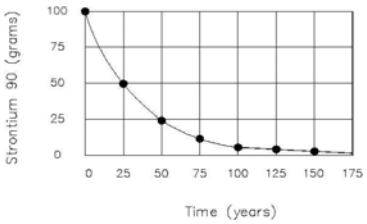
BOT/MBIO/ZOO 1005 – Concepts in Biology
Midterm 3 (100 points) -- Form 1 (Blue)
November 20, 2007

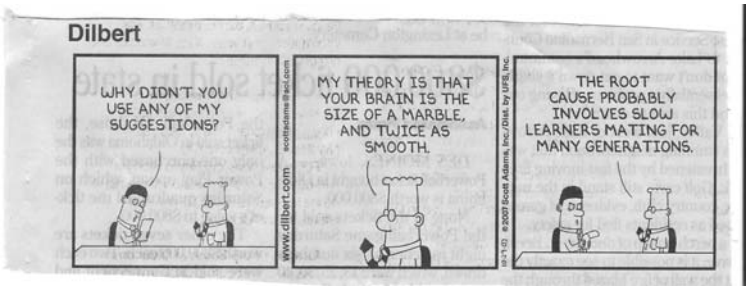
Part I: Multiple choice, true-false, and matching (50 points)



True-false (mark T for true, F for false):

1. According to the graph at right, the half-life of the radioactive element strontium-90 is 25 years.
2. The theory of endosymbiosis explains how mycorrhizal fungi colonized the roots of land plants about 475 million years ago
3. Whereas all animals are heterotrophs, all fungi are autotrophs.
4. Many fungi reproduce both sexually and asexually, and their feeding filaments are called hyphae.

Multiple choice / matching



5. The Dilbert cartoon at right best illustrates:
   a. the bottleneck effect
   b. nonrandom mating
   c. the absence of evolution
   d. sexual selection
   e. mutation

6. According to the movie, the *Triumph of Life*:
   a. the origin of life came before the origin of photosynthesis
   b. the first animals to use land for reproduction were horseshoe crabs
   c. arthropods were among the first animals to move onto land full-time
   d. a, b, and c are true
   e. only b and c are true

7. Which of the following statements is true?
   a. Scorpions are gastropods
   b. Monotremes are lichens
   c. Flatworms have radial symmetry
   d. Crustaceans are arthropods
   e. Most echinoderms form mycorrhizae

8. Which of the following statements is FALSE?
   a. Humans would be better off if we could eradicate all prokaryotes.
   b. The theory of "membrane infolding" has been proposed to explain the origin of the nuclear envelope.
   c. Both mitochondria and chloroplasts contain DNA.
   d. Slime molds are protists that can be either unicellular or multicellular.
   e. Algae are protists that can have brown, red, or green photosynthetic pigments.

9. In a flowering plant or a gymnosperm, pollen is analogous to ...
   a. the fetus inside a placental mammal
   b. the baby inside a marsupial's pouch
   c. the sperm cells that fertilize a female's egg cells
   d. the fruit that holds the plant's seeds
   e. the cone that produces a pine tree's seeds

10. A fish called an Amazon molly is a hybrid of two parental fish: *P. mexicana* and *P. latipinna*. By the biological species concept, are *P. mexicana* and *P. latipinna* different species?
    a. yes, definitely
    b. yes, but only if the Amazon molly can produce fertile offspring
    c. yes, but only if *P. mexicana* and *P. latipinna* look different from one another
    d. yes, but only if the Amazon molly is sterile
    e. no, definitely not

11. In fruit flies, courtship includes a "song" in which a male fly extends one wing and vibrates it. Individual flies don't make this song in exactly the same way, and if the female doesn't like a male's song, she will not mate with him. This example illustrates:
    a. radiometric dating
    b. fly dating
    c. sexual selection
    d. survival of the fittest
    e. genetic drift

12. A short article called "Rethinking Earth's early years" in *Discover* has this quote: "…the diamonds were dated between 3.1 billion and 4.3 billion years old…" Which of the following isotopes might be useful in coming up with that date?
    a. ^{12}C, a stable (nonradioactive) isotope
    b. ^{187}Pb, with a half-life of 15.2 seconds
    c. ^{59}Fe, with a half-life of 44.5 days
    d. ^{14}C, with a half-life of 5730 years
    e. ^{40}K, with a half-life of 1.26 billion years

