



Metabolism Engineering Internship:

Health Bars for Disaster Relief

Engineering Notebook



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Metabolism Engineering Internship: Health Bars for Disaster Relief Unit Overview

As a food engineer intern, your job is to create a health bar that will be used during natural disasters to meet the metabolic needs of different groups of people—patients and rescue workers. You will design and test possible recipes using a digital model called the RecipeTest Design Tool. In addition to providing the best balance of nutrients to help people keep their energy up and heal their bodies, the health bars must taste good and not be too expensive.

Safety Guidelines for Science Investigations

Workplace safety is always a concern, especially in the labs here at Futura. Please review and follow these safety guidelines. If you have any questions, ask your internship coordinator for assistance.

- 1. Follow instructions and listen carefully. If you don't know what to do, ask your internship coordinator.
- 2. **Don't taste things.** No tasting anything or putting it near your mouth unless your internship coordinator says it is safe.
- 3. **Smell substances like a chemist.** When you smell a substance, don't put your nose near it. Instead, gently move the air from above the substance to your nose. This is how chemists smell substances.
- 4. **Protect your eyes.** Wear safety goggles if something wet could splash into your eyes, if powder or dust might get in your eyes, or if something sharp could fly into your eyes.
- 5. **Protect your hands.** Wear gloves if you are working with materials or chemicals that could irritate your skin.
- 6. Keep your hands away from your face. Do not touch your face, mouth, ears, eyes, or nose while working with chemicals, plants, or animals.
- 7. **Tell your internship coordinator if you have allergies.** We want you to be safe and comfortable at work.
- 8. Be calm and careful. Move carefully and slowly around the office and labs.
- 9. Report all spills, accidents, and injuries to your internship coordinator.
- 10. Avoid anything that could cause a burn. Ask your internship coordinator for help with hot water or hot equipment.
- 11. Wash your hands with soap and water at the end of the workday, especially if you've handled plants, animals, or chemicals.

Amina Reid, Project Director Futura | Food Engineering Division

Safety Agreement

By writing my name below, I agree to follow the rules outlined in the Safety Guidelines while working at Futura.

Day 1: Welcome!

Hello interns,

I am excited for you to join this new food engineering internship at Futura! I love working for our company because we work to solve problems that affect people around the planet.

We will be working on a project for International Disaster Aid (IDA) to design health bars that both rescue workers and patients can eat to keep their energy up and meet the needs of their bodies during disaster relief efforts.

There are three things to consider when planning a health bar design:

- 1. Meeting the metabolic needs of rescue workers and patients.
- 2. Having a high taste score, so that people will want to eat the bars.
- 3. Keeping the cost low so that IDA can help as many people as possible.

We'll get started by learning more about metabolism. Today, your internship coordinator will introduce you to the project resources: the RecipeTest Design Tool and the Futura Food Engineer's Dossier. Note: *Dossier* (DAW-see-ay) is a term professionals sometimes use for a set of related documents. It includes a glossary to support you if you need help with unfamiliar words.

Deliverables:

- Annotations for Chapter 2: "Meeting Your Metabolic Needs"
- After Hours: Annotations for Chapter 1: "Request for Proposals"

Good Luck!

Amina

After-Hours Work

Return to the Day 1: Welcome! message from Amina Reid on page 3 and be sure you've completed all internship tasks for the day.

- Read and annotate Chapter 1 in the Dossier: "Request for Proposals" (RFP). Your internship coordinator may have asked you to complete additional tasks.
- If you are required to read the Safety Guidelines and read and complete the Safety Agreement form, find those on page 2 of your Engineering Notebook.
- Double-check your Daily Message to see if there are other deliverables that need to be completed after hours.

Name: _

Day 2: Researching Ingredients

Welcome back, interns!

We will continue researching metabolism today. You will focus on making connections between metabolism and FuturaBar ingredients by researching and making predictions about how various ingredients are metabolized and meet people's specific needs, including your own.

By understanding the relationship between nutrients and metabolic function, you'll be able to design a better FuturaBar that helps many different kinds of people function in disaster areas. While you are working today, think about how specific nutrients on the small scale (cellular level) affect your body's ability to grow, breathe, think and move. You'll need to figure this out before you can start designing your FuturaBar. After hours, please reread Chapters 2–3 of the Dossier and add to or revise your annotations.

Deliverables:

- Researching Ingredients sheet
- After Hours: Reread Chapters 2 and 3, and revise annotations for Chapter 2, thinking about how different nutrients affect your metabolic needs
- Complete any additional tasks your internship coordinator has asked you to do

Hope you learn a lot today!

