

BOT/MBIO/ZOO 1005 – Concepts in Biology

Midterm 3 (100 points) -- Form 1 (Blue)

April 19, 2007

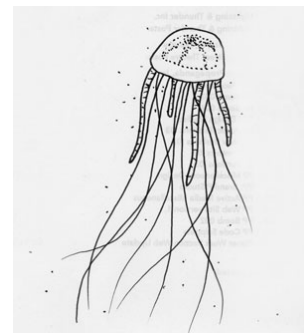
Part I: Multiple choice, true-false, and matching (50 points)

True-false (mark A for true, B for false):

1. All eukaryotes are multicellular.
2. Of the nine animal phyla we studied in class, only phylum Chordata contains both vertebrate and invertebrate representatives.
3. Before there were radially symmetrical animals, there were bilaterally symmetrical animals.
4. Fungi are autotrophs with cell walls made of chitin.

Multiple choice / matching

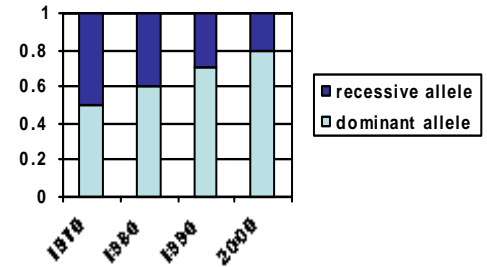
5. Which of the following statements about angiosperm reproduction is FALSE?
 - a. the seed contains pollen
 - b. the diploid zygote results from the fusion of a sperm cell and an egg cell
 - c. many angiosperms lure pollinators with nectar, a “rotting meat” odor, or fake sex pheromones
 - d. after pollination, some parts of the female flower develop into a fruit
 - e. seed dispersal improves a plant’s reproductive success by reducing competition between a plant and its offspring
6. Which of the following is the only **domain** that contains eukaryotes?
 - a. Bacteria
 - b. Animalia
 - c. Plantae
 - d. Archaea
 - e. Eukarya
7. According to the film “The Triumph of Life,” which of the following is NOT true?
 - a. Photosynthetic bacteria generated the O₂ that transformed the planet billions of years ago.
 - b. Horseshoe crabs were among the first types of animals to use land for mating.
 - c. Invertebrates moved onto land before vertebrates did.
 - d. Plants moved onto land before vertebrates did.
 - e. Vertebrate animals occupied the oceans before invertebrate animals.
8. Seahorses are unusual because the males, not the females, care for the young of the species. The females are brightly colored and compete for the males’ attention. The males are dull. The difference between the coloration of the females and males is likely the result of:
 - a. genetic drift
 - b. punctuated equilibrium
 - c. a catastrophe
 - d. sexual selection
 - e. the formation of a lichen
9. Lots of evidence suggests that Darwin had it right: finches flew from South America to the Galapagos Islands, where they established a new population that is genetically distinct from their South American ancestors. This is an example of:
 - a. the founder effect
 - b. artificial selection
 - c. sexual selection
 - d. asexual reproduction
 - e. the bottleneck effect
10. The animal pictured at right is a ____, and its symmetry is ____.
 - a. cnidarian ... bilateral
 - b. cnidarian ... radial
 - c. chordate ... bilateral
 - d. chordate ... radial
11. Which of the following characteristics is NOT shared by ALL animals?
 - a. multicellular
 - b. heterotroph
 - c. gastrulation
 - d. mitochondria
 - e. eukaryotic



12. Which of the following is *not necessarily* associated with natural selection?
- differential reproductive success
 - overproduction of offspring
 - genetic variation
 - catastrophic events
 - inheritance

13. Which of the following are most likely to be homologous to one another?
- the forelimb of a dog and the forelimb of a cat
 - the wings of a butterfly and the wings of a sparrow
 - the mouth of a mosquito and the beak of a hummingbird
 - the wings of a dragonfly and the wings of a hawk
 - both b and d

14. Researchers collected data over four decades to construct the figure at right. Scientists drew blood from all members of a population of tree shrews and examined the alleles for gene X. Which of the following might be an appropriate conclusion?
- evolution has occurred
 - speciation has occurred
 - natural selection favors homozygous recessive individuals
 - the tree shrews must be reproducing asexually
 - the results are meaningless without radiometric dating data



15. The difference between the founder effect and a population bottleneck is that the founder effect:
- is a type of genetic drift, whereas a population bottleneck is a type of natural selection
 - is a type of natural selection, whereas a population bottleneck is a type of genetic drift
 - can occur only on islands, whereas a population bottleneck can occur anywhere
 - requires the isolation of a small colony of individuals from the larger population, whereas a population bottleneck requires a drastic decline in population size
 - is a mechanism of evolution, whereas a population bottleneck is not

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

- a. cuticle b. hypha c. lignin d. phloem e. lichen

16. Helps plants retain water
 17. Fungal filament

 18. The first plants that did not require water for transferring sperm to eggs were:

- a. mosses b. ferns c. angiosperms d. gymnosperms e. green algae

19. Which of the following events had to have occurred **before** all of the others in the origin of life?
- polymer formation
 - formation of lipids that enclosed RNA
 - endosymbiosis
 - gastrulation
 - formation of organic monomers

20. Natural selection results in:
- increased genetic variation
 - offspring that are better adapted to the future environment
 - offspring that are adapted to their current environment
 - an increase in the size of the population
 - mass extinction

21. What is the function of fruit?

- it is where pollen develops
- it is a seed dispersal vehicle
- it physically supports the plant
- it attracts pollinators
- both b and d are correct