13. Which of the following pairs are <u>homologous</u> to each other?
    a. cat tail … human tail bone
    b. deer antlers … insect antenna
    c. butterfly wing .. bird wing
    d. the mantle of an oyster … the mantle over my fireplace
    e. a, b, and c are all homologous

14. In the excellent movie *Maria Full of Grace*, the title character smuggles heroin into the United States by swallowing small rubber packets containing the drug. She is therefore hiding the drugs in her:
    a. coelom b. digestive tract c. gastrula d. phloem e. both a and b

15. The pelvis of a whale, the pelvic and limb bones of a snake, and the non-functioning eyes in cave-dwelling salamanders all illustrate:
    a. biogeography as a line of evidence in evolution
    b. molecular evidence for evolution
    c. vestigial organs as evidence for evolution
    d. experimental evidence for the mechanism of evolution
    e. comparative embryology as a line of evidence for evolution

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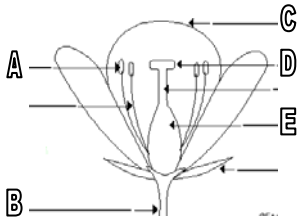
Matching. Each answer may be used more than once or not at all.

16. In the drawing at right, where does the pollen LAND on a female flower?
17. In the drawing at right, where do the seeds form?



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18. Jackson pointed out an error in your lab manual. It says, "Members of the Domain Bacteria are prokaryotic. All other organisms are eukaryotic…" What is wrong with that statement?
    a. Members of Domain Bacteria are eukaryotic; all other organisms are prokaryotic.
    b. Only members of Domain Archaea are prokaryotic; all other organisms are eukaryotic.
    c. Members of both Domain Bacteria and Domain Archaea are prokaryotic; all other organisms are eukaryotic.
    d. Members of Domain Bacteria, Domain Archaea, and Kingdom Protista are all prokaryotic; all other organisms are eukaryotic.
    e. Members of Domain Bacteria and Domain Archaea are eukaryotic; all other organisms are prokaryotic.

19. Place the following events in order from earliest to latest. That is, if you think A came first and F came last, you would enter ABCDEF into your clicker.
    A. polymer formation
    B. formation of lipids that enclosed RNA
    C. endosymbiosis
    D. gastrulation
    E. formation of organic monomers
    F. origin of bilateral symmetry

20. HOW MANY of the organisms in the following list have xylem? Enter the number into your clicker.
angiosperm; bacterium; brown alga; conifer; diatom; dinoflagellate; fern; moss; slime mold

21. Last week, an oil tanker crashed into the San Francisco Bay Bridge, spilling a lot of oil. I heard on the radio that many seabirds have died as a result. Suppose the oil spill ends up killing so many birds that it reduces the genetic diversity of the surviving bird populations. That situation would illustrate:
a. artificial selection
b. bottleneck effect
c. branching speciation
d. punctuated equilibrium
e. mechanical isolation

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22. I found a diagram that mistakenly shows a toad as an example of a reptile. This is incorrect, because a toad is actually a(n):
a. mammal b. bird c. tunicate d. echinoderm e. amphibian

23. Which of the following would be a better example of a living reptile than a toad?
a. *Archaeopteryx* b. turtle c. salamander d. caecilian e. frog

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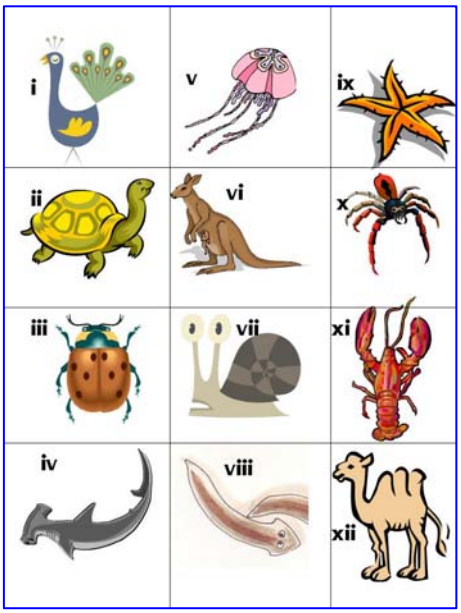
24. In the figure at right, the number of animals with BOTH a complete digestive tract AND a coelom is:
a. 12 b. 10 c. 8 d. 6 e. 4

25. In the figure at right, the number of animals that are arthropods is:
a. 1 b. 2 c. 3 d. 4 e. 5



26. Important! What color is your test form? (0 points)
a. blue b. yellow

Please turn off your clicker once you are done with the exam.

