

## Study Guide: BIO 1030, Second Midterm

Note: This is an unedited version—check again in two days for an error free version.

**Sarah Marie Michienzi will be holding an exam review session, Friday, April 18th from 11:45 - 1:45, location to be announced this coming Monday. If you have any questions, please contact Sarah at: [az4268@wayne.edu](mailto:az4268@wayne.edu)**

### Childbed Fever & the Nature of Science

(Read online: [Scientific Inquiry: Invention and Test](#) (Hempel).

1. You should do well on the test if you know and understand the following:
2. What is puerperal fever (aka child bed fever)?
3. What was Semmelweis's problem, his starting point?
4. Name 3 mistaken hypotheses, and describe the test used to falsify each one.
5. What was the correct hypothesis? What event led Semmelweis to first suspect that it was the key explanation? How did he go about testing it? What were the results?
6. What does Semmelweis's story tell us about the history of science?
7. The Semmelweis washing hands discovery was a forerunner of which great medical / biological theory?

### The Cell

Read: *Essential Biology*, pp. 55-9). Supplementary visual slide show (in French): Powers of 10: [PPT Format](#) / [PDF Format](#)

1. Describe 3 types of scientific instruments which helped expand our senses and improve our understanding of the world.
2. Name 3 types of microscopes and explain what you can see with each kind of scope.
3. Name and explain three key characteristics of a microscope
4. Summarize the cell theory in one sentence
5. Differentiated between unicellular and multicellular organisms
6. Differences between prokaryotes and eukaryotes
7. Being able to use scientific notation—powers, e.g., express  $10^7$  and  $10^{-7}$  in plain English

### Photosynthesis

Read *EB* pp. 104-106, 108 [*Engelmann's experiment only*], 114-116

1. Name and explain at least two reasons which make human beings absolutely dependent on photosynthesis for the own survival.
2. Describe the photosynthetic reaction
3. What was Engelmann's hypothesis? prediction? His test?
4. What happens to white light, when it passes through a prism?
5. How was Engelmann able to determine the rate of photosynthesis?
6. Which colors were most and least effective in promoting photosynthesis?
7. Describe and explain a practical application of Engelmann's results
8. What's the connection between the greenhouse effect and photosynthesis?
9. What is the role of the atmosphere in the greenhouse effect?

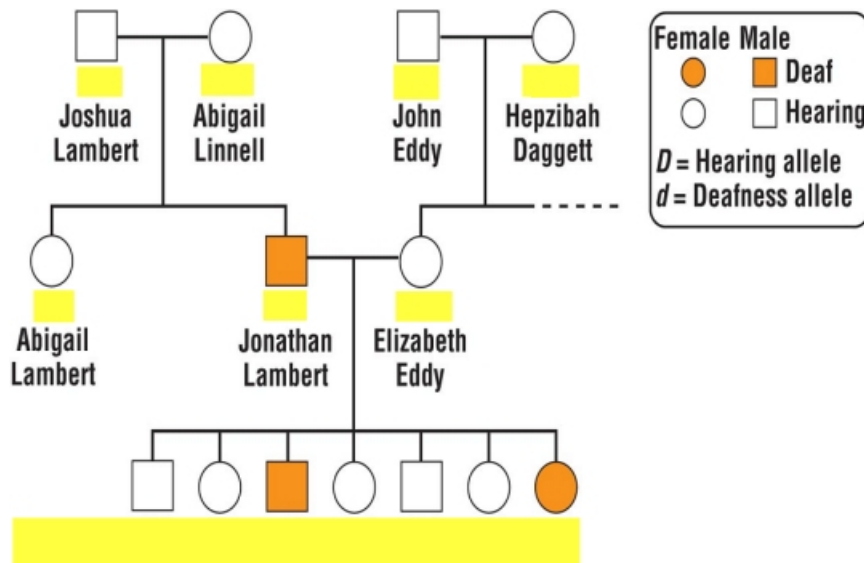
10. What are the key greenhouse gases?
11. Explain the statement: The earth's atmosphere, and particularly its greenhouse components (carbon dioxide, water, methane, and some others), serves as blanket?
12. Is the greenhouse effect, by itself, good or bad? So, actually, what we should be talking about is the \_\_\_\_\_ greenhouse effect.
13. Explain the statement: Global warming (or the greenhouse effect) justify the belief that you can, indeed, have too much of a good thing.
14. What the relationship between deforestation and global warming?
15. Name two key sources of rising levels of CO<sub>2</sub>.
16. Name at least 3 present (right now, as we take the test) impacts of global warming.
17. Which other facts suggest that climate change might be real?
18. Use the example of cyanobacteria to support and explain the statement: "Life can profoundly affect the biosphere and the process of evolution.
19. Can parallels be drawn between the impact of blue-green algae a long time ago and the impact of humanity now?
20. What's wrong with this argument: A lot of people out there complain about the "greenhouse effect" and the presence of "too much carbon dioxide." What these fools do not realize, is that carbon dioxide is essential to life. Without it, earth would be too cold, and there would be no photosynthesis. So, the claim of "global warming" is pure hogwash

