; therefore, most excess glucose is stored as fat, of which we can store a lot!

As an example of glucose homeostasis, an average person usually secretes about 1 unit of insulin per hour; however, approximately one hour after eating, the pancreas secretes up to 5 units of insulin per hour to help transport the additional glucose that is available in the bloodstream. [Note: These numbers are approximate, depending on the amount of food consumed, the person’s body weight and degree of insulin resistance (the body’s responsiveness to insulin)]. As time goes by and more glucose is being taken in by the body cells, the amount of glucose in the bloodstream is decreased. This stimulates the glucagon to convert stored glycogen in the liver into glucose, which is released into the bloodstream. In turn, the newly released blood glucose causes the pancreas to secrete more insulin to transport the glucose into the cells for use. As the amount of glucose in the bloodstream drops, the pancreas secretes less insulin.

The interrelationship of insulin and glucagon facilitates the maintenance of a stable blood glucose level. However, if a person does not produce enough insulin (insulin deficiency), or the insulin is not capable of transporting the glucose into the cells (insulin resistance), the cells will not get the energy needed to function. This condition is known as diabetes. In type 1 diabetes, the pancreas does not make insulin. Without insulin present to unlock the receptors on the cells, glucose cannot enter the cells and builds up in the bloodstream. In type 2 diabetes, the body still produces insulin but it may make a lower amount than average, or there may be a decrease in the number and/or responsiveness of the receptors on the cell. Even though insulin is present, it cannot be used as effectively as it should be, so it is more difficult for glucose to enter the cells. Eventually the beta cells will become exhausted trying to overcome the insulin resistance.
The following activity is designed to help students understand the physiology of glucose regulation. Students will act out the process of glucose homeostasis. The activity has three parts: a simulation of normal glucose homeostasis, a discussion of hypoglycemia and hyperglycemia (low and high levels of glucose in the blood), and simulations of glucose regulation in a person with type 1 diabetes and a person with type 2 diabetes. This activity must be conducted in an area where the students will have room to move. The materials listed are for a class of 30 students, however, the amounts can be adjusted accordingly for larger or smaller numbers of students.

**Materials:**
- Site Labels
- Student Role Tags with string
- Chair
- Script

**Preparation:**
Label various sites around the room with the Site Label Cards or other labeling method. The bloodstream could be represented with red yarn that “flows” near the other sites.
Make the appropriate number of Student Role Tags. Each role should be either written in a different color on a large index card or use different colors of paper to identify the various roles. For example, write “Glucose (sugar)” on 24 pieces of red paper, “Glucagon” on 1 piece of yellow paper, and write “Insulin” on 5 pieces of white paper. Punch a hole at either end of the paper and use string to allow the role tag to hang around the students’ neck.
The chair should be placed near the “Tissue Cells” site.
All “Glucose” students should be placed in an area near the bloodstream, but not actually in the bloodstream. All “Glucagon” and “Insulin” students should be located at the pancreas site.

**Script to be read by the teacher:** Activities performed by the students follow.

**Part A: Normal Blood Glucose Regulation**
1. **All cells in the body need energy.** Glucose is a simple sugar that fuels all the cells of the body. Glucose is absorbed by the intestines from the food that we eat and is distributed all over the body through the bloodstream. One glucose molecule should enter the bloodstream.

2. **When there is a high level of glucose in the blood, insulin is secreted by the pancreas.** Insulin is a hormone produced in the pancreas that allows cells to be able to absorb glucose to be used for energy. Most people produce approximately 1 unit of insulin per hour. One insulin molecule should leave the pancreas and enter the bloodstream.

3. **Insulin helps move glucose from the bloodstream into cells by functioning as a key that unlocks receptors on the cell.** Once the receptors are unlocked by insulin, glucose can enter the cell and is used by the cell to make energy. This is similar to having special access to concert events because you are being escorted by a band member. The insulin and glucose molecules should lock arms and the insulin molecule should escort the glucose molecule to the cell site.
4. Cells use the energy stored in the glucose molecule to carry out life processes. The glucose molecule should begin a slow series of 20 jumping jacks to simulate the energy being used.

5. Cells require several glucose molecules to get enough energy to function. A second and third glucose molecule should enter the bloodstream, and each molecule should be escorted to the cell site by the insulin. As soon as each glucose molecule is in the cell, it should begin its series of 20 jumping jacks.

6. Once a cell has acquired enough glucose for its energy requirement, any additional glucose in the bloodstream is taken to the liver for storage. Three new glucose molecules should enter the bloodstream. Each molecule should be escorted by the insulin to the liver site. Note that only one insulin is in the blood at this time and that the sugar molecules are entering at a slow rate. (*see note below)

7. Glucose is stored in the liver in the form of glycogen*. Glycogen can be stored away for use when there is not enough glucose in the bloodstream. Glucose molecules form bonds by the process of dehydration synthesis. Once the three students are at the liver site, they should hold hands to simulate bonding to form a glycogen molecule.

8. As glucose molecules are being used up in the body cells, new glucose molecules from the bloodstream replace them. Once the glucose molecules in the cells have finished their jumping jacks, they may sit down. New glucose molecules enter the bloodstream one at a time and are escorted to the cells by the insulin to maintain the idea that the cells require a constant supply of glucose. All glucose molecules should begin a slow series of 20 jumping jacks once they are at the cell site.

9. As more glucose enters the bloodstream, the insulin molecules transport them either to the cells for immediate use or to the liver for storage. The glucose molecules continue to enter the bloodstream and be escorted by the insulin to either the cells or to the liver. When in the cells, the glucose molecules do jumping jacks. When in the liver, they bond together to form glycogen. If possible, have half of the glucose molecules not enter immediately, but wait until step 12.

10. If a person does not have glucose in the blood, (for example the person has not eaten for a long time) glucagon is released from the pancreas, and travels to the liver to break the bonds of glycogen storage to release more glucose into the bloodstream. These glucose molecules are then taken into the body cells by insulin. The glucagon student travels from the pancreas to the liver where he or she should break the bonds between the glucose molecules and “pushes” each one into the bloodstream where the insulin molecule locks arms with the glucose molecule and escorts the glucose to the cell site. The glucose molecules then begin their slow series of 20 jumping jacks. Maintain the release of glucose molecules from the glycogen chain until 3 students are in the cell; the others should remain in the liver as stored glycogen.

