

## Molecular Genetics – Biotechnology Project

### GOAL

You will research and describe the application of genetic modification (GM) in one of three areas: (1) Medicine, (2) Research, **OR** (3) Agriculture /Industry. These are the topic choices (see **Table 1**).

### FORMAT

This assignment format is called a RAFT (role, audience, format, topic; see RAFT chart in **Table 2**. **You choose:** your role, the format with which you will present the information, and the topic to present. **The audience** is the general public; so present the information in a way that is simple and easy to understand. **Present the information in the most creative way you can!** See **Table 2** to pick your role, format, and topic.

### WHAT TO SUBMIT

Your final product will somehow incorporate **answers to the following essential questions**.

### QUESTIONS

- 1. What is the technology and what is it used for? [4 K]
- 2. Who originally deserves “kudos” for this technology? What historical scientific contributions that have advanced our understanding of molecular genetics played a role in developing this technology? Explain. [4 K]
- 3. What is one focused example of how genetic modification is applied in relation to the topic? [4 A]
- 4. What is the impact of this technology on a social, political, environmental and/or ethical level? [8 A]
  - a) Advantage. Be specific and thorough. Explain all ideas.
  - b) Disadvantages. Be specific and thorough. Explain all ideas.
- 5. How is DNA involved in this technology? What is done to DNA in this technology? [2 I]
- 6. How is the use of this technology regulated in Canada, and how does Canadian regulation of this technology compare to the regulation in one other country (of your choice)? [4 I]
- 7. What does the technology “look like”? Provide a diagram or construct a model depicting specific procedures and/or equipment used; e.g., the steps of PCR. [4 C]
- \* Works Cited and **in-text notations**. At least 5 references must be used (excluding the 5 websites listed below). [5 I]
- \* Proper spelling, grammar, sentence structure and scientific terminology. [4 C]
- \* Appropriate role and format for the targeted audience; creativity; clear, concise and organized. [4 C]

**TOTAL:            /8 K            /12 A            /12 C            /11 I**

**TABLE 1: TOPIC CHOICES**

<b>Medicine</b>	<b>Example</b>
Human Gene Therapy	Somatic and germline genetic engineering for treating or curing genetic diseases such as cystic fibrosis, haemophilia, muscular dystrophy, sickle cell anemic, or diabetes.
Recombinant Pharmaceuticals	For the production of insulin, human growth hormone (hGH), or blood clotting factors.
Vaccines	Genetically engineering viruses that can still confer immunity, but lack the infectious sequences.
Antisense Therapy	The development of antisense drugs to treat cancers, diabetes, asthma, arthritis, HIV/AIDS, high cholesterol, or hemorrhagic fever viruses.
<b>Research</b>	<b>Example</b>
<b>Gene Function Discovery</b>	
Loss of function experiments	Using gene knockouts in which an organism is engineered to lack the activity of one or more genes to determine the role of that gene.
Gain of function experiments	The logical counterpart of knockouts. These experiments are sometimes performed in conjunction with knockout experiments to more finely establish the function of the desired gene.
Tracking experiments	Seek to gain information about the localization and interaction of a desired protein. For example, using green florescent protein (GFP) to visualize the product of genetic modification.
<b>Agriculture/Industry</b>	<b>Example</b>
Genetically modified foods/transgenic crops	Genetically modifying foods or crops to be drought, temperature, or insect resistant. Creating pharmaceutical crops to incorporate edible vaccines or drugs.
Bioremediation	Using genetically engineered bacteria to clean up oil spills and other toxic waste.
Biofuels	Using genetically engineered organisms to produce renewable energy resources (e.g., GM bacteria to produce diesel fuel).

**RESOURCES**

**BioCanada** is a tool to help you locate information on biotechnology from the Government of Canada. Access policies, research activities and resources from the departments and agencies of the Government of Canada. Find information on research and development, health, ethics, the environment, and the business of biotechnology.

<http://www.bioportal.gc.ca/english/BioPortalHome.asp?x=1>

<http://www.biogateway.gc.ca/english/linksearch.asp?x=1&formAction=SubjectArea>

**The National Human Genome Research Institute** was established in 1989 to carry out the role of the National Institutes of Health (NIH) in the International Human Genome Project (HGP). The HGP was developed in collaboration with the United States Department of Energy and begun in 1990 to map the human genome. Access credible information regarding health, education, research, issues and news in genetics.

<http://www.genome.gov/>

Genetics Tutorial and Resource website - <http://learn.genetics.utah.edu/>

Nature Science Journal - <http://www.nature.com/genetics/index.html>

**TABLE 2: BIOTECHNOLOGY RAFT**

<b>ROLE (You choose)</b>	<b>AUDIENCE</b>	<b>FORMAT (You choose)</b>	<b>TOPIC (You choose)</b>
<b>Doctor</b>	General public	Recorded song with lyrics and other required written components of the assignment submitted.	See Table 1 for topic choices
<b>Scientist</b>		Informative public poster (e.g., for washrooms or subway cars).	
<b>TV or radio news reporter</b>		Pre-recorded TV commercial or news broadcast (5-10 minutes) with other required written components of the assignment submitted.	
<b>Newspaper or Magazine Journalist</b>		Informative website (e.g., create a weebly or wiki website).	
<b>Student informing a class, parent, friend or family member</b>		Prezi or other type of media presentation (must be approved).	
<b>Other (must be approved)</b>		An arts and crafts piece and other required written components of the assignment (e.g., model constructed from various materials).	
		A social justice awareness product that could be marketed for sale (e.g., genetics quilt or pillow case, re-usable shopping bag, giant fridge magnet, food or medicine packaging, etc.).	