### **Patterns of Inheritance**

*Read: EB, 143-148 [including only top 2 paragraphs of p. 148]; 150-155)*

1. What are the parallels between Mendel and Semmelweis?
2. Construct a table with 4 cells, showing the expected distributions of 100 simultaneous tosses of a nickel and a dime
3. Let's assume that Detroit has 80,000 families each with precisely two children. How many families will have either two boys or a boy and a girl? How many will have just two girls? What is the ratio of the first number to the second?
4. Imagine yourself a banker. To save money, you devised an ingenious scheme of monitoring the vigilance of your bank's night watchman. At the opposite ends of the building, there are 2 light switches. Every hour during his 10-hour shift, the guard must approach one switch and flip a coin. If it's Heads, he is to turn the switch on, if it's Tails, he is to turn it off. He then must approach the second switch and repeat the same procedure. If both switches are on, the light is on. If either one is off, or if both are off, the light is off. You have installed a special machine that tells you, for every hour, whether the light has been on or off. Four months and 1000 hours later, you examine the lighting record to determine whether the guard should receive a raise or be fired. You observe that during that time, the light has been on 570 hours and off 430 hours. In *Zax*, green skin color is determined by a recessive gene, while purple skin color is determined by a dominant gene?
  - a. What is the phenotype of a green *zax*? The genotype? Is it homozygous or recessive?

- b. Can I determine the genotype of a purple zax by just looking at it? If I have no farther information, what can of genotypes might a purple zax have? How can I determine the genotype of a purple zax?
  - c. A purple zax married a green zax and they had 4 children. Two of the children were green and two purple. What is the genotype of the purple parent? Is it homozygous or heterozygous?
  - d. A true breeding purple zax married a true breeding green zax. What will be the phenotype of their children?
  - e. These children now got married to children with the same kinds of parents and had 20 children, in their turn. What kind of zax you expect now?
6. Please determine the genotypes of each individual in the chart below. When the identity of a gene is unknown, use a –.



7. Illustrate and explain the term “incomplete dominance.”
8. Albinism is a recessive trait. What probabilities would you give a married couple, both of whom are albinos? A married couple, where both have normal skin color, but are carriers of the disease?
9. List and explain four reasons why it’s unwise to boast about having descended from, say, the nasty English King John, who was forced to sign the *Magna Carta* on 1215?
  1. Give one example where genetics is known to have a profound impact on history.
  10. Give one example where genetics is known to have a profound impact on history.
  11. Among other colors, the coat color of Labrador retrievers can be black or chocolate. Black is determined by a dominant allele (gene) and chocolate by a recessive allele.
    - a. What is the phenotype of either dog?
    - b. What is the genotype?
    - c. What will happen when a chocolate bitch mates with a black dog?

12. The gene for freckles is dominant. A freckled lady married a non-freckled man.
  - a. What's the lady's genotype?
  - b. What the lady's genotype if her daughter has no freckles?

### **Proteins, DNA, and the Genetic Code**

Read: Proteins and DNA [EB 46-51]; the Genetic Code (EB 179-180)

1. Give two examples of biological macromolecules
2. Most of the work that is carried on in a cell is carried out by which specific type macromolecule? Which class among these carry out most of the work?
3. Describe the chain structure (not chemical structure) of both DNA and protein. How many components in each.
4. Why does life need a genetic code? What's the basic idea behind the code?
5. Why can't you have just two nucleotides specifying one amino acid in that code?

### **Frankenstein's Monsters?**

Read: EB, pp. 219-223; 227-229 [to 2nd parag.]; 236-237 [safety to goal?]

1. Why do some people view GMOs as Frankenstein's monsters? Describe a few specific examples of such monsters.
2. What's special about half the corn produced in the USA today, as opposed to corn produced in, say, 1960? Please explain the unique features of this corn and how it is made.
3. Describe and explain the process of DNA fingerprinting.
4. How was modern genetics able to throw light on the origin of Cheddar Man?
5. What was one positive contribution of DNA fingerprinting? What does it tell us about our criminal "justice" system? What are the implications of this to capital punishment?
6. If you were arrested for murder which you did not commit, would you trust the system, knowing that the truth will out?
7. Describe and explain evidence suggesting that GMOs are unsafe, paying special attention to Dr. Dr. Arpad Pusztai's work, conception rate in pigs, preferences of wild animals, and effects of GMOs on monarch butterflies
8. What were the key points in Michael Moore's film "Congressional Pimp." How much light does this film throw on our country's decisions regarding GMOs? Climate change?