11. When a person eats, this supplies a large amount of glucose to the bloodstream. Approximately one hour after eating, the pancreas will secrete up to 5 units of insulin to deal with all of this new glucose. All remaining glucose molecules (except two) should enter the bloodstream at once. All insulin molecules should be released from the pancreas. Cells should be provided with their three glucose molecules for immediate energy and the remaining glucose molecules are put into storage in the liver as glycogen.
12. Once the blood glucose level has gone back down, the pancreas returns to secreting only one unit of insulin per hour, and the glucagon breaks down glycogen and releases glucose as needed from the liver to supply the cells with a constant glucose supply. The final two glucose molecules enter the bloodstream one at a time and are put where they are needed, either in the cell or in the liver.

13. Now answer the questions on Part A of the worksheet using what you have just learned. The teacher should allow the students time to answer the questions on Part A and then go over them to be sure the students understand the basic regulation of blood glucose concentrations.

14. On a separate sheet of paper, write a paragraph to explain glucose regulation using the following terms: blood glucose, insulin, glycogen, glucagon, pancreas, cells, glycogen, muscle, fat cells, and liver. Once you have your paragraph written, share your paragraph with a partner, so that any missed or inaccurate information can be included and clarified. These paragraphs will be graded using the “6-Trait Writing Model.” The teacher should then allow the students to write their paragraphs, peer-edit, and turn them in.

*Please note: Glycogen is also stored in muscle and most excess glucose is stored as fat (thus the link between obesity and diabetes). Since this lesson serves as an introduction to diabetes, this information will not be included in the activity, but may be explained verbally by the teacher.

Part B: Hypoglycemia and Hyperglycemia
The teacher should read and discuss the following questions with the class.
1. What happens to glucose levels when insulin is not available? The glucose levels in the blood increase, but the cells cannot use this glucose for energy. Therefore, more glucose will be excreted as waste from the body.

2. How does this affect the cell's ability to make energy? The cells cannot make energy, so they will die.

3. What happens if there is too little glucose in the bloodstream? The cells will not be able to get enough glucose for energy.

4. What happens if there is too much insulin in the bloodstream? There will not be enough glucose in the bloodstream to maintain a healthy homeostasis.

5. When blood sugar levels increase due to a lack of insulin, a condition known as hyperglycemia results. What do you think the treatment for this condition would be? Injection of insulin or ingestion of oral medications so that the glucose can get into the cells or into the liver for storage.

6. Low blood glucose is known as hypoglycemia. If a person has hypoglycemia, what do you think the best treatment would be? A quick way to raise blood sugar and treat hypoglycemia would be to eat or drink something with a lot of easily available sugar, like candy or fruit juice.

To further assess the understanding of this topic, have the students write a short description of a physiological scenario in which insulin would be needed and a physiological scenario in which glucose would be needed. They should then trade their
scenarios with a partner and have the partners identify which treatment would be recommended and why for each scenario.

Part C: Diabetes

1. Now that we know about glucose regulation and what happens if levels of glucose or insulin are too high or too low, we can learn more about diabetes, a disease that makes it difficult for the cells to get the glucose that they need. We have seen that blood glucose levels are dependent upon the secretion of insulin from the pancreas. So what will happen if the pancreas does not secrete enough insulin to keep up with the blood glucose amounts? Let’s see how this lack of insulin affects the body:

   **Glucose molecules enter the bloodstream.** The glucose students enter the bloodstream in a single-file line.

   **However, unlike in normal glucose regulation, insulin is not released from the pancreas to put the glucose into the cells, so the sugar molecules continue on their journey. Eventually there is such a high concentration of glucose in the bloodstream that the glucose is exceted by the kidneys as waste. This condition of glucose in the urine is known as glycosuria.** The insulin students stay in the pancreas as the glucose molecules walk past the cells and end up outside the bloodstream, representing being excreted from the body as waste.

2. Not producing any insulin is known as type 1 diabetes (or preexisting diabetes). People with type 1 diabetes must take insulin to maintain normal blood glucose levels. About 5-10 percent of people with diabetes have type 1 diabetes.

3. There is another way that diabetes can make it difficult for cells to get the glucose that they need to make energy. In this type of diabetes, known as type 2 diabetes, the pancreas still makes insulin but the cells can’t use it very well. Let’s see what happens in this condition.

   The teacher should put a chair in front of the “Cells” location so that the glucose cannot enter the area.

   **Glucose molecules enter the bloodstream.** The glucose students enter the bloodstream in a single-file line.

   **The pancreas secretes insulin.** One insulin student leaves the pancreas and finds a glucose molecule to lock arms with.

   **In type 2 diabetes, the body produces insulin, but there is a decrease in the number of receptors on the cell.** Even though insulin is present, it cannot be used as effectively as it should be, so it is more difficult for glucose to enter the cells. The insulin tries to enter the cell, but the chair is in the way. Therefore, the insulin breaks off the glucose, the glucose continues on the bloodstream to be excreted, and the insulin tries again with another glucose molecule. The beta cells try to overcome the resistance by producing more insulin and eventually “die” of exhaustion.

   **Another way that type 2 diabetes can occur is that the body produces too little insulin.** The glucose students enter the bloodstream in a single file line but no insulin arrives to escort them into the cells.

4. **Ask students: Although there is insulin available, what happens to the cell’s ability to get energy?** It decreases because glucose cannot get through the cell membrane.
Site Cards: Place these at various stations around the room. The “bloodstream” might be labeled with pieces of red yarn that “flows” by the other sites.

<table>
<thead>
<tr>
<th>Liver</th>
<th>Pancreas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bloodstream</td>
<td>Cells</td>
</tr>
</tbody>
</table>

Student Role Cards: Each type of molecule role should be printed in a different color or on a different color of card for easy identification. The type of molecule label is on the left and the number of cards of each type is listed on the right. These numbers are given for a class of 30, but the amounts of each molecule type can be changed proportionally to allow for larger or smaller class sizes.

