Total Score: ___/50

Name _____

Homework 1

Due April 10th at the beginning of lecture

Instructions:

You are welcome to discuss concepts with your classmates but must compose your own answers. If you are unsure of the honor code for this course, please ask or look at the course website. http://www.its.caltech.edu/~bi1/Bi1__Micro-_to_Macro-Biology/Policies.html
The goal of this assignment is to help you understand a dense research paper. Many of the questions do not have a single correct answer. You will be given full credit as long as your answer is reasonable.
The answers must be legible and should not extend past the allotted space. Keep in mind that a few well-written sentences can give a higher score than a whole page of text.
Remember to write your full name on each page.

Read Komeili et al., (2006) Magnetosomes Are Cell Membrane Invaginations Organized by the Actin-Like Protein MamK. *Science.* 311: 242-245

1) *Science* papers don't follow the traditional paper organization discussed in recitation section with headers for each section of the paper. Instead, the papers contain all of the requisite information, but the sections blend one into the next. As you read through Komeili *et al.*, pay attention to how it is organized and mark the transitions from one section to the next. In the table below, write the first line of each section. (5 points)

Abstract:	
Introduction:	
Materials and Methods:	
Results:	
Discussion:	

Name _____

2) **In one or two sentences**, answer the questions below in the left column. In the right column note which section of the paper (following your division above in Question 2) contained the relevant information. Some answers may be found in multiple sections, but you only need to list one. (20 points)

	Which section?
What was the scientific goal or hypothesis of this paper?	
What is a magnetosome composed of?	
What do magnetosomes help the cell accomplish?	
How did the authors determine the localization of the magnetosomes?	
Where are magnetosomes located? Do the results of this paper agree or disagree with previous results using other techniques?	
The authors saw that intracellular filaments were associated with magnetosome chains (Figure 2). What other observation led them to investigate the role of cytoskeleton-like proteins in magnetosome localization?	
What is MamK?	

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How did the authors investigate the localization of MamK?	
What happens to magnetosome positioning in cells without the protein MamK? What does this suggest about the role of MamK?	
Why are the results of this research significant?	

3) Propose an experiment to test if other proteins affect MamK localization. **(6 sentences maximum)** (5 points)

4) Is there any evidence **in this paper** that bacteria sense magnetic fields? If so, where is this information located in the paper? If not, where might you find it? (2 points)

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5) This question can be answered by thinking critically about the environment in relation to magnetic fields. However, feel free to use additional outside sources to supplement your answer. If you do use outside sources, please cite them in your answer. (8 points)

a) The authors state that magnetotaxis helps bacteria "search for their preferred microaerophilic environments". What information does Earth's magnetic field provide that might help bacteria find different concentrations of oxygen? **(4 sentences maximum)**

b) Based on your answer to a, what regions of the planet would you **not** expect to have magnetotactic bacteria, and why? **(4 sentences maximum)**

6) Magnetosomes are an active area of research and there been many developments since this paper was published. Finding related research is an important skill regardless of your field. Answer the following questions using Web of Knowledge (http://apps.webofknowledge.com/) **(no sentences needed)** (10 points)

a) How many times has this paper (Komeili *et al.* 2006) been cited?

b) What is the most recent paper that cites Komeili *et al.*?

c) What is the most cited paper that cites Komeili *et al.*?

d) What is the title of one review that cites Komeili *et al.*?

e) How many times has Grant Jensen cited Komeili*et al.*?