

## Microbe Madness—

### CLASS SET for students- DO NOT WRITE ON THIS!

You've learned about what cells do, and you've learned about how evolution works. It's time to put the two together! You are tasked to *think like a scientist* and anticipate the set of genes for a microbe that will allow you to stand the test of time and changes in the environment! This kind of predictive thinking allows scientists to hypothesize about the requirements life forms might need in order to survive in places we can't necessarily see for ourselves, like ancient earth, or on other planets.

Be prepared! The environment could be...

- a. hot, OR cold
- b. wet OR dry
- c. salty or unsalty
- d. acidic or neutral
- e. have an atmosphere of oxygen, carbon dioxide or sulfur (we'll have 2 gases at a time)

Steps to follow:

1. Build your microbe! You will do this by selecting the genes you think will give you the best advantage in an ever-changing world, and it will require you to think strategically. Some things to keep in mind are...
  - A cell's genome is only SO BIG, so there are only so many genes it can hold. Therefore, **your total budget for genes is 15 points.**
  - Some genes will make you better suited to an environment, and some won't. No genes are deal-breakers though: **you just have to be competitive enough to survive better than the other microbes and pass on your genes.**
  - Some genes are package deals: you'll notice that if you choose to photosynthesize, you also must be able to take in carbon dioxide AND iron! That's a lot of your gene points, but it may be worth it...?
  - Write your gene choices in BIG PRINT on your MICROBE page.

Gene Name		Function	Size of Gene
<b>Must have</b>	<b>Glycoside Hydrolase</b>	Digest sugar	1
	<b>ATP Synthase</b>	ATP is a molecule used to shuttle energy around a cell in order for it to function	2
	<b>Amino Acid Polymerase</b>	Make protein <u>-</u> something all cells must do in order to survive	2
	Oxidase	Breathe oxygen	2
	Sulfurase	Breathe sulfate	2
	Monooxygenase	Breathe carbon dioxide	1
	Cholesterol Decarboxylase	Inflexible membranes <u>-</u> counteracts effects of higher temperatures	1
	Lipid Cyclase	Fluid membranes <u>-</u> flexible to counteract effects of	2

	cold temperatures	
Sodium Transporter	Export salts <u>_</u> helpful so cell doesn't get overwhelmed with salt inside it	1
Flagellar Motor	Motility <u>_</u> able to move towards a resource Great for accessing light or sugar resources	3
Photosystem 2 Reaction Center AND Siderophily genes	Photosynthesis <u>_</u> only beneficial in an environment with carbon dioxide Siderophily <u>_</u> to get iron, required for photosynthesis	5
Activator	Sporulate <u>_</u> hibernate during poor conditions	3
Plasmid	Two extra genes <u>_</u> gives you flexibility to withstand changing environmental conditions	2
Photolyase	Repairs cells <u>_g</u> good for recovering from ultraviolet ray damage or very dry environments	2

Steps, continued:

2. We'll randomly select environmental qualities for the first round. Then, you and your first partner will decide which of your two microbes are best suited to survive. Remember, ***your genes don't have to be a perfect match, they just have to be more competitive in that particular environment.*** The winner will advance on to the next round.
3. We will repeat step 2 as each group decides which of their remaining microbes is likely to survive each new change in the environment, resulting two finalists, and lastly, one winner who survived the test of time.
4. Demonstrate your thinking: after both the quarterfinal vote and the final vote, you must explain the reasons for your choice. Think like a scientist and explain which microbe advanced in the game, and why. This critical thinking and writing will be turned in as a large part of your grade for this assignment.

Name:

Date:

Class:

## Microbe Madness: Explain Your Thinking!

### First Round

After you and your seatmate have selected the microbe that advances to the next round, support your choice with evidence:

We think that \_\_\_\_\_'s microbe will be more successful because the environment is \_\_\_\_\_ and this microbe has \_\_\_\_\_ gene. This gene will help because.....

### Quarterfinals

Environmental Conditions	
Temperature	
Water	
Salinity (salt)	
Acid	
Atmosphere	

After you and your classmates have selected the microbe that advances to the quarterfinals, support your choice with evidence:

Which microbe was best suited to survive in the environmental conditions?	
Evidence (genes that it has)	Reasoning – what makes that gene BEST for this environment?

## Finals

Environmental Conditions	
Temperature	
Water	
Salinity (salt)	
Acid	
Atmosphere	

After you and your classmates have selected the microbe that advances to the finals, support your choice with evidence:

Which microbe was best suited to survive in the environmental conditions?	
Evidence (genes that it has)	Reasoning – what makes that gene BEST for this environment?

Now, turn your reasoning into a well-crafted paragraph, with a main idea/topic sentence in which you assert your claim. Follow that with documentation of your evidence and reasoning. This should be done on a separate sheet of paper.



Name:

Date:

Class Period:

### Microbe Madness Final Writing Assignment

You've written a paragraph that examines why your chosen microbe is well suited to its environment. Now, we're going to make it even stronger. Your first task is to type it into a google document. Please use the default font and font size.

Next, share your document with your partner, and complete the Peer Review.

### Peer review

Name of Reviewer:

Checklist:

Criteria	Yes!	Sort of...	Errr.... Not yet.
Main Idea sentence- <b>answers</b> the question "Which microbe was best suited to survive in the environmental conditions?"			
Evidence- <ul style="list-style-type: none"> <li>1st piece of evidence is supported with reasoning that goes BEYOND what was stated on the ToolBox chart and <i>makes good sense</i></li> <li>add a comment in google.docs that shows why the reasoning is good or what needs to be fixed.</li> </ul>			
<ul style="list-style-type: none"> <li>2nd piece of evidence is supported with reasoning that goes BEYOND what was stated on the ToolBox chart and <i>makes good sense</i></li> <li>add a comment in google.docs that shows why the reasoning is good or what needs to be fixed.</li> </ul>			
<ul style="list-style-type: none"> <li>3rd piece of evidence is supported with reasoning that goes BEYOND what was stated on the ToolBox chart and <i>makes good sense</i></li> <li>add a comment in google.docs that shows why the reasoning is good or what needs to be fixed.</li> </ul>			
Conclusion- a statement that wraps up the paragraph in a way that masterfully sums up the paragraph			
Spelling, grammar and language conventions- these can be pointed out in the document			

Next, fix your own mistakes on your document, and turn it in!

Your Name:

## Microbe Madness Rubric

Criteria	Yes!	Sort of...	Errr.... Not yet.
<b>Microbe Madness “Explain Your Thinking”</b> worksheet shows clear thought process and going beyond what was merely stated for you.			
<b>Rough Draft of Paragraph</b> complete and on time.			
<b>Final Paragraph</b>			
Main Idea sentence- <b>answers</b> the question “Which microbe was best suited to survive in the environmental conditions?”			
Evidence- <ul style="list-style-type: none"><li>• 1st piece of evidence is supported with reasoning that goes BEYOND what was stated on the ToolBox chart and <i>makes good sense</i></li></ul>			
<ul style="list-style-type: none"><li>• Conclusion- a statement that wraps up the paragraph in a way that masterfully sums up the paragraph</li></ul>			
<ul style="list-style-type: none"><li>• Spelling, grammar and language conventions- have minimal mistakes</li></ul>			

Print these sheets double sided, so, for example, one side says "Acidic" and the other "Neutral Acidity"

# Acidic

# Hot



# Neutral Acidity

# Cold

Wet

Salty

Dry

Low salt

Oxygen atmosphere

Carbon Dioxide  
Atmosphere

Sulfur atmosphere