Student Questions

These questions were written during the 2-minute write at the end of lecture and discussed with the class during the following lecture meeting, on the dates indicated. I recommend that your review these questions and your notes from our discussion as you learn about biology. You may be tested on some of this content. (If I don’t address your specific question in class, you are welcome to pursue it during my office hours.)

Thursday, January 6, 2005: Introduction to the science of biology
1. I’m confused about the CHNOPS thing. What does it have to do with levels of organization [in biological systems]?
2. How can you tell if cells are prokaryotic or eukaryotic?
3. How do prokaryotic cells, or other cells without mitochondria provide enough energy for cell function?
4. What is the difference between kingdoms and domains? How many kingdoms are there?
5. DNA seems to be the building [instructions] for everything in a cell, but where are the instructions for DNA?
6. What would be the best possible [bait] scent for catching crab in the bay?

Tuesday, January 11, 2005: The process of science and introduction to Darwin
1. Do plants give off heat during photosynthesis? What would be their loss of energy (during energy transformations) if not as heat?
2. Is it still deductive reasoning when you don’t try to prove that something is true, but instead try to prove that it is false?
3. What did Darwin observe that made him want to explain evolution?

Thursday, January 13, 2005: Natural Selection and intro. to cell division & genetics
1. Are any of the phenotypic changes in humans (e.g. loss of wisdom teeth) an example of macroevolution?
2. Does binary fission only occur in prokaryotes?
3. Why do nerve cells not divide by mitosis?
4. Why do cells age?
5. Are there genes that only control the expression of other genes?
6. How are heterozygous genotypes related to “carriers” of genetic diseases?

Thursday, January 20, 2005: Population genetics and introduction to speciation
1. Does meiosis occur in the same amount of time as mitosis, or does it take longer?
2. Does crossing-over occur during mitosis?
3. What is the purpose [or advantage] of crossing-over during meiosis?
4. If a person is heterozygous for a certain character (Aa), could crossing-over occur in the production of one gamete and not in the other(s)? Could crossing-over occur during reproduction in one generation, and then reverse in the next generation?
5. Is a hybrid always a new species or can they breed back to their parent species?
6. Are mating habits in species inherited or are they a consequence of the environment?
7. How much genetic difference does there need to be to consider two populations different species?
Tuesday, January 25, 2005: Speciation
1. Are the gradualism and punctuated equilibrium model accepted as counter-theories or coinciding theories?
2. When discussing evolution, the concept of a “common ancestor” is often mentioned, if evolution has always been occurring, where did the “common ancestor” come from or evolve from?
3. Are humans polymorphic? If so, could we evolve into separate species overtime?

Thursday, January 27, 2005: Origin of Life and Early Eukaryotes
1. Support for ancestral community for eukaryotes: greater base of genes to produce current branching? Does the analogy of a tree with extensive root system work?
2. What caused early [prokaryotic] cells to grow in size and become compartmentalized?
3. If there was no life when Earth was formed, how can there be life if matter can neither be created nor destroyed?
4. Assuming inorganic molecules form nucleotides and then RNA, at what point can you call an arrangement of these molecules life?
5. It seems like everything come from something, but where did all start? If it is the big bang, from where did the energy for that come?

Tuesday, February 1, 2005: The colonization of land by plants
1. How does oxygen cause us to age?
2. Diploid and haploid still confuse me. [How do these terms relate to gametes and zygotes?]
3. [What] do we have to know about the chemical processes of photosynthesis?
4. [What] do we have to know about the different life cycles of plants?
5. What is the difference between seeds and spores?

Thursday, February 3, 2005: Seed plants
1. Why [is] an animal that disperses pollen called a “vector”?
2. In angiosperms, why does [the megaspore in] the ovule undergo mitosis before fertilization?
3. [In angiosperms, double fertilization produces a 2N zygote and 3N endosperm.] Why is the endosperm triploid (3N)? Are there any other plants (outside angiosperms) that are triploid?
4. In agriculture, what is the difference between artificial selection and genetically modified foods?
5. How closely related are wild and “domesticated” yeasts (are they different species)?

Tuesday, February 8, 2005: Fungi
1. What is the difference between diffusion and osmosis? Could substances diffuse out of hyphae?
2. Are all unicellular fungi called yeasts? How does yeast work in bread-making?
3. Do all fungi produce antibiotics (like Penicillium), or is penicillin just the most effective?
4. When does a multicellular organism cease to be a colony of individuals?
Thursday, February 10, 2005: Introduction to Ecology
1. Do any chemicals evaporate with water or does water always separate from anything it is mixed with?
2. What is the Ekman transport vector? Why is it important?
3. What are the lowest points in the ocean? What could possibly live there?

Thursday, February 17, 2005: Population Ecology
1. Haven’t we seen whales breaching with giant squids?
2. To what phyla do puffballs belong?
3. Is a forest or grassland considered a uniform distribution?
4. When calculating population sizes, do you count migratory species?
5. Do we know the carrying capacity of the world for humans?

Tuesday, February 22, 2005: Population and Community Ecology
1. When determining human population growth, do the only consider natural death or all causes?
2. In the barnacle example, are you saying that Balanus is better suited to the environment and that if desiccation was not a problem at the higher water level, they would force out the Chthamalus?
3. Assuming two species occupy the same ecological niche, why couldn’t they both co-exist assuming they were equally fit?

Thursday, February 24, 2005: Community Ecology
1. Wouldn’t ash and other material [following an eruption or forest fire] be nutrient-rich and counted as soil, therefore making it secondary succession?

Tuesday, March 1, 2005: Community Ecology
1. What happens to the rest of the light energy if only 1% is used?
2. How would omnivores be classified in consumer nomenclature?
3. If organic and inorganic materials are only recycled, where are they from?
4. Is there any way to artificially produce photosynthesis to limit CO2?
5. If we need 2,000 calories per day and maybe half go out as feces, does that mean that we use only 10 calories for growth per day?

Thursday, March 3, 2005: Introduction to Animal Evolution
1. What is the difference between morphogenesis and metamorphosis?
2. When does the zygote become an embryo?
Tuesday, March 8, 2005: Invertebrate biodiversity
1. How do animals with gastrovascular cavities prevent self-digestion?
2. [Related to nervous system function.] Isn’t the human spinal cord the same tissue that makes up the brain, so that when you react to a stimulus (heat, noise), doesn’t the spinal cord act like another specialized brain?
3. If humans had a gastrovascular cavity, would it mean a smaller body size because they wouldn’t be able to eat all of the time?
4. If clams are protostomes, does that mean they eat from one end and have an anus at the other end?
5. Can the animals that must molt in order to grow control when this happens, e.g. when they’re threatened?

Thursday, March 10, 2005: Chordates and the Origin of Vertebrates
1. At what point do specialized organs appear (kidneys, liver, etc.)?
2. Are there eggs that are not amniote?