### **Canaries in a Coal Mine**

Read: [Easter Island](#) and EB, 393-396); An *Inconvenient Truth* (film shown in class; [for a summary of film, click here](#))

1. What does it mean: Canary in a coal mine? Why is this the theme for this unit?
2. What is colony collapse disorder? What are the effects on bees? How many hives are lost? What will the world be like, if the bees are gone? What are the possible causes of this tragedy?
3. What is the bat situation in the USA? What are bats good for? What might be the cause of their troubles?

4. Where is Easter Island? When was it first discovered by the outside world? What condition was it in, when it was discovered? What sciences helped explain its decline by the 18<sup>th</sup> century? What were the causes of collapse? Compare the ecology of Easter Island in the 7<sup>th</sup> century to the 17<sup>th</sup> centuries. Which exotic species caused most of the collapse? Which exotic species caused additional collapse? What are the lessons of Easter Island to us? What advantage, according to Diamond, do we have over the Easter Islanders, which may save us from their fate? What happened to their diet? Why did it decline? What kind of canoes did they have in the 8<sup>th</sup> century and the 18<sup>th</sup>?
5. Describe and explain the Iranian chess board puzzle. What does it have to do with population?
6. What happened to world population over the millennia? Give as many details as you can.
7. Explain the meaning of the word “sustainable.”
8. I place a single bacterium in a dish right now, 11 a.m., Wed., April 14, 2008. It splits into 2 in 30 minutes, into 4 bacteria in the next 30 minutes . . . Let’s say the dish can only hold 1 million bacteria, and that this point will be reached by 4 p.m. today. At what time will the dish be half-full?
9. Summarize the key point of the 1992 warning of the majority of world scientists to humanity.
10. According to Al Gore’s *An Inconvenient Truth*, what are the:
  1. Present impacts of climate change.
  2. 3 causes of humanity’s collision with Earth.
  3. 3 misconceptions about climate change.

### **Human Impact on the Environment**

Read: EB 439-462

2. Be familiar with examples of an exotic (introduced) species, and, when described in the text or lecture, their negative impact on their new ecosystem.
3. Release of various substances into the biosphere and their effects. The distinction between synthetic and natural poisons.
4. Concept of biological magnification. Give one example.
5. Why is the ozone layer important? What happened to it in Antarctica’s spring? Over our heads?
6. How far up above our heads is the ozone layer located? How does it carry out its good works? Why is it at risk? What are the long-term consequences of this depletion?
7. Three levels of biological diversity
8. Describe the extent of species loss in the world? What’s likely to happen?
9. How does habitat destruction contribute to species extinction?
10. Give an example showing that exotic species can cause species extinction too.
11. Another cause of species loss is overexploitation. Document this with a few examples. Document this with the Easter Island saga.
12. Why is biological diversity important? Give examples.

13. Lessons of the red-cockaded woodpecker to conservation biology.
14. Why are hot spots and wilderness areas important?
15. Variety of steps you can personally take to save the earth.

**Animal Behavior: Do Animals Think?**

*Read: Lecture*

1. Describe various examples suggesting that animals might be capable of thinking. In what ways is each suggestive of thinking?
2. Describe two examples suggesting that animals might be incapable of thinking. In what ways is each suggestive of incapacity to think?
3. Give examples of thinking.
4. Various observations suggesting that elephants think. In what way does each observation raise the possibility of thinking?
5. Any given behavior of an animal could be caused by one of 3 factors. What are they. Explain. How can you show that a behavior is genetically acquired? Acquired by trial and error?
6. How much light do hyena mothers throw on the controversy about animal thinking?
7. What's the Clever Hans story? Why is it a cautionary tale?
8. According to Fabre, do insects think? What kind of evidence does he give for his conclusion? Be sure to be familiar with all experiments describe in the lecture.
9. Describe the string-pulling experiments with elephants. What conclusion do they suggest?
10. Describe the Povinelli paradigm and its application to chimpanzees and elephants. What conclusion emerges from these experiments?
11. Do elephants understand what they are doing when they remove a lid off a bucket to get a treat inside the bucket? Explain.
12. The elephant competition experiment overall lends more support to the thinking hypothesis or to the trial and error one?