22. Embryologically, echinoderms appear to be most closely related to:
a. sponges b. arthropods c. annelids d. mollusks e. chordates
23. A budding biologist finds a new invertebrate, a “bookworm,” among the books in the library. The worm is segmented and has a coelom. It’s safe to say that it is probably most closely related to:
a. earthworms and leeches d. nematodes
b. Planaria e. tapeworms
c. hydra
24. Which of the following creates new alleles?
a. sexual reproduction d. genetic drift
b. natural selection e. both a and c
c. mutation
25. Which of the following events is NOT correctly matched with the approximate time that the event occurred?
a. Earth forms – 4.6 billion years ago d. O₂ accumulates in atmosphere – 2.5 billion years ago
b. first animals – 700 million years ago e. plants and fungi colonize land – 475 million years ago
c. humans appear – 65 million years ago
26. Important! What color is your test form? (0 points)
a. blue b. yellow

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

MC _____ / 50
SA _____ / 50
Total = _____ / 100

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Score (this page) _____ / 15 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. a. A “chytrid” is a type of fungus that infects the skin of amphibians. In what **kingdoms** are the chytrids and the amphibians? (2 points total)

(1) The chytrids: _____ (2) The amphibians: _____

b. What is one difference you would expect to see between a chytrid’s cell and an amphibian’s cell? (1 pt)

c. Describe the difference between how a fungus acquires food vs. how a frog acquires/digests food (2 pts).

d. Suppose that in a rainforest in Costa Rica, a few amphibians have natural resistance to the chytrid infection. Explain how natural selection might increase the incidence of resistance over multiple generations; be sure to apply both of the conditions required for natural selection to occur (3 points).

e. A student once asked me this burning question: “Are all fungi bad?” Knowing what you now know about fungi, give a correct answer, with at least two lines of evidence justifying your opinion (2 points).

2. Fill in the table below (3 points total):

	True tissues? (yes/no)	Segmented? (yes/no)	Complete digestive tract? (yes/no)
Sponges		No	No
Annelids	Yes	Yes	
Arthropods	Yes		Yes
Echinoderms	Yes		
Mollusks		No	Yes

3. Explain why mosses and ferns are considered incompletely adapted to the terrestrial environment (2 points).

4. a. Suppose someone gives you a rock containing the world's oldest known fossils. Based on what we learned in class, about how old do you expect the rock to be? (1 pt) _____
- b. Do you expect these fossils to be prokaryotic or eukaryotic? (1 point) _____
- c. The radioactive isotope potassium-40 (^{40}K) decays to argon-40 (^{40}Ar) with a half-life of 1.26 billion years. Using your answer for part (a), **about how many of ^{40}K 's half lives have gone by** since the rock formed, and **what percent of the original amount of ^{40}K remains?** Show your work for full credit (3 pts).
5. a. What specific structure(s) in eukaryotic cells is the "membrane infolding" theory proposed to explain? (1 point)
- b. What specific structure(s) in eukaryotic cells is the endosymbiosis theory proposed to explain? (1 point)
- c. Sketch or explain the endosymbiosis theory (2 points).
- d. What are two lines of evidence for the endosymbiosis theory? (2 points)
- (1) _____ (2) _____
- e. About how long ago did the origin of eukaryotes occur? (1 point) _____
6. RB sent me a news story about the identification of the gene that allows some dogs to be large and others to be small. The article said: "It is possible that when humans started to domesticate dogs, a bit of DNA didn't get copied right, and a small dog appeared in a litter." Suppose people realized that a small dog could be useful (or cute). How could they have used artificial selection (selective breeding) to generate an entire breed of small dogs? (2 points)
7. a. What is the name for a symbiotic association between a plant root and a fungus? (1 point)
- b. What is the name of the vascular tissue that the plant uses to move sugars to its fungal partner? (1 point)
8. Name two examples of animal phyla that contain parasites of mammals (2 points):

(1) _____

(2) _____

Score (this page) _____ / 17 points

9. Orchid species are famous for their intricate, insect-pollinated flowers. In natural communities, reproductive barriers prevent the formation of hybrids, even when different orchid species flower at the same time. Nevertheless, orchid fanciers have been able to freely interbreed the various species, resulting in the production of spectacular (and often fertile) hybrid orchids. Propose a specific reproductive barrier that might apply to the wild orchids, and describe how that barrier might lead to speciation (3 points).

10. In the table below, name **any three** of the six independent lines of evidence for evolution. For each of your chosen lines of evidence, describe a specific observation you would expect to make if birds evolved from a specialized group of reptiles (6 points total).

Line of evidence	Predicted observation
1.	
2.	
3.	

11. Humans are less hairy than our primate ancestors were. One hypothesis for this observation is sexual selection, which is a form of natural selection that results from unequal opportunities to mate. Explain how sexual selection could cause the “less hairy” allele to become more common in the human population (2 points).

12. a. Name one feature that ALL Protista have in common: _____ (1 point)

b. List the three groups of Protista and a characteristic of each group (3 points total):

<u>Group</u>	<u>Characteristic</u>
(1)	
(2)	
(3)	

13. Both a blastula and a slime mold “slug” are multicellular. What is the difference between how a zygote becomes a blastula and how a slime mold becomes a multicellular “slug”? (2 points)



14. EXTRA CREDIT! This picture shows a “leaf skeleton” (a partially decomposed leaf). Why do the veins decompose more slowly than the rest of the leaf tissue? (2 pts)