<table>
<thead>
<tr>
<th>Glucose (sugar)</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin</td>
<td>5</td>
</tr>
<tr>
<td>Glucagon</td>
<td>1</td>
</tr>
</tbody>
</table>
Glucose Regulation Worksheet

Diabetes: A National Epidemic
Carrie Newdigger and Laurie Hayes, CDC’s 2006 Science Ambassador Program

Part A: Normal Glucose Regulation

1. What molecule do cells use for energy?

2. What hormone aids the diffusion of glucose across cell membranes?

3. How is glucose stored in the body for periods of fasting?

4. Where is glycogen stored?

5. What hormone causes glycogen to break down into glucose molecules?

6. Among glucose (G), insulin (I), and glucagon (C) identify which molecule is being described.
   _____ causes the blood sugar level to decrease
   _____ causes the blood sugar level to increase
   _____ is the molecule measured in “blood-sugar” levels
   _____ promotes movement of glucose into certain cells
   _____ stimulates cells to break down glycogen into glucose
   _____ stimulates formation of glycogen from glucose

Part B: Hypo- and Hyperglycemia

1. Define hypoglycemia and explain how it is treated.

2. Define hyperglycemia and explain what might cause this.

Part C: Diabetes

1. What chronic disease occurs when blood glucose levels are too high?

2. What are two types of diabetes?
3. What is the physiological problem that occurs in type 1 diabetes and how is it treated?

4. What is the physiological problem that occurs in type 2 diabetes?
Glucose Regulation (Answer Key)

Diabetes: A National Epidemic
Carrie Newdigger and Laurie Hayes, CDC’s 2006 Science Ambassador Program

Part A:
1. What molecule do cells use for energy? **Glucose**
2. What hormone aids the diffusion of glucose across cell membranes? **Insulin**
3. How is glucose stored in the body for periods of fasting? **Glycogen**
4. Where is glycogen stored? **Liver**
5. What hormone causes glycogen to break down into glucose molecules? **Glucagon**
6. Among glucose (G), insulin (I), and glucagon (C) identify which molecule is being described.
   ___I___ causes the blood sugar level to decrease
   ___C___ causes the blood sugar level to increase
   ___G___ is the molecule measured in “blood-sugar” levels
   ___I___ promotes movement of glucose into certain cells
   ___C___ stimulates cells to break down glycogen into glucose
   ___I___ stimulates formation of glycogen from glucose

Part B: Hypo- and Hyperglycemia
1. Define hypoglycemia and explain how it is treated. A condition in which blood glucose levels are too low. It can be treated by giving a person food or drink that will raise the blood sugar quickly, like orange juice or candy.
2. Define hyperglycemia and explain what might cause this. A condition in which blood glucose levels are too high. It can be caused by not enough insulin present in the body, or by cells that are not able to use insulin as efficiently as cells of people who do not have diabetes.

Part C:
1. What chronic disease occurs when blood glucose levels are too high? **Diabetes**
2. What are two types of diabetes? **Type 1 and type 2 diabetes**
3. What is the physiological problem in type 1 diabetes and how is it treated? People with type 1 diabetes do not produce insulin. Type 1 diabetes must be treated with insulin.
4. What is the physiological problem in type 2 diabetes? People with type 2 diabetes are not able to use insulin as efficiently as they should and may also produce less insulin than they should.
Venn Diagram Activity Instructions

Diabetes: A National Epidemic
Carrie Newdigger and Laurie Hayes, CDC’s 2006 Science Ambassador Program

Give each student two different-colored sheets of paper. On one, write “Type 1”, and on the other write “Type 2”. As the teacher reads the following statements, have the students hold up the appropriate paper. If the statements applies to both type 1 and type 2 diabetes, the students should hold up both papers. The answers are in parentheses.

- Blood sugar is too high (Both)
- Cells can’t use insulin as well and/or less insulin is produced (Type 2)
- Increasing in prevalence in children (Type 2)
- Managed by eating healthy foods, exercise, maintaining healthy body weight, checking blood glucose levels (Both)
- May account for 5% to 10% of all diagnosed cases of diabetes (Type 1)
- May account for 90% to 95% of all diagnosed cases of diabetes (Type 2)
- People with this type of diabetes must take insulin to control their diabetes (Type 1)
- Pancreas stops making insulin (Type 1)
- Risk factors include older age, obesity, family history, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity, and race/ethnicity (Type 2)
- Risk factors involve autoimmune, genetic, and environmental factors (Both)
- Risk of developing this type of diabetes may be reduced by regular physical activity and maintenance of healthy body weight (Type 2)
- Suspected to follow exposure to an “environmental trigger”, such as an unidentified virus, stimulating an immune attack against the insulin-producing cells of the pancreas (Type 1)
- Symptoms may include frequent urination, excessive thirst, unexplained weight loss, extreme hunger, sudden vision changes, fatigue, tingling or numbness in hands or feet, very dry skin, sores that are slow to heal, increase in infections (Both)
- Used to be called “adult onset diabetes” or “non-insulin-dependent diabetes mellitus (NIDDM)” (Type 2)
- Used to be called “insulin dependent” or “juvenile diabetes” (Type 1)
A summary of statements used in the “Venn Diagram Activity is provided below:

Type 1:
- The pancreas stops making insulin
- People with type 1 diabetes must take insulin to control their diabetes
- Used to be called “insulin dependent” or “juvenile diabetes”
- May account for 5% to 10% of all diagnosed cases of diabetes
- Risk factors involve autoimmune, genetic, and environmental factors
- Suspected to follow exposure to an “environmental trigger”, such as an unidentified virus, stimulating an immune attack against the insulin-producing cells of the pancreas

Both
- Blood sugar is too high
- People can help control their diabetes by eating healthy foods, exercise, maintaining healthy body weight, checking blood glucose levels
- Symptoms may include frequent urination, excessive thirst, unexplained weight loss, extreme hunger, sudden vision changes, fatigue, tingling or numbness in hands or feet, very dry skin, sores that are slow to heal, increase in infections

Type 2:
- People with type 2 diabetes do not produce enough insulin and/or cannot use the insulin their bodies make as well as people who do not have diabetes
- Used to be called “adult onset diabetes” or “non-insulin-dependent diabetes mellitus (NIDDM)”
- May account for 90% to 95% of all diagnosed cases of diabetes
- Increasing in prevalence in children
- Risk factors include older age, obesity, family history of type 2 diabetes, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity, and race/ethnicity
- Risk of developing the disease may be reduced by regular physical activity and maintenance of a healthy body weight
Diabetes affects the body cells ability to obtain glucose. Since glucose is essential for cellular energy, the inability to obtain this molecule can lead to death of cells. Undiagnosed or uncontrolled diabetes can lead to severe complications throughout the body.

