Science 316  Sample questions, exam 3

Notes:
This sample exam contains questions primarily relevant to the final 3rd of the class (though some will also require remembering earlier material). Remember, however, that your final will be cumulative – previous sample questions are a good place for you to look to study for the review section of the exam. The distribution will be ~75 points covering the final 3rd of the course and ~25 points covering the first $\frac{2}{3}$ of the course. On the final you will be allowed a larger note sheet – a full 8.5 x 11 sheet of paper.
Remember as you go through these example questions that on the final they may appear in modified form. For this reason try to focus not on the answer to the question, but on the reasoning behind the answer – it is this reasoning that will allow you to answer related questions on the exam. You should be able to explain not only why the right answer is right, but why the wrong answer is wrong.

1&2) Use this food chain to answer the following questions:

1) What is the original source of energy for this food chain?
   A) The Grass
   B) Mouse feces
   C) The sun
   D) Convection
   E) Conduction

2) What process(es) are important means of converting energy from one form to another in this food chain?
   A) Digestion
   B) Respiration
   C) Photosynthesis
   D) A and C
   E) A,B, and C

3) The energy pyramid has its characteristic shape because of:
   A) The inefficiency of energy transfer as required by the 1st law of thermodynamics (Conservation of energy).
   B) The conversion of energy to heat required by the 2nd law of thermodynamics (Order to Disorder).
   C) The destruction of energy as required by the 3rd law of thermodynamics (Demolition of Energy)
   D) A and B
   E) A, B and C

4) In Competition:
   A) One organism benefits while the 2nd is harmed
   B) Both organisms are harmed
   C) Both organisms benefit
   D) One organism benefits while the 2nd organism is unaffected
   E) One organism is harmed while the 2nd organism benefits

5) Think about the definition of evolution to answer this question.
   True or false: Individuals can evolve.
   A) True
   B) False
6 & 7) Use the food web given here to answer the following questions:

6) Which of the following organisms use energy initially captured by both the Oak and the Grass?
   A) Grasshopper
   B) Chipmunk
   C) Hawk
   D) A and B
   E) B and C

7) If the grass captures 300 Joules of energy in a day and the Oak captures 200 Joules in the same day, what will eventually happen to that energy? (Hint – it may take a very long time)
   A) 500 Joules will be converted to energy in Chipmunks.
   B) 250 Joules will be converted to heat, the rest will be split between the hawk and the spider
   C) 250 Joules will be spread evenly among the animals, 250 Joules will be converted to light energy.
   D) 500 Joules will be converted to heat
   E) 250 Joules will be converted to energy in Chipmunks, 100 Joules will be converted to energy in Squirrels and 150 Joules will be converted to energy in Grasshoppers.

8) Which of the following species interactions is/are demonstrated in this food web?
   A) Predation
   B) Herbivory
   C) Competition
   D) A and B
   E) A, B and C

9) Many corals contain living photosynthetic algae in the cells that line their gut. These algae are not digested, but produce sugars and starches that the corals use as food. The corals are well defended, and algae that are incorporated into the coral are less susceptible to herbivores than algae growing outside of the coral. The interaction between corals and algae is an example of:
   A) Parasitism
   B) Commensalism
   C) Competition
   D) Mutualism
   E) Predation

10) Some scientists believe that by increasing the combustion of fossil fuels, human beings are influencing atmospheric levels of CO2. Which of the following is a way that this excess CO2 could potentially be removed from the atmosphere (assuming we could accomplish it), in order to stabilize atmospheric levels of CO2?
    A) Increasing global respiration rates.
    B) Increasing global photosynthetic rates.
    C) Increasing global digestive rates.
    D) Decreasing global photosynthesis rates.
    E) Decreasing global sedimentation rates.

11) In the diploid life cycle, which of the following processes does mitosis immediately follow?
    A) Fertilization
    B) Meiosis
    C) Formation of spores
    D) A and B
    E) B and C
12) Which form of evolution can be defined as tiny microevolutions, over sufficient time, add up and accumulate in isolated populations and eventually result in new species.
   A) Punctuated equilibrium
   B) Homeobox mutation
   C) Punctuated gradualism
   D) Allopatric speciation
   E) Gradualism

13) Macroevolution uses which of these scientific fields to support their hypothesis?
   A) Tree-building
   B) Phylogenetics
   C) Comparative anatomy
   D) Fossil record
   E) All of the above

16) In order for natural selection to occur, which of the following is/are necessary?
   A) Variation
   B) Differential reproduction
   C) Heredity
   D) A and C
   E) A, B and C

17) A farmer notices that his walnuts come in a wide range of sizes. He wants to increase the average size of his walnuts, so he only allows trees which produce the largest walnuts to breed. He continues to breed the trees for twenty years, constantly destroying trees with small walnuts and breeding trees with walnuts above a certain size. After twenty years, he measures his walnuts and finds no change in the average nut size. Which of the following is most likely missing, and would account for the farmer’s inability to increase the size of his walnuts?
   A) Differential survival based on walnut size
   B) Differential reproduction based on walnut size
   C) Variation in walnut size
   D) Heredity of walnut size

19) A small, isolated population (i.e., individuals cannot enter or leave) of 20 goats lives on an island. There are several traits that vary, resources are abundant, no mating preferences are observed, and each goat is likely to have the same number of offspring over its lifetime. Over the years of the study, no mutations appear. Can this population evolve, and if so, what mechanism would be most likely to account for that evolution?
   A) Yes; natural selection
   B) Yes; gene flow
   C) Yes; sexual selection
   D) Yes; genetic drift
   E) No – the population will not evolve.

