

The Role of Biotechnology in Our World

Part A: Experiment on Making Homemade Cheese

1. Prepare your own homemade cheese using a recipe of your choice or the one provided below. The following websites will be helpful:
 - http://culturecheesemag.com/recipes/make_cheese/winter_2011/cheese_curd
 - <http://www.cheesemakingrecipe.com/>
 - http://biology.clc.uc.edu/fankhauser/cheese/cheese_course/cheese_course.htm
2. Prepare a display of your experiment. Your choice of display should consist of the elements listed below, all of which should be securely attached to the board. You should also bring in samples of your cheese.

Elements to include: purpose, material/equipment, procedure, observations, analysis/discussion, conclusion, and references.

How to Make Rennet Cheese

Equipment: Spoon, stainless steel pot, thermometer, and strainer

Ingredients: Milk, water, salt and rennet

1. Heat the milk to 82°C. This pasteurizes the milk so no bacteria cause it to spoil. Slowly heat milk and stir gently every once in a while, to ensure milk does not burn.
2. Depending on the directions on the type of rennet you purchase, mix up the rennet. For Junket dissolve your tablet in ¼ cup of cool water. I prefer to mix ½ tablet with ¼ cup water. You could also use liquid rennet.
3. Let milk cool to about 100 degrees Fahrenheit. Add the rennet solution and mix by stirring for about 1 minute.
4. Let the milk/rennet mixture sit as close to 100 degrees as possible overnight. Let the mixture sit absolutely still, do not disturb!
5. The next day the curds should be separating from the whey. Simply dump these through a strainer to separate. The curds left in the strainer are the cheese.

Transfer the curds to another container and add salt to taste.

Recipe retrieved from:

<http://practicalbio.blogspot.ca/2011/12/easy-enzyme-experiment-rennet-and.html>

Assessment Rubric

CRITERIA	LEVEL 1 50-59%	LEVEL 2 60-69%	LEVEL 3 70-79%	LEVEL 4 80-100%	SCORE /10
Attractiveness	<ul style="list-style-type: none"> The display has limited attractiveness in terms of design, graphics, layout, and neatness. 	<ul style="list-style-type: none"> The display has some level of attractiveness in terms of design, graphics, layout, and neatness. 	<ul style="list-style-type: none"> The display is highly attractive in terms of design, graphics, layout, and neatness. 	<ul style="list-style-type: none"> The display is exceptionally attractive in terms of design, graphics, layout, and neatness. 	_____
Required Elements	<ul style="list-style-type: none"> The display includes few required elements 	<ul style="list-style-type: none"> The display includes some required elements 	<ul style="list-style-type: none"> The display includes most required elements 	<ul style="list-style-type: none"> The display includes all required elements 	_____
Performing and recording	<ul style="list-style-type: none"> Follows selected procedures with limited competence; Makes few observations Records little data Recognizes the need to modify the plan only when prompted 	<ul style="list-style-type: none"> Follows selected procedures with moderate competence Makes many observations but they may be insufficient to generate data Records data but organization is lacking Has difficulty recognizing the need to modify the plan 	<ul style="list-style-type: none"> competently Follows selected procedures; Makes sufficient observations to generate data Records relevant data in an organized way Modifies the plan when necessary 	<ul style="list-style-type: none"> Selects and follows appropriate procedures; Makes rich observations Records relevant data in an organized and skillful way When necessary, modifies the plan in insightful ways 	_____

Analyzing and Interpreting <i>(Discussion)</i>	<ul style="list-style-type: none"> • Provides limited analysis of data; • Demonstrates limited ability to draw conclusions based on the data; • Provides limited evaluation of methods used; • conducts limited evaluation of the quality of evidence gathered. 	<ul style="list-style-type: none"> • Provides some analysis of the data; • Demonstrates some ability to draw conclusions based on the data; • Provides some evaluation of methods used; • Conducts some evaluation of the quality of evidence gathered. 	<ul style="list-style-type: none"> • Provides sufficient analysis of the data; • Draws valid conclusions based on the data; • Provides sufficient evaluation of methods used; • Conducts sufficient evaluation of the quality of evidence gathered. 	<ul style="list-style-type: none"> • Provides rich analysis of the data; • Draws insightful conclusions based on the data; • Provides a thorough evaluation of methods used; • Conducts thorough evaluation of the quality of evidence gathered. 	<p>_____</p>
Total					<p>_____</p>

Part B: Research/Written Report

Overview:

Applications of biotechnology are used various ways in the food, environmental, agricultural and health industries. For instance, the process of fermentation that you saw take place as you made your cheese and yogurt is one example of biotechnology.

In the second part of this assignment, you will do research to find out about another application of biotechnology. You will also be given the opportunity to present your findings to your classmates.