Amina

Daily Message Notes	

Name: _

Researching Ingredients

- 1. Choose a food from the Ingredients Table in Dossier Chapter 3. Each member of your design team should choose a different ingredient.
- 2. Use the information in Chapters 2 and 3 in the Dossier and the diagram below to gather information about your ingredient.
- 3. Complete questions in Part 1.
- 4. Share information about your ingredient with the other members of your group.
- 5. Discuss and complete the questions in Part 2 with your group members.

Part 1

Record the following information about your ingredient:

- Carbohydrate content: _____
- Protein content: ______
- Glycemic index: ______



Researching Ingredients (continued)

What happens in your body after you eat the ingredient you investigated?

What important molecules does your ingredient provide to your cells? Why do your cells need those molecules?

Part 2

Choose an ingredient that one of your group members researched. What happens in your body after you eat that ingredient? How is it similar to or different from the ingredient you researched?

Look back at the Ingredients Table in the Dossier. If you could only eat one food on the ingredient list all day for one week, which one would you choose and why?

After-Hours Work

Return to the Day 2: Researching Ingredients message from Amina Reid on page 5 and be sure you've completed all internship tasks for the day.

- Reread and annotate Chapter 2: "Meeting Your Metabolic Needs" and Chapter 3: "Ingredient Information" in the Dossier: "Request for Proposals" (RFP).
- Add to or revise your annotations using this focus question: *How do different nutrients help people meet different metabolic needs?*
- Your internship coordinator may have asked you to complete additional tasks.
- Double-check your Daily Message to see if there are other deliverables that need to be completed after hours.

Day 3: Target Populations

Hi interns,

Today you'll continue your research by learning more about the different target populations that you'll be designing recipes for. IDA is looking for designs that will meet the needs of their rescue workers and the patients that they serve. Different people have different metabolic needs, so you'll want to choose your ingredients carefully.

It is really important that you make sure you understand the metabolic needs of these target populations before you begin testing out different recipe designs. Luckily, Futura found some volunteer test users to serve as representatives of each target population to help us out. Today, you and your group will analyze the needs of the test users using the Dossier Chapter 4: "Target Populations."

Deliverables:

- Annotations for Ch. 4: "Target Populations"
- Test Users' Notes in Futura Workspace

Good luck with your research!

Amina

Daily Message Notes		

After-Hours Work

Return to the Day 3: Target Populations message from Amina Reid on page 9 and be sure you've completed all internship tasks for the day.

- Open the Dossier.
- Reread Chapter 4: "Target Populations".
- Add to or revise your annotations using these focus questions: *Why do some test users need high glycemic index foods, while others do not?*

Your internship coordinator may have asked you to complete additional tasks. Double-check your Daily Message Notes to see if there are other deliverables that need to be completed after hours.

Day 4: Analyzing Ingredients

Hi Interns,

I'm glad to see how quickly you are learning! Today you will finish up this phase by isolating variables, a process that will let you see how changing one ingredient at a time affects the RecipeTest results. You'll also begin to consider trade-offs. A trade-off is when you have to give up one thing in return for another.

Today you will use RecipeTest to complete your research by analyzing the health bar ingredients. You'll also set some priorities so that you are ready to begin designing your FuturaBar recipes during your next day at the office. After-hours, I want you to show your understanding of the project so far by completing the Project Summary form.

Deliverables:

- Health Bar Ingredients Analysis
- After-Hours: Project Summary

Good luck today!

Amina

Daily Message Notes	

Name: _

Ingredients Analysis

- 1. In your group, decide which four ingredients each pair of students will test. Circle each ingredient that you and your partner are responsible for investigating.
- 2. In your pair, decide which partner will test for Rescue Workers and which partner will test for Patients.
- 3. Test 1 ingredient at a time by selecting 100 grams of the same ingredient and click SEND TO LAB.
- 4. Compare the results with your partner to see how the target populations are similar or different.
- 5. In the table below, record notes on the results for each criterion for both target populations.
- 6. Share your findings with your group members, and answer the questions that follow.