The following list of complications are associated with diabetes. Using your knowledge of Greek and Latin root words in medical terminology (or a dictionary if you need help), translate each of these complications into common, or “layman’s” terms. Then, using an outline of a body, illustrate where these complications would occur. The first one is done for you.

<table>
<thead>
<tr>
<th>Diabetes Complication</th>
<th>Common Term</th>
<th>Area Where Complications Might Occur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular disease</td>
<td>Heart disease, leading to stroke, heart attack</td>
<td>Heart and vessels</td>
</tr>
<tr>
<td>Gastroparesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nephropathy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neuropathy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedal ulcers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Periodontal disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renal disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retinopathy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urologic problems</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Common Complications of Diabetes

Diabetes: A National Epidemic
Carrie Newdigger and Laurie Hayes, CDC’s 2006 Science Ambassador Program

Diabetes affects the body cells ability to obtain glucose. Since glucose is essential for cellular energy, the inability to obtain this molecule can lead to death of cells. Undiagnosed or uncontrolled diabetes can lead to severe complications throughout the body.

The following list of complications are associated with diabetes. Using your knowledge of Greek and Latin root words in medical terminology (or a dictionary if you need help), translate each of these complications into common, or “layman’s” terms. Then, using an outline of a body, illustrate where these complications would be expressed. The first one is done for you.

<table>
<thead>
<tr>
<th>Diabetes Complication</th>
<th>Common Term</th>
<th>Area Where Complications Might Occur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular disease</td>
<td>Heart disease, leading to stroke, heart attack</td>
<td>Heart and vessels</td>
</tr>
<tr>
<td>Gastroparesis</td>
<td>NERVE DAMAGE IN THE STOMACH</td>
<td>STOMACH</td>
</tr>
<tr>
<td>Hypertension</td>
<td>HIGH BLOOD PRESSURE</td>
<td>VESSELS AND HEART</td>
</tr>
<tr>
<td>Nephropathy</td>
<td>KIDNEY DISEASE</td>
<td>KIDNEYS</td>
</tr>
<tr>
<td>Neuropathy</td>
<td>NERVE DISEASES</td>
<td>NERVES THROUGHOUT MAINLY EYES, KIDNEYS, STOMACH</td>
</tr>
<tr>
<td>Pedal ulcers</td>
<td>FOOT ULCERS</td>
<td>FEET AND LOWER EXTREMITIES</td>
</tr>
<tr>
<td>Periodontal disease</td>
<td>GUM DISEASE</td>
<td>GUMS IN MOUTH</td>
</tr>
<tr>
<td>Renal disease</td>
<td>KIDNEY DISEASE</td>
<td>KIDNEYS</td>
</tr>
<tr>
<td>Retinopathy</td>
<td>EYE DISEASE, SPECIFICALLY RETINAL VESSELS</td>
<td>EYES</td>
</tr>
<tr>
<td>Urolologic problems</td>
<td>URINARY TRACT, BLADDER</td>
<td>KIDNEYS, URETER, URETHRA</td>
</tr>
</tbody>
</table>
Diabetes Today
Diabetes: A National Epidemic
Carrie Newdigger and Laurie Hayes, CDC’s 2006 Science Ambassador Program

In this assignment, you will develop a class newspaper to explain the characteristics, effects, and prevention methods for diabetes. The sections for the paper will include the following:

Headlines: facts, statistics, and latest research
Lifestyle: prevention techniques and ideas for recipes
Opinion: advice columns and letters to the editor
Entertainment: crossword and educational comics
Advertising: careers and equipment involved in the management of diabetes

Feel free to look at the newspapers provided to get an idea of the layout and organization of a newspaper publication.

Each group of students will be responsible for a section. Each group (except for the Entertainment section) will consist of a copy editor and at least one reporter.

The purpose of the reporter is to research the information required for his/her particular section, and write at least one story related to that sector of news. The purpose of the copy editor is to proofread submitted stories for accuracy, mechanics, and thoroughness, and write a headline for each article.

All final stories are due on or before: _________________________

You will be graded according to the following rubric for your section.

**Sections:** Headlines (facts, statistics, and latest research) and **Lifestyle** (prevention techniques and ideas for recipes)