1. Select a partner and together choose an application of biotechnology either in the food, environment, health or agricultural industries. Examples of biotechnological applications you might choose include the following:

Industry	Type of Biotechnology
Agriculture	Development of transgenic crops
Food	Fermentation
Health	In-vitro fertilization
Health	Electrophoresis
Environment	Bioremediation, and phytoremediation
Health	Genomics, gene therapy, xenotransplantation
Agriculture	Bio-pesticides, cloning

2. Use your textbook, the library, newspapers, the internet and any other available resources to research and gather information about the ethical and social implications of the biotechnological application that you have chosen.

3. Prepare a written report of your findings in the form of an essay, journal article, blog, or some other suitable format of your choice. Be sure to include a reference list in your report. Use the APA style.

Written Report Rubric

Criteria	Level 1 50-59%	Level 2 60-69%	Level 3 70-79%	Level 4 80-100%
Knowledge and Understanding	demonstrates limited knowledge and understanding of content	demonstrates some knowledge and understanding of content	demonstrates considerable knowledge and understanding of content	demonstrates thorough knowledge of content
Communication	expresses and organizes ideas and information with limited effectiveness	expresses and organizes ideas and information with some effectiveness	expresses and organizes ideas and information with considerable effectiveness	expresses and organizes ideas and information with a high degree of effectiveness
Thinking and Inquiry	demonstrates limited ability to select appropriate research resources	demonstrates some ability to select appropriate research resources	demonstrates considerable ability to select appropriate research resources	demonstrates a thorough ability to select appropriate research resources
Application	applies knowledge and skills in familiar and new contexts with limited effectiveness	applies knowledge and skills in familiar and new contexts with some effectiveness	applies knowledge and skills in familiar and new contexts with considerable effectiveness	applies knowledge and skills in familiar and new contexts with a high degree of effectiveness

Note: A student whose achievement is below level 1 (50%) has not met the expectations for this or activity.

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|--------------------------------|-------------------|
| A. Knowledge and Understanding | _____ / 10 |
| B. Thinking and Inquiry: | _____ / 10 |
| C. Communication | _____ / 10 |
| D. Application | _____ / 10 |
| <u>TOTAL:</u> | _____ / 40 |

E. **Comments:**

Part C: Present Your Findings

1. Together with your partner, brainstorm ideas for your project. Summarize and decide on a general reporting style (e.g., radio show, video presentation, TV style interview, etc.) using any media format (i.e., brochure, flyer, poster, power point, Prezi, etc.) of your choice. Your report should highlight the ways in which this biotechnology is used in the environmental, agricultural, health or food related industry and its importance. Consider the following questions as you prepare your presentation:

- a) What is your chosen biotechnological application?
- b) Why is this application of value?
- c) What are the social advantages and disadvantages of this application?
- d) What are the ethical advantages and disadvantages of the application?
- e) What careers are associated with the industry that produces the product you chose?

2. Be prepared to answer questions and participate in classroom discussions based on your topic.

3. List the jobs to be done in order to complete the project.

4. Divide the tasks for your presentation among members of your group.

5. Ensure that you discuss your project ideas and format with your teacher before proceeding to the next step.

Presentation Rubric

Category	Levels				Points
	1 50-59%	2 60-69%	3 70-79%	4 80-100%	
Knowledge/Understanding	demonstrates limited understanding of content for presentation	demonstrates some understanding of content for presentation	demonstrates considerable understanding of content for presentation	demonstrates a thorough understanding of content for presentation	10
Communication	communicates and interacts with audience with limited effectiveness; expresses and organizes ideas with limited effectiveness	communicates and interacts with audience with some effectiveness; expresses and organizes ideas with some effectiveness	communicates and interacts with audience with considerable effectiveness; expresses and organizes ideas with considerable effectiveness	communicates and interacts with audience with a high degree of effectiveness; expresses and organizes ideas with a high degree of effectiveness	10
Thinking/Investigation	limited evidence of planning and organization of presentation; uses critical and creative thinking processes with limited effectiveness	Some evidence of planning and organization of presentation; uses critical and creative thinking processes with some effectiveness	Considerable evidence of planning and organization of presentation; uses critical and creative thinking processes with considerable effectiveness	Thorough planning and organization of presentation; uses critical and creative thinking processes with a high degree of effectiveness	10
Application	makes connections between ideas presented with limited effectiveness;	makes connections between ideas presented with some effectiveness;	makes connections between ideas presented with considerable effectiveness;	makes connections between ideas presented with a high degree of effectiveness;	10

	visuals are accessible and included in the overall presentation	visuals are accessible, creative, and included in the overall presentation	visuals are accessible, creative, and important to the overall presentation	visuals are accessible, creative, professional and important to the overall presentation	
Total					<u>40</u>