Туре	Metabolic Needs Patients	Metabolic Needs Rescue Workers	Taste Score	Cost per Bar
Raisins	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			
Pumpkin Seeds	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:	I		
Nonfat Milk Powder	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			
Puffed Wheat	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:	1		

Туре	Metabolic Needs Patients	Metabolic Needs Rescue Workers	Taste Score	Cost per Bar
Puffed Rice	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			
Soy Beans	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			
Nutritional Yeast	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			
Chocolate Chips	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			

Туре	Metabolic Needs Patients	Metabolic Needs Rescue Workers	Taste Score	Cost per Bar
Prunes	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			

Ingredients Analysis (continued)

Based on your research:

1. Which ingredients do you think will make the best tasting bar? Why?

2. Which ingredients do you think would produce the best bar for meeting growth and repair needs? Why?

3. Which ingredients do you think would produce the best bar for getting an immediate burst of energy? Why?

4. Which ingredients do you think would produce the best bar for storing energy to use later?

Ingredients Analysis (continued)

5. Which ingredients do you think will be best for keeping the cost of the bar low?

Name: ___

After-Hours Work

Return to the Day 4: Analyzing Ingredients message from Amina Reid on page 11 and be sure you've completed all internship tasks for the day.

• Complete the Project Summary form on the next page. If needed, refer back to the RFP in the Dossier to review the project details.

Your internship coordinator may have asked you to complete additional tasks. Double check your Daily Message and Daily Message Notes to see if there are other deliverables that need to be completed after hours.

Project Summary

Defining the Problem: Summarize your understanding of the project by answering the following questions. You may wish to review the Dossier to help you respond to the questions.

1. What is the engineering problem you are trying to solve during this project?

2. Describe the first criterion: meet the metabolic needs of the target population. Why is it important?

3. Describe the second criterion: have a high taste score. Why is it important?

4. Describe the third criterion: keep costs low. Why is it important?

5. Based on your research so far, which criterion do you think is most important for a successful health bar design? Why?

Day 5: Designing FuturaBars

Hello interns!

Today you begin the Design phase of the internship. Think about what you've learned from reading the Dossier during the Research phase: nutrients that come from the foods we eat are composed of mostly protein and carbohydrates. Our bodies metabolize these into amino acids for cellular growth and repair and glucose for energy. Some carbohydrates break down quickly which results in immediate energy. Carbohydrates that break down more slowly are good for long term energy release. You will use RecipeTest to build health bars that meet the metabolic needs of the target populations, taste good, and are affordable so that more people will have access to them.

You'll run many iterative tests to find an effective design. Each time you test a FuturaBar design, you will analyze the results to see how you can improve your next version. When engineers test designs, they use the results to help plan the next design.

Before you leave today, your team should send me the results of the design you like best. I'll review it and send you feedback about how well your design addresses the project criteria.

Deliverables:

- Several designs recorded on RecipeTest Data
- RecipeTest Design form

Cheers,

Amina

Amina Reid, Project Director Futura | Food Engineering Division

Daily Message Notes		

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RecipeTest Design

Target Population: Patients / Rescue Workers (circle one)

Record your optimized recipe and testing data here. Then you will submit your optimized recipe in the RecipeTest Design Form in Futura Workspace in order to receive feedback from the project director. **Note:** Only one partner needs to submit a form for feedback.

Version: _____

- How many grams of raisins? _____
- 2. How many grams of pumpkin seeds? _____
- 3. How many grams of nonfat milk powder? _____
- 4. How many grams of puffed wheat? _____
- 5. How many grams of puffed rice? _____
- 6. How many grams of soy beans? _____
- 7. How many grams of nutritional yeast?
- 8. How many grams of dark chocolate chips?
- 9. How many grams of prunes? _____
- 10. What is your FuturaBar's taste score? _____
- 11. What is the total cost for one of your FuturaBars? _____
- 12. What percent (%) of your FuturaBar is protein? ______
- 13. What percent (%) of your FuturaBar is carbohydrates? ______
- 14. What is your FuturaBar's glycemic index? ______

Day 6: Choosing an Optimal Design

Hi Interns,

I reviewed the results for the design your team submitted and sent a feedback letter. Work with your colleagues and internship coordinator to review and interpret my comments. Then, think about my suggestions as you do more iterative testing and choose an optimal recipe. It may be helpful to revisit the Dossier as you plan your final designs. After hours, I want to know your thoughts about the trade-offs of your optimal design.

You've probably noticed that each version you've designed has trade-offs—when a design can be strong for one criterion, but not as good for another. To identify an optimal solution to a problem, engineers share and discuss results, consider trade-offs, and set priorities in order to improve their designs.

Deliverables

- Design Feedback Summary
- Record several new designs
- Optimal design selected
- After-hours: Trade-Offs Reflection

Many thanks!