<table>
<thead>
<tr>
<th>Element</th>
<th>1 pts</th>
<th>2 pts</th>
<th>3 pts</th>
<th>4 pts</th>
<th>5 pts</th>
<th>Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idea and Content Development</td>
<td>Little or no scientific information</td>
<td>States the information, but some is inaccurate</td>
<td>Scientific information is accurate, but unclear and undeveloped</td>
<td>Scientific information is accurate, and clear, but few specific details</td>
<td>Scientific information is well developed with details and examples</td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>The reader feels lost</td>
<td>Identifiable sense of structure</td>
<td>Easy to follow, logical order, but weak introduction or conclusion</td>
<td>Easy to follow, introduction and conclusion strong, but transitions</td>
<td>Transitions are smooth, organization is logical with strong introduction and</td>
<td></td>
</tr>
<tr>
<td>Element</td>
<td>1 pts</td>
<td>2 pts</td>
<td>3 pts</td>
<td>4 pts</td>
<td>5 pts</td>
<td>Points Awarded</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>----------------</td>
</tr>
<tr>
<td>Idea and</td>
<td>Little or no States the Scientific Scientific Scientific</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Section: Opinion** (advice columns and letters to the editor)
<table>
<thead>
<tr>
<th>Content Development</th>
<th>scientific information in either the letter or advice</th>
<th>information in the letter, but some the advice is inaccurate</th>
<th>information is accurate, but unclear and undeveloped</th>
<th>information is accurate, and clear, but few specific details</th>
<th>information is well developed with details and examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>The reader feels lost; the letter and advice do not match up</td>
<td>Identifiable sense of structure; either the letter or the advice sounds rational, but not both</td>
<td>Easy to follow, logical order, but weak introduction or conclusion</td>
<td>Easy to follow, introduction and conclusion strong, but transitions are hard to follow</td>
<td>Transitions are smooth, organization is logical with strong introduction and conclusion</td>
</tr>
<tr>
<td>Word Choice</td>
<td>Little or inaccurate use of scientific terminology</td>
<td>Words are used properly, but lacks adjectives and development</td>
<td>Some use of strong describing words, and scientific terms</td>
<td>Language is functional and the message gets across</td>
<td>Scientific terms convey the intended message in a precise way</td>
</tr>
<tr>
<td>Conventions</td>
<td>Errors in spelling, punctuation, usage, and grammar make it difficult to read</td>
<td>Some use of punctuation, capitalization, correct spelling of common words</td>
<td>Spelling usually correct, most conventions are used properly</td>
<td>Writer has few conventional mistakes, and nearly all terms are spelled correctly</td>
<td>Good use of grammar, capitalization, punctuation, usage, spelling, paragraphing, and uses these conventions wisely</td>
</tr>
<tr>
<td>Participation in the Group and Effort</td>
<td>Did not complete his/her share of the project; frequently off-task</td>
<td>Rarely contributed to the group; often needed to be reminded to focus and produce</td>
<td>Was helpful and cooperative in completing his/her share</td>
<td>Contributed great effort to the group’s project; helped organize the group and keep people on task</td>
<td>Went above and beyond the call of duty to further the group’s work</td>
</tr>
<tr>
<td>Overall Result</td>
<td>The section is extremely weak in most areas</td>
<td>The section is not well polished, hard to read, and appears that the students do</td>
<td>The section shows evidence of little effort and research; diagrams</td>
<td>The section shows evidence of some effort and diagrams aide the</td>
<td>The section shows evidence of effort, the students understand the topic, and</td>
</tr>
</tbody>
</table>
not understand the topic and graphics do not add much clarity or interest information, but the authors’ own thinking is not evidenced diagrams and illustrations add to the information

<table>
<thead>
<tr>
<th>Section: Entertainment (crossword or other interactive puzzle)</th>
<th>1 pts</th>
<th>2 pts</th>
<th>3 pts</th>
<th>4 pts</th>
<th>5 pts</th>
<th>Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concepts Covered</strong></td>
<td>The concepts covered are trivial and not related to the topic</td>
<td>The concepts covered are related to the topic, but some information is inaccurate</td>
<td>The concepts covered are related to the topic, but the information is trivial</td>
<td>The concepts covered are related to the topic and important but do not summarize the topic</td>
<td>The concepts covered are important and function well to summarize the information of the topic</td>
<td></td>
</tr>
<tr>
<td><strong>Usability</strong></td>
<td>The task is very poorly constructed and will not work</td>
<td>The instructions of the task are not well defined</td>
<td>The instructions of the task are well defined, but there are inaccuracies in the reliability of the information</td>
<td>The task is clearly defined and accurate, but no self-check is available</td>
<td>The task is clearly defined, accurate, and self-check is available</td>
<td></td>
</tr>
<tr>
<td><strong>Neatness</strong></td>
<td>The task is not neatly presented</td>
<td>The task is neatly done, but lacking in graphics</td>
<td>The task is neatly and presented, and but graphics are inappropriate to the content</td>
<td>The task is neatly presented, and graphics are appropriate to the content</td>
<td>There is a clear and thoughtful organization between the graphics and the topic content</td>
<td></td>
</tr>
<tr>
<td><strong>Creativity and Design of the Task</strong></td>
<td>Little creativity is expressed by the author to the target audience</td>
<td>The task is creatively presented, but little thought will be required to complete it</td>
<td>The task is creatively presented, and the target audience will be intrigued</td>
<td>The task is creatively presented, and the target audience will be intrigued</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Did not | Rarely | Was helpful | Contributed | Went above |
### Participation in the Group and Effort

<table>
<thead>
<tr>
<th>Participation in the Group and Effort</th>
<th>complete</th>
<th>contributed to</th>
<th>and</th>
<th>great effort</th>
<th>and beyond</th>
</tr>
</thead>
<tbody>
<tr>
<td>share of the project; frequently off-task</td>
<td>the group; often needed to be reminded to focus and produce</td>
<td>cooperative in completing his/her share</td>
<td>the call of duty to further the group’s work</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Overall Result

| Overall Result | The section is extremely weak in most areas | The section is not well polished, hard to read, and appears that the students do not understand the topic | The section shows evidence of little effort and research; diagrams and graphics do not add much clarity or interest | The section shows evidence of some effort and diagrams aide the information, but the authors’ own thinking is not evidenced | The section shows evidence of effort, the students understand the topic, and diagrams and illustrations add to the information |