20) Which of the following processes can lead to adaptation?
   A) Mutation
   B) Gene flow
   C) Natural Selection
   D) Genetic drift
   E) None of the above
23) The barnacle is a creature that benefits enormously from an association with whales. The barnacle attaches itself to the whale's skin and gets transported from place to place without having to expend energy, and can thus find food very easily – the whale delivers it to food rich waters in its own travels. The relationship between barnacles and whales is termed commensalism. Knowing this, which of the following would you expect to be true?
   A) The whale is harmed by the barnacle's presence.
   B) The whale is unaffected by the barnacle's presence.
   C) The whale benefits from the barnacle's presence.
   D) The barnacle is harmed by the whale’s presence.
   E) The barnacle is unaffected by the whale’s presence.

24-26) Label the energy pyramid below with the energy conversion process that each numbered arrow represents. For example, Question number 24 is asking for the process that converts energy in plants into energy in herbivores. Possible answers are to the right of the pyramid, and answers may be used more than once.

   ![](energy_pyramid.png)

   Possible Answers:
   A) Fermentation
   B) Photosynthesis
   C) Digestion
   D) Condensation
   E) Respiration

28) An athlete trains in high altitude conditions, developing increased heart and lung capacity. After competing, she moves back to the lowlands and has a child. Can she expect her child to inherit these acquired traits? Why or why not?
   A) Yes. Offspring always resemble their parents
   B) Yes. You can pass on traits acquired over your lifetime
   C) No. These traits are a response to the environment, and are not heritable
   D) No. Each child receives only ½ of it's DNA from the mother, so the child is unlikely to inherit the right combination of genes.
   E) Cannot determine from available information
30) Farmers observe a drastic decline in their grain harvest. Some of the farmers blame this on a huge increase in the rodent population, and argue that predators – which were hunted intensely the last several years – need to be brought back to kill the rodents, while other farmers object to their return. They get together to test the hypothesis that the drop in grain harvest was caused by the absence of predators. Which group(s), below, should they measure the harvest of in order to best determine whether or not an absence of predators reduces harvest?

Group 1: 5 fields where predators are allowed to hunt normally
Group 2: 5 fields where predators are excluded by fences.
Group 3: 5 fields where predators are captured and kept in the fences with prey

A) Group 1
B) Group 2
C) Groups 1 and 2
D) Groups 1 and 3
E) Groups 2 and 3

31-34) Match the letter of the item in the right hand column that best describes or is best associated with each term (s) in the left hand column. Each letter should be used only once.

31) ______ Natural Selection A. A form of evolution driven by random changes in the DNA of individual organisms.
32) ______ Genetic Drift B. A form of evolution driven by random events, particularly important in small populations.
33) ______ Gene flow C. A form of evolution driven by the ability of individuals with particular traits to survive better than individuals with other traits.
34) ______ Mutation D. A form of evolution driven by the movement of individuals between populations.

E. A form of evolution driven by non-random mating of individuals.

35) The biggest difference between microevolution and macroevolution is that macroevolution deals explicitly with ________, while microevolution does not deal with it.

A) Changes in gene frequency
B) Variation
C) Speciation
D) Heredity
E) Differential reproduction

36) Which stage(s) of the life cycle to the right is/are diploid?

A) Adult
B) Offspring
C) Zygote
D) A and B
E) A and C

38-39) Use the Evolutionary tree for the major groups of animals provided to answer the following questions. Groups of animals are listed in bold type at the ends of branches, while traits that are important to separating the various groups are in italics alongside or through the branches. Note: it is not necessary that you know what these organisms or traits are. If you can read the diagram you can answer the questions.
38) Which of the following groups of organisms possess a pseudocoelom?
   A) Cnidaria
   B) Nematoda
   C) Echinodermata
   D) A and C
   E) A and B

39) Which of the following groups of organisms is most closely related to the Arthropoda?
   A) Cnidaria
   B) Sponges
   C) Echinodermata
   D) Annelida
   E) Vertebrates

40) In order for two populations to be considered separate species, what must exist between them?
   A) Geographic isolation
   B) Migration
   C) Differential reproduction
   D) Diversifying evolution
   E) Reproductive isolation

41) Which of the following is/are meiosis important to?
   A) Growth
   B) Sexual reproduction
   C) Asexual reproduction
   D) A and B
   E) B and C
43) A cell with a total of 20 chromosomes undergoes mitosis. The daughter cells will each have:
   A) 10 chromosomes
   B) 20 chromosomes
   C) 30 chromosomes
   D) 40 chromosomes
   E) a random number of chromosomes

44) A cell with 8 chromosomes undergoes a process which results in 4 cells with 4 chromosomes each. The original cell, with 8 chromosomes, was_____ , and the process that the original cell went through was______ .
   A) Haploid; Mitosis
   B) Diploid; Mitosis
   C) Triploid; Mitosis
   D) Haploid; Meiosis
   E) Diploid; Meiosis

45) The Great Dane and the Chihuahua are examples of dogs that have undergone ______ via the process of _____.
   A) Convergent evolution; natural selection
   B) Convergent evolution; artificial selection
   C) Stabilizing selection; natural selection
   D) Divergent evolution; gene flow
   E) Divergent evolution; artificial selection

47) Two populations live in the same habitat, but cannot interbreed: One population breeds in the spring, and the other breeds in fall. This is an example of _______ , a ________ reproductive isolation mechanism.
   A) Temporal isolation; prezygotic
   B) Gametic isolation; prezygotic
   C) Gametic isolation; postzygotic
   D) Temporal isolation; postzygotic
   E) Behavioral Isolation; postzygotic