Amina

Amina Reid, Project Director Futura | Food Engineering Division

Daily Message Notes

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Design Feedback Summary

Name			Date		
Submitted Version	Protein Content (Criterion: Meet metabolic needs)	Carbohydrate Content (Criterion: Meet metabolic needs)	Glycemic Index (Criterion: Meet metabolic needs)	Criterion: Taste Score	Criterion: Cost per Bar
Design details					
Feedback from proj- ect direc- tor					
Goal for meeting criterion					
Redesign strategy					



After-Hours Work

Return to the Day 6: Choosing an Optimal Design message from Amina Reid on page 22 and be sure you've completed all internship tasks for the day.

• Complete the Trade-Offs Reflection form on the next page.

Your internship coordinator may have asked you to complete additional tasks. Double-check your Daily Message and Daily Message Notes to see if there are other deliverables that need to be completed after hours.

Trade-off Reflection

A *trade-off* happens in a situation where a design has good results for one criterion but not for another. Look at the results for your optimal FuturaBar design. Describe some of the trade-offs you noticed while designing your FuturaBar.

1. Which criterion did you prioritize? (check one)

metabolic needs of target populations met

high taste score

🗌 keep cost low per bar

2. Why did you prioritize this criterion?

3. When you prioritized this criterion, what were some of the trade-offs? Describe what happened to the results of the other two criteria.

Day 7: Composing Proposal Outlines

Hello interns,

Today you will start working on your design proposal. Proposals are one way scientists and engineers communicate their ideas. You will use the proposal to explain why you think your chosen design is optimal. Writing good proposals can be hard, so I've asked your internship coordinator to help you outline the most important section, the Design Decisions. You might also want to refer to the Dossier for information and resources to help you.

Engineering proposals explain how a design addresses each of the project criteria. If you include strong evidence in your argument that demonstrates you understand how and why your design works, it is more likely that your proposal will be considered by International Disaster Aid. The outline process will help you collect and organize evidence that supports the argument that you have selected an optimal design. I will review the Background Research sections of your outline and send feedback to help improve your final proposals. I always appreciate feedback when I am working on a formal proposal.

Deliverables:

• Proposal Outline

Use lots of evidence!

Amina

Daily Message Notes		

Proposal Outline

Instructions

For each criterion, list the pieces of evidence from your iterative testing, Ingredients Analysis, Design Feedback Summary, and Dossier research that support your optimal design.

Optimal Design

Towned Demulation	 		Detiente
larget Population:	Rescue	e workers	Patients

List the design details of your proposed optimal design.

Version #: _____ List ingredients used: _____

Metabolic Details:	% Protein	% Carbohydrates	Glycemic Index

Design Decisions

For each criterion, list the pieces of evidence from your iterative testing, Ingredients Analysis, Design Feedback Summary, and Dossier research that support your optimal design.

Metabolic Needs

DATA ANALYSIS	
Nutrient Details: Protein Content(%)	Design goal:
Nutrient Details: Carbohydrate Content(%)	Design goal:
Nutrient Details: Glycemic Index	Design goal:
Comparison to another design:	

BACKGROUND RESEARCH

Think about how your design choices affected metabolic needs. How did the glycemic index and the amount of carbohydrates and proteins in your recipe affect the results for growth and repair and energy needs? What information about these nutrients applies specifically to the metabolic needs of your target population? Why did you choose specific ingredients to meet specific metabolic needs?

Proposal Outline (continued)

Taste	
DATA ANALYSIS	
Final result:	Design goal:
Comparison to another design:	
BACKGROUND RESEARCH	
Think about how your design choices affected taste. V taste score?	Vhat information about the ingredients is related to the

Cost

DATA ANALYSIS	
Final result (\$):	Design goal (\$):
Comparison to another design:	
BACKGROUND RESEARCH	
Think about how your design choices affected the cos is related to the cost?	t of the FuturaBar. What information about the ingredients

Day 8: Writing Design Decisions

Greetings interns,

Today you will use my feedback on your proposal outlines to write the Design Decisions paragraphs of your proposal. These paragraphs are the heart of your argument that explains why your health bar design is an optimal one. You might also want to refer to the Dossier for information and resources to help you write.

Writing strong proposals for a specific audience, helping them understand the project and your decisions, is an important part of being an engineer. You know more about the science behind your design than most of the people who will be reading your proposal, so your writing should be clear and professional. Writing clear arguments that explain your thinking is an essential part of scientific communication.

Deliverables:

• Final Proposal: Design Decision paragraphs

Happy writing!