### Section: Entertainment (educational comics)

<table>
<thead>
<tr>
<th>Element</th>
<th>1 pts</th>
<th>2 pts</th>
<th>3 pts</th>
<th>4 pts</th>
<th>5 pts</th>
<th>Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content and Organization</td>
<td>The content is not related to the topic</td>
<td>The content is related to the topic, but is inaccurate</td>
<td>The content is accurate, but undeveloped</td>
<td>The content is accurate and clear, but hard to follow</td>
<td>The content is accurate, clear, and easy to follow</td>
<td></td>
</tr>
<tr>
<td>Originality and Creativity</td>
<td>No frames of the comic strip reflect creativity.</td>
<td>Some frames of the comic strip reflect creativity but characters do not portray important objects of the topic</td>
<td>Some frames of the comic strip reflect creativity and characters portray important objects of the topic</td>
<td>Most frames of the comic strip reflect creativity</td>
<td>All frames of the comic strip reflect an exceptional degree of student creativity and portrayal of the topic</td>
<td></td>
</tr>
<tr>
<td>Conventions</td>
<td>Errors in spelling, punctuation, usage, and grammar make it difficult to</td>
<td>Some use of punctuation, capitalization, correct spelling of common words</td>
<td>Spelling usually correct, most conventions are used properly</td>
<td>Writer has few conventional mistakes, and nearly all terms are spelled</td>
<td>Good use of grammar, capitalization, punctuation, usage, spelling, paragraphing,</td>
<td></td>
</tr>
<tr>
<td>Visual Appeal and Artistry</td>
<td>The comic strip is distractively messy or very poorly designed.</td>
<td>The comic strip is hard to identify roles due to a lack of artistic skill</td>
<td>The cartoon is acceptably attractive but it may be a bit messy.</td>
<td>The comic strip is exceptionally attractive in terms of design, layout, and neatness.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td>---------------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation in the Group and Effort</td>
<td>Did not complete his/her share of the project; frequently off-task</td>
<td>Rarely contributed to the group; often needed to be reminded to focus and produce</td>
<td>Was helpful and cooperative in completing his/her share</td>
<td>Contributed great effort to the group’s project; helped organize the group and keep people on task</td>
<td>Went above and beyond the call of duty to further the group’s work</td>
<td></td>
</tr>
<tr>
<td>Overall Result</td>
<td>The section is extremely weak in most areas</td>
<td>The section is not well polished, hard to read, and appears that the students do not understand the topic</td>
<td>The section shows evidence of little effort and research; diagrams and graphics do not add much clarity or interest</td>
<td>The section shows evidence of some effort and diagrams aide the information, but the authors’ own thinking is not evidenced</td>
<td>The section shows evidence of effort, the students understand the topic, and diagrams and illustrations add to the information</td>
<td></td>
</tr>
</tbody>
</table>

**Section: Advertising** (careers and equipment involved in the management of diabetes)

<table>
<thead>
<tr>
<th>Element</th>
<th>1 pts</th>
<th>2 pts</th>
<th>3 pts</th>
<th>4 pts</th>
<th>5 pts</th>
<th>Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Little or no information related to the topic</td>
<td>States the information, but some is inaccurate, and/or does not look like a real ad</td>
<td>Scientific information is accurate, but not much information is provided</td>
<td>Scientific information is accurate, and clear, but few specific details</td>
<td>Scientific information is well developed with details and examples</td>
<td></td>
</tr>
<tr>
<td>Visual Appeal and Artistry</td>
<td>The ad is distractively messy or very poorly designed.</td>
<td>The ad is hard to understand due to a lack of artistic skill</td>
<td>The ad is acceptably attractive but it may be a bit messy.</td>
<td>The ad is exceptionally attractive in terms of design, layout, and neatness.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------------------------------------</td>
<td>-----------------------------------------------------------</td>
<td>------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graphics</td>
<td>The ad does not contain graphics</td>
<td>The graphics are inappropriate</td>
<td>Quality graphics are included but do not aid the purpose of the ad</td>
<td>Quality graphics are included and well used to aid the purpose of the ad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventions</td>
<td>Errors in spelling, punctuation, usage, and grammar make it difficult to read</td>
<td>Some use of punctuation, capitalization, correct spelling of common words</td>
<td>Spelling usually correct, most conventions are used properly</td>
<td>Writer has few conventional mistakes, and nearly all terms are spelled correctly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation in the Group and Effort</td>
<td>Did not complete his/her share of the project; frequently off-task</td>
<td>Rarely contributed to the group; often needed to be reminded to focus and produce</td>
<td>Was helpful and cooperative in completing his/her share</td>
<td>Contributed great effort to the group’s project; helped organize the group and keep people on task</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall Result</td>
<td>The section is extremely weak in most areas</td>
<td>The section shows evidence of little effort and research; diagrams and graphics do not add much clarity or interest</td>
<td>The section shows evidence of some effort and diagrams aide the information, but the authors’ own thinking is not evidenced</td>
<td>The section shows evidence of effort, the students understand the topic, and diagrams and illustrations add to the information</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The following rubrics are to be used to assess each person’s contribution to the assigned section of the newspaper. The area of “Overall Result” can be an assessment of each section’s group product.

**Sections:** **Headlines** (facts, statistics, and latest research) and **Lifestyle** (prevention techniques and ideas for recipes)

