Exam I  Representative Questions

Because science is a process, not a collection of facts, the exams in this course will test your ability to think critically and apply knowledge, not memorize facts. Expect application and synthesis questions (eg, questions 3, 5, 8, 9 16).

1. If two organisms are in the same phylum and the same family, then they also belong to the same
   A. order.
   B. subspecies.
   C. genus.
   D. species.
   E. all of the above

2. Approximately how far back in time does the fossil record extend?
   A. 5,000 years
   B. 6,000,000 years
   C. 3,500,000 years
   D. 3,500,000,000 years
   E. 5,000,000,000,000 years

3. A ship that had been used for many years in arctic exploration was sold and moved to a harbor in the warm waters of the Caribbean. Worms that lived on the ship bottom crawled off in the warm waters and attempted to attach to other ships in this tropical area where there were no similar worms. Some of the worms were able to survive and reproduce. What would you expect to happen to this group of worms over many generations in this new environment?
   A. The worms will mate and produce offspring just as they did in their previous environment, and the group’s traits will likely remain unchanged after many generations.
   B. The worms will gain new, more complex traits through natural selection that will help them better adapt to the warmer waters because natural selection leads to more complex and well adapted organisms.
   C. The mutation rate will increase in this group of worms in order to promote evolution.
   D. Worms possessing genetic variations that help them to survive and thrive in the new environment will produce more offspring than others lacking those traits. Over time, the proportion of the worm population with these adaptive traits will likely increase.

4. An organism has just been discovered and needs to be placed into one of the domains of life. The characteristics that have been reported are multicellular and autotrophic. Based on your knowledge, in which domain should this organism be placed?
   A. Eukarya
   B. Archea
   C. Eubacteria
   D. Protista
5. When koalas were first discovered by Europeans, they were classified as bears (Family: Ursidae). Later, it became apparent that koalas are not bears (which are placental mammals), but marsupials (pouched mammals) of the family Phasolarctidae. During the time that koalas were classified as bears, what was true of the family Ursidae?
   A. It was actually polyphyletic.
   B. It was actually monophyletic.
   C. Its original classification probably had a better basis in fact than the current one.
   D. none of the above

6. Linnaeus’ concept of taxonomy is that the more closely two organisms resemble each other, the more closely related they are in a classification scheme. In evolutionary terms, the more closely related two organisms are,
   A. the less similar their DNA sequences are.
   B. the more similar their habitats.
   C. the more likely they are to be related to fossil forms.
   D. the more recently they shared a common ancestor.

7. Ways in which Volvox has become advanced over Euglena include which of the following?
   I. Mature organism is a single haploid cell.
   II. Movement is coordinated among cells.
   III. Colonial organization borders on multicellularity.
   A. I only
   B. II only
   C. III only
   D. II and III
   E. I, II and III

Use Figure 1 to answer the following two questions.

![Figure 1](image)

8. A common ancestor for species C and E could be at position number
   A. 1.
   B. 2.
   C. 3.
   D. 4.
   E. 5.
9. Which extant species should be the best candidate to serve as the outgroup of the clade whose common ancestor occurs at position number two?
   A. A  
   B. B  
   C. C  
   D. D  
   E. E

10. Organisms classified as *Euglena* have previously been classified as Protozoa, Protista, plants, and animals. Why the confusion?
   A. Like Protozoa, they are unicellular.  
   B. Like animals, they can move.  
   C. Like plants, many are photosynthetic.  
   D. Like protists, they don’t fit neatly into other categories.  
   E. All of the above have caused confusion about the evolutionary relationships of *Euglena*.

Use the following information to answer questions 11 and 12 below. According to the Miller-Urey experimental results, chemical evolution leading up to and including the formation of living matter is believed to have occurred during the early history of Earth. Below are two pairs of events that might have occurred during this period. Judge the relative time of each of these pairs of events according to the key below.

A. Event I occurred before Event II,  
B. Event II occurred before Event I.  
C. Events I and II occurred simultaneously.

11. **Event I**  
formation of photosynthetic organisms  
   **Event II**  
formation of heterotrophic organisms

12. **Event I**  
   atmosphere of hydrogen, water, methane and ammonia  
   **Event II**  
   reducing atmosphere

13. Protists are ecologically important in all of the following ecosystems EXCEPT  
   A. freshwater systems.  
   B. marine phytoplankton.  
   C. Antarctic dry valleys.  
   D. parasitic ones.

14. Sponges are limited to feeding on small food particles because  
   A. they have no mouth.  
   B. they have an incomplete digestive tract.  
   C. their cell membranes are highly selective.  
   D. their digestion is entirely intracellular.  
   E. they lack a mechanisms for bringing food into their bodies.
15. Which of the following can be found in the mesohyl of a sponge?
   1. amoebocytes
   2. spicules
   3. spongin
   4. zygotes
   5. choanocytes

   A. 1, 2, 3, 4 and 5
   B. 1 and 2
   C. 2, 3 and 4
   D. 1, 2, 3 and 4

The questions below refer to the following table, which compares the % sequence homology of four different parts (2 introns and 2 exons) of a gene that is found in five different eukaryotic species. Each part is numbered to indicate its distance from the promoter (e.g., Intron I is the one closest to the promoter). The data reported for species A were obtained by comparing DNA from one member of species A to another member of species A.

<table>
<thead>
<tr>
<th>Species</th>
<th>Intron I</th>
<th>Exon I</th>
<th>Intron VI</th>
<th>Exon V</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
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<tr>
<td>B</td>
<td>98%</td>
<td>99%</td>
<td>82%</td>
<td>96%</td>
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<td>C</td>
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<td>99%</td>
<td>89%</td>
<td>96%</td>
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<tr>
<td>D</td>
<td>99%</td>
<td>99%</td>
<td>92%</td>
<td>97%</td>
</tr>
<tr>
<td>E</td>
<td>98%</td>
<td>99%</td>
<td>80%</td>
<td>94%</td>
</tr>
</tbody>
</table>

16. Based on the tabular data, and assuming that time advances vertically, which phylogenetic tree is the most likely depiction of the evolutionary relationships among these five species?

A.
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E  B  C  D  A
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B.
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E  C  B  D  A
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C. 

D.

17. Describe three different methods of protozoan reproduction and name a protozoan that uses each one of them.
Answers:
1. A
2. D
3. D
4. A
5. A
6. D
7. D
8. D
9. D
10. E
11. B
12. C
13. C
14. D
15. D
16. A
17.
a) Binary fission, the division of a cell into two more or less equal daughter cells; *Trypanosoma, Amoeba, Didinium, and Paramecium*
b) Multiple fission, simulotaneous division of a cell into more than two daughter cells; *Plasmodium* and *Toxoplasma*
c) Sexual reproduction, requires gamete formation and the subsequent fusion of gametes to form a zygote (in protozoans, the sexually mature individual is usually haploid); *Plasmodium*

(Conjugation, the exchange of nuclear material between two cells producing daughter cells that are not genetically identical to their parents. Although genetic recombination occurs during conjugation, actual reproduction occurs through cell division.)