NOTE: If you noticed anything at all unusual happening to your clicker during the exam, please use the space below to describe what happened:

Name _____ ID #_____

MC _____ / 50

SA _____ / 50

Total = _____ / 100

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Score (this page) _____ / 16 points

On my honor, I affirm that I have neither given nor received inappropriate aid in the completion of this exam.

(signed) _____

Part II: Short answer (50 points)

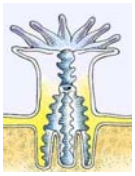
1. Sponges and sea cucumbers are both brightly colored marine animals.

   a. Name one feature that is unique to sponges (2 points): _____

   b. What phylum are sea cucumbers in? (1 point) _____

   c. Sponges and sea cucumbers are immobile or very slow-moving, and they are often brightly colored or produce an arsenal of toxic chemicals. Use natural selection to explain the connection between low mobility and the production of toxic chemicals (3 points).

2. a. The two animals at right both belong to the same phylum. What is it? (1 pt)
   _____



   b. What are two features that place these two animals in the same phylum? (2 points)
   (1)

   (2)

3. a. If you go to the doctor complaining of a yeast infection, she will prescribe different drugs than if you had a bacterial infection. Why won't the same drugs work against these two types of organisms? (2 points)

   b. Which do you think would be hardest: developing new drugs that kill parasitic worms inside your body, or developing new drugs that kill bacteria inside your body? Explain your answer (2 points).

4. Thanksgiving is coming, and that means a lot of turkeys are getting nervous. Turkey breeders are always working to create new lines of turkeys with ever-plumper breasts. Explain how a turkey breeder would use artificial selection to create a new variety with tiny wings and huge amounts of breast meat (3 points).

Name _____ ID #_____

Score (this page) _____ / 21 points

5. a. Bats are mammals; hummingbirds are birds. What phylum do these animals belong to? (1 pt)

   b. What four features do all animals in this phylum have in common? (4 points)
   (1) (3)

   (2) (4)

   c. Name two features that define mammals (2 points).

   d. Despite their differences, both bats and hummingbirds pollinate plants. How do you predict the flowers of bat-pollinated plants would differ from those of bird-pollinated plants? (2 points)

   e. Briefly describe the events that happen from the time of pollination to the development of a mature fruit (3 points).

6. You are part of an expedition to unearth an ancient monastery in Egypt. Historical documents suggest the monastery is approximately 700 years old, but you need physical evidence to support this claim. As part of the excavation, you find a wooden bowl. Using radiometric dating methods, you determine that the bowl has 75% of its original ^{14}C remaining. The half-life of ^{14}C is approximately 5700 years. Does this evidence support the documents? Use the radioactive decay graph to defend your answer (3 points).

7. Name two adaptations that occur in land plants but not green algae. How does each contribute to a land plant's reproductive success? (4 points)

   (1)

   (2)

8. The hackberry tree outside Dale Hall Tower is in bad shape. It is being decayed by some sort of wood rot fungus, as evidenced by an enormous mushroom on the side of the trunk. Suppose your friend says to you, "If the landscapers would just knock that big mushroom off the tree, it would kill the fungus." Do you think that would save the tree? Why or why not? (2 points)

Name _____ ID #_____

Score (this page) _____ / 13 points

9. Use simple drawings to show the difference between an incomplete and a complete digestive tract, and name an example of an animal that has each type of digestive tract (2 points).

10. a. The three groups of mammals are monotremes, marsupials, and placental mammals. How do these three groups of mammals differ in the way babies develop? (3 points)

b. Placental mammals evolved more recently than marsupials. How does the reproductive difference between marsupial and placental mammals explain the fact that placental mammals have driven marsupial mammals extinct almost everywhere around the world? (2 points)

11. A few weeks ago, we had a quiz in which you explained your interpretation of how evolution works. One of the answers was, "An organism has to learn to adapt to the changing conditions in the environment or they will never survive." Explain how this statement misrepresents what really happens in evolution by natural selection (2 points).

12. Complete the following table by placing "yes" or "no" in each open cell (4 points total).

	Vascular tissue	Pollen	Fruit
Conifers	yes		
Mosses	no		
Flowering plants		yes	
Ferns			no

13. EXTRA CREDIT! HIV/AIDS is a challenge to our species; what conditions would have to be met for humans to evolve increased resistance to HIV? [Hint: refer to the two requirements for natural selection]. (2 pts)