<table>
<thead>
<tr>
<th>Element</th>
<th>1 pts</th>
<th>2 pts</th>
<th>3 pts</th>
<th>4 pts</th>
<th>5 pts</th>
<th>Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Idea and Content Development</strong></td>
<td>Little or no scientific information</td>
<td>States the information, but some is inaccurate</td>
<td>Scientific information is accurate, but unclear and undeveloped</td>
<td>Scientific information is accurate, and clear, but few specific details</td>
<td>Scientific information is well developed with details and examples</td>
<td></td>
</tr>
<tr>
<td><strong>Organization</strong></td>
<td>The reader feels lost</td>
<td>Identifiable sense of structure</td>
<td>Easy to follow, logical order, but weak introduction or conclusion</td>
<td>Easy to follow, introduction and conclusion strong, but transitions are hard to follow</td>
<td>Transitions are smooth, organization is logical with strong introduction and conclusion</td>
<td></td>
</tr>
<tr>
<td><strong>Word Choice</strong></td>
<td>Little or inaccurate use of scientific terminology</td>
<td>Words are used properly, but lacks adjectives and development</td>
<td>Some use of strong describing words, and scientific terms</td>
<td>Language is functional and the message gets across</td>
<td>Scientific terms convey the intended message in a precise way</td>
<td></td>
</tr>
<tr>
<td><strong>Conventions</strong></td>
<td>Errors in spelling, punctuation, capitalization, correct spelling of common words</td>
<td>Some use of punctuation, capitalization, correct spelling of common words</td>
<td>Spelling usually correct, most conventions are used properly</td>
<td>Writer has few conventional mistakes, and nearly all terms are spelled correctly</td>
<td>Good use of grammar, capitalization, punctuation, usage, spelling, paragraphing, and uses these conventions wisely</td>
<td></td>
</tr>
<tr>
<td><strong>Participation</strong></td>
<td>Did not complete</td>
<td>Rarely contributed</td>
<td>Was helpful and</td>
<td>Contributed great effort</td>
<td>Went above and beyond</td>
<td></td>
</tr>
<tr>
<td>in the Group and Effort</td>
<td>his/her share of the project; frequently off-task</td>
<td>to the group; often needed to be reminded to focus and produce</td>
<td>cooperative in completing his/her share</td>
<td>to the group’s project; helped organize the group and keep people on task</td>
<td>the call of duty to further the group’s work</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
<td>--------------------------------------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Overall Result</td>
<td>The section is extremely weak in most areas</td>
<td>The section is not well polished, hard to read, and appears that the students do not understand the topic</td>
<td>The section shows evidence of little effort and research; diagrams and graphics do not add much clarity or interest</td>
<td>The section shows evidence of some effort and diagrams aide the information, but the authors' own thinking is not evidenced</td>
<td>The section shows evidence of effort, the students understand the topic, and diagrams and illustrations add to the information</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section: Opinion (advice columns and letters to the editor)</th>
<th>1 pts</th>
<th>2 pts</th>
<th>3 pts</th>
<th>4 pts</th>
<th>5 pts</th>
<th>Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idea and Content Development</td>
<td>Little or no scientific information in either the letter or advice</td>
<td>States the information in the letter, but some the advice is inaccurate</td>
<td>Scientific information is accurate, but unclear and undeveloped</td>
<td>Scientific information is accurate, and clear, but few specific details</td>
<td>Scientific information is well developed with details and examples</td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>The reader feels lost; the letter and advice do not match up</td>
<td>Identifiable sense of structure; either the letter or the advice sounds rational, but not both</td>
<td>Easy to follow, logical order, but weak introduction or conclusion</td>
<td>Easy to follow, introduction and conclusion strong, but transitions are hard to follow</td>
<td>Transitions are smooth, organization is logical with strong introduction and conclusion</td>
<td></td>
</tr>
<tr>
<td>Word Choice</td>
<td>Little or inaccurate use of scientific terminology</td>
<td>Words are used properly, but lacks adjectives and development</td>
<td>Some use of strong describing words, and scientific terms</td>
<td>Language is functional and the message gets across</td>
<td>Scientific terms convey the intended message in a precise way</td>
<td></td>
</tr>
<tr>
<td>Conventions</td>
<td>Errors in spelling, punctuation, usage, and grammar make it difficult to read</td>
<td>Some use of punctuation, capitalization, correct spelling of common words</td>
<td>Spelling usually correct, most conventions are used properly</td>
<td>Writer has few conventional mistakes, and nearly all terms are spelled correctly</td>
<td>Good use of grammar, capitalization, punctuation, usage, spelling, paragraphing, and uses these conventions wisely</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Participation in the Group and Effort</td>
<td>Did not complete his/her share of the project; frequently off-task</td>
<td>Rarely contributed to the group; often needed to be reminded to focus and produce</td>
<td>Was helpful and cooperative in completing his/her share</td>
<td>Contributed great effort to the group’s project; helped organize the group and keep people on task</td>
<td>Went above and beyond the call of duty to further the group’s work</td>
<td></td>
</tr>
<tr>
<td>Overall Result</td>
<td>The section is extremely weak in most areas</td>
<td>The section is not well polished, hard to read, and appears that the students do not understand the topic</td>
<td>The section shows evidence of little effort and research; diagrams and graphics do not add much clarity or interest</td>
<td>The section shows evidence of some effort and diagrams aide the information, but the authors’ own thinking is not evidenced</td>
<td>The section shows evidence of effort, the students understand the topic, and diagrams and illustrations add to the information</td>
<td></td>
</tr>
</tbody>
</table>