Amina

Daily Message Notes			

Tips: Help With Your Proposal

Interns,

If you need some help getting started with your paragraphs, here are some ideas to choose from.

DESIGN DECISIONS PARAGRAPHS

About specific criteria:

- For our proposed design, the results for metabolic needs (growth and repair and energy) were . . .
- We were able to meet the metabolic needs of our target population by . . .
- We were able to keep costs low by . . .
- Using the Futura RecipeTest Design Tool, we picked a design that . . .

When talking about your goals:

- Our goal was . . .
- Based on design feedback, we chose to set a goal to . . .

For comparing designs:

• In another design, we got _____ but . . .

For talking about background research:

- Background research told us that . . .
- In the Dossier, we learned that . . .
- Research with RecipeTest showed us that . . .

Tips: Help With Your Proposal (continued)

INTRODUCTION

- This FuturaBar design used (list ingredient types). This recipe had (list metabolic information like % carbohydrate, % protein, glycemic index).
- The results showed the design met _____% of the metabolic needs for growth and repair.
- The results showed the design met _____% of the metabolic needs for short term energy and _____% of the metabolic needs for long term energy.
- This design had a taste score of _____.
- The cost per bar was _____.

CONCLUSIONS

- Our FuturaBar design is the optimal choice because . . .
- Our priority was the criterion _____ because . . .
- Our FuturaBar design will meet the needs of International Disaster Aid because . . .
- Even though our recipe does not _____, we think it is optimal because . . .
- This FuturaBar recipe will (write something about one criterion here) well because . . .
- A trade-off we had to make in our optimal design was . . .

Hope this helps!

Amina

Final Proposal

When writing your Final Proposal, remember to write in a clear and professional manner. Refer to these resources:

- Proposal Rubric and Sample Proposal
- RecipeTest Data
- Background research and notes
- Food Engineer's Dossier
- Proposal Outline feedback letter

Introduction

Use your responses from the Project Summary to describe the project goal and criteria. Add one to two sentences to describe your optimal design.

Final Proposal (continued)

Design Decisions

Use your Proposal Outline and feedback from your project director to explain how your design addresses each criterion.

Metabolic Needs

Taste

Final Proposal (continued)

Cost Per Bar

Conclusion: Considering Trade-Offs

Use your responses from the Trade-Offs Reflection to describe your design priorities and the resulting trade-offs. Add your closing statement.

Name: _

Day 9: Completing the Proposal

Hello interns,

Today you'll be focusing on finishing your proposal by adding two more paragraphs: the beginning and the ending! Your internship coordinator will help you use the Project Summary to write the Introduction, and the Trade-Offs Reflection to write the Conclusion. You might also want to refer to the Dossier for information and resources to help you write.

These two paragraphs are the final sections of your proposal. The introduction explains the project to the reader, while the conclusion shows that you've thought carefully about the trade-offs involved in your optimal health bar design. Remember to use scientific and professional language to communicate your ideas.

You might notice that writing this proposal is like iterative testing—you are taking a version, analyzing and revising it, and then rewriting to improve the final version!

Deliverables:

Completed Final Proposal

I look forward to reading your excellent proposals!

Amina

Daily Message Notes			

Day 10: Thanks, Interns!

Dear interns,

Today is the final day of your internship with me here at Futura's Food Engineering Division. I'm impressed with the variety of health bars you've designed.

I really enjoyed watching you learn how to think critically about various metabolic needs, nutrients, and design criteria, while practicing good scientific communication with your colleagues. I hope that you will be able to take some of what you have learned here and apply it to help you with future problem solving and scientific arguments. You've been great interns!

There is one last task that I have for you: an Internship Exit Survey. Please get started on it now—your responses will help us improve internships for the next batch of interns!

Deliverables:

Internship Exit Survey

Good luck in the future!

Amina

Daily Message Notes			

Internship Exit Survey

Futura would like to improve the internship experience for future interns. Please complete this survey to give us feedback.

How comfortable would you feel explaining the following concepts to a new intern?

- 1. How a student's job is different from an intern's job. (check one)
 - Very uncomfortable. I don't understand this.
 - Uncomfortable. I'm not sure I understand this.
 - Pretty comfortable. I think I understand this.
 - Very comfortable. I totally understand this.
- 2. What criteria are and how they are related to designing something. (check one)
 - Very uncomfortable. I don't understand this.
 - Uncomfortable. I'm not sure I understand this.
 - Pretty comfortable. I think I understand this.
 - ☐ Very comfortable. I totally understand this.
- 3. What a trade-off is and how a trade-off affects engineering designs. (check one)
 - Very uncomfortable. I don't understand this.
 - Uncomfortable. I'm not sure I understand this.
 - Pretty comfortable. I think I understand this.
 - Very comfortable. I totally understand this.
- 4. Why scientific communication is important in engineering. (check one)
 - Very uncomfortable. I don't understand this.
 - Uncomfortable. I'm not sure I understand this.
 - Pretty comfortable. I think I understand this.
 - Very comfortable. I totally understand this.