**Section: Entertainment (crossword or other interactive puzzle)**

<table>
<thead>
<tr>
<th>Element</th>
<th>1 pts</th>
<th>2 pts</th>
<th>3 pts</th>
<th>4 pts</th>
<th>5 pts</th>
<th>Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts Covered</td>
<td>The concepts covered are trivial and not related to the topic</td>
<td>The concepts covered are related to the topic, but some information is inaccurate</td>
<td>The concepts covered are related to the topic, but the information is trivial</td>
<td>The concepts covered are related to the topic and important but do not summarize</td>
<td>The concepts covered are important and function well to summarize the information of the topic</td>
<td></td>
</tr>
<tr>
<td><strong>Usability</strong></td>
<td>The task is very poorly constructed and will not work</td>
<td>The instructions of the task are not well defined</td>
<td>The instructions of the task are well defined, but there are inaccuracies in the reliability of the information</td>
<td>The task is clearly defined and accurate, but no self-check is available</td>
<td>The task is clearly defined, accurate, and self-check is available</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td><strong>Neatness</strong></td>
<td>The task is not neatly presented</td>
<td>The task is neatly done, but lacking in graphics</td>
<td>The task is neatly and presented, and but graphics are inappropriate to the content</td>
<td>The task is neatly presented, and graphics are appropriate to the content</td>
<td>There is a clear and thoughtful organization between the graphics and the topic content</td>
<td></td>
</tr>
<tr>
<td><strong>Creativity and Design of the Task</strong></td>
<td>Little creativity is expressed by the author to the target audience</td>
<td>The task is creatively presented, but little thought will be required to complete it</td>
<td>The task is creatively presented, and the target audience will be intrigued</td>
<td>The task is creatively presented, and the target audience will be intrigued</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Participation in the Group and Effort</strong></td>
<td>Did not complete his/her share of the project; frequently off-task</td>
<td>Rarely contributed to the group; often needed to be reminded to focus and produce</td>
<td>Was helpful and cooperative in completing his/her share</td>
<td>Contribute[d great effort to the group’s project; helped organize the group and keep people on task</td>
<td>Went above and beyond the call of duty to further the group’s work</td>
<td></td>
</tr>
<tr>
<td><strong>Overall Result</strong></td>
<td>The section is extremely weak in most areas</td>
<td>The section is not well polished, hard to read, and appears that the students do not understand the topic</td>
<td>The section shows evidence of little effort and research; diagrams and graphics do not add much clarity or interest</td>
<td>The section shows evidence of some effort and diagrams aide the information, but the</td>
<td>The section shows evidence of effort, the students understand the topic, and diagrams and</td>
<td></td>
</tr>
<tr>
<td>Section: Entertainment (educational comics)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Element</strong></td>
<td><strong>1 pts</strong></td>
<td><strong>2 pts</strong></td>
<td><strong>3 pts</strong></td>
<td><strong>4 pts</strong></td>
<td><strong>5 pts</strong></td>
<td><strong>Points Awarded</strong></td>
</tr>
<tr>
<td>Content and Organization</td>
<td>The content is not related to the topic</td>
<td>The content is related to the topic, but is inaccurate</td>
<td>The content is accurate, but undeveloped</td>
<td>The content is accurate and clear, but hard to follow</td>
<td>The content is accurate, clear, and easy to follow</td>
<td></td>
</tr>
<tr>
<td>Originality and Creativity</td>
<td>No frames of the comic strip reflect creativity.</td>
<td>Some frames of the comic strip reflect creativity but characters do not portray important objects of the topic</td>
<td>Some frames of the comic strip reflect creativity and characters portray important objects of the topic</td>
<td>Most frames of the comic strip reflect creativity</td>
<td>All frames of the comic strip reflect an exceptional degree of student creativity and portrayal of the topic</td>
<td></td>
</tr>
<tr>
<td>Conventions</td>
<td>Errors in spelling, punctuation, usage, and grammar make it difficult to read</td>
<td>Some use of punctuation, capitalization, correct spelling of common words</td>
<td>Spelling usually correct, most conventions are used properly</td>
<td>Writer has few conventional mistakes, and nearly all terms are spelled correctly</td>
<td>Good use of grammar, capitalization, punctuation, usage, spelling, paragraphing, and uses these conventions wisely</td>
<td></td>
</tr>
<tr>
<td>Visual Appeal and Artistry</td>
<td>The comic strip is distractively messy or very poorly designed.</td>
<td>The comic strip is hard to identify roles due to a lack of artistic skill</td>
<td>The cartoon is acceptably attractive but it may be a bit messy.</td>
<td>The comic strip is attractive in terms of design, layout, and neatness.</td>
<td>The comic strip is exceptionally attractive in terms of design, layout, and neatness.</td>
<td></td>
</tr>
<tr>
<td>Participation in the Group and Effort</td>
<td>Did not complete his/her share of the project;</td>
<td>Rarely contributed to the group; often needed to be</td>
<td>Was helpful and cooperative in completing</td>
<td>Contributed great effort to the group’s project;</td>
<td>Went above and beyond the call of duty to further the group’s</td>
<td></td>
</tr>
<tr>
<td>Element</td>
<td>1 pts</td>
<td>2 pts</td>
<td>3 pts</td>
<td>4 pts</td>
<td>5 pts</td>
<td>Points Awarded</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>Content</strong></td>
<td>Little or no information related to the topic</td>
<td>States the information, but some is inaccurate, and/or does not look like a real ad</td>
<td>Scientific information is accurate, but not much information is provided</td>
<td>Scientific information is accurate, and clear, but few specific details</td>
<td>Scientific information is well developed with details and examples</td>
<td></td>
</tr>
<tr>
<td><strong>Visual Appeal and Artistry</strong></td>
<td>The ad is distractively messy or very poorly designed.</td>
<td>The ad is hard to understand due to a lack of artistic skill</td>
<td>The ad is acceptably attractive but it may be a bit messy.</td>
<td>The ad is attractive in terms of design, layout, and neatness.</td>
<td>The ad is exceptionally attractive in terms of design, layout, and neatness.</td>
<td></td>
</tr>
<tr>
<td><strong>Graphics</strong></td>
<td>The ad does not contain graphics</td>
<td>The graphics are inappropriate</td>
<td>The graphics are appropriate but lack quality</td>
<td>Quality graphics are included but do not aid the purpose of the ad</td>
<td>Quality graphics are included and well used to aid the purpose of the ad</td>
<td></td>
</tr>
<tr>
<td><strong>Conventions</strong></td>
<td>Errors in spelling, punctuation, capitalization</td>
<td>Some use of punctuation, capitalization</td>
<td>Spelling usually correct</td>
<td>Writer has few conventional</td>
<td>Good use of grammar, capitalization,</td>
<td></td>
</tr>
</tbody>
</table>

**Section: Advertising** (careers and equipment involved in the management of diabetes)
<table>
<thead>
<tr>
<th><strong>Participation in the Group and Effort</strong></th>
<th>Usage, and grammar make it difficult to read</th>
<th>Correct spelling of common words</th>
<th>Most conventions are used properly</th>
<th>Most mistakes, and nearly all terms are spelled correctly</th>
<th>Punctuation, usage, spelling, and uses these conventions wisely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did not complete his/her share of the project; frequently off-task</td>
<td>Rarely contributed to the group; often needed to be reminded to focus and produce</td>
<td>Was helpful and cooperative in completing his/her share</td>
<td>Contributed great effort to the group’s project; helped organize the group and keep people on task</td>
<td>Went above and beyond the call of duty to further the group’s work</td>
<td></td>
</tr>
</tbody>
</table>

| **Overall Result** | The section is extremely weak in most areas | The section is not well polished, hard to read, and appears that the students do not understand the topic | The section shows evidence of little effort and research; diagrams and graphics do not add much clarity or interest | The section shows evidence of some effort and diagrams aide the information, but the authors’ own thinking is not evidenced | The section shows evidence of effort, the students understand the topic, and diagrams and illustrations add to the information |

**Usage, and correct most mistakes, punctuation, spelling of conventions, and nearly usage, make it common are used all terms are spelling, difficult to words properly spelled paragraphing, read correctly and uses these conventions wisely.**