Internship Exit Survey (continued)

Imagine you are giving advice to a new Futura Engineering intern.

5. Imagine you are giving advice to a new Futura Engineering intern. What would you tell them about the engineering design process?

6. What was hard or challenging about the internship?

7. What tips would you suggest for a successful internship?

Metabolism Engineering Internship Glossary

analyze: to examine in detail for a purpose *analizar: examinar en detalle y con un propósito*

carbohydrate: a group of molecule types that are broken down by the digestive system into glucose *carbohidrato: un grupo de tipos de moléculas que son descompuestos en glucosa por el sistema digestivo*

cellular respiration: the chemical reaction between oxygen and glucose that releases energy into cells *respiración celular: la reacción química entre oxígeno y glucosa que libera energía en las células*

criteria: standards by which something may be judged *criterios: normas por medio de las cuales se puede juzgar algo*

deliverable: a thing to be delivered, usually in a development or design process entregable: una cosa que debe entregarse, usualmente durante un proceso de desarrollo o diseño

disaster relief: help, usually food and supplies, that is given to people who have survived disaster ayuda en casos de desastre: ayuda, usualmente alimentos y provisiones, que se da a personas que han sobrevivido a un desastre

dossier: a set of related documents about a particular topic *expediente: un conjunto de documentos relacionados sobre un tema particular*

energy: the ability to make things move or change energía: la capacidad de hacer que las cosas se muevan o cambien

engineer: a person who uses math and science to design things *ingeniero/a: una persona que utiliza las matemáticas y la ciencia para diseñar cosas*

food engineer: a type of engineer who solves problems related to food materials, safety, storage, and distribution

ingeniero/a en alimentos: un tipo de ingeniero/a que resuelve problemas relacionados con los materiales, la seguridad, el almacenamiento, y la distribución de los alimentos

glucose: a molecule that organisms can use to release energy, and that is made of carbon, hydrogen, and oxygen atoms

glucosa: una molécula que los organismos pueden usar para liberar energía y que está hecha de átomos de carbono, hidrógeno y oxígeno

Metabolism Engineering Internship Glossary (continued)

glycemic index: a measure of how quickly carbohydrates break down into glucose

índice glucémico: una medida de cuán rápido los carbohidratos se desintegran en glucosa

interns: beginners at a workplace who do work that is closely supervised because they are learning on the job

becarios/as: principiantes que hacen un trabajo estrechamente supervisado porque están aprendiendo durante el mismo

iterative testing: repeating a process in a way that considers the results of a previous design

pruebas iterativas: la repetición de un proceso de manera que se consideren los resultados de un diseño anterior

metabolic needs: what the body needs in order to undergo cellular processes for growth and repair and energy release

necesidades metabólicas: lo que el cuerpo necesita para desempeñar procesos celulares para el crecimiento y la reparación y la liberación de energía

metabolism: the body's use of molecules for energy and growth *metabolismo: el uso de moléculas por el cuerpo para obtener energía y crecer*

optimal: most successful, considering the situation *óptimo: más exitoso, considerando la situación*

proposal: a formal design that is supported by evidence, and submitted for discussion and review propuesta: un diseño formal respaldado por evidencia y presentado para discusión y revisión

proteins: a category of large molecules that perform important functions inside living things *proteínas: una categoría de moléculas grandes que desempeñan funciones importantes dentro de los seres vivientes*

starch: a type of energy storage molecule made of many glucose molecules connected together *almidón: un tipo de molécula de almacenamiento de energía hecha de muchas moléculas de glucosa unidas*

target population: a group of people who are supposed to be served by a designed product *población objetivo: un grupo de gente que debe ser servido por un producto diseñado*

test users: people who test out a product while it is being designed *usuarios/as de prueba: personas que testean un producto mientras que está siendo diseñado*

Metabolism Engineering Internship Glossary (continued)

trade-off: when you have to give up one thing in return for another concesión: una situación en la que se debe renunciar a algo para obtener otra cosa a cambio

variable: something that can be changed and may be measured *variable: algo que se puede cambiar y que se puede medir*

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