W2012 SC/BIOL 1001M 3.0 Midterm I – February 3, 2012

SECTION M <u>VERSION A & C</u>

This test consists of **34 multiple choice items** (including section and version indicators – these do not count in the score but must be completed). There are **10 pages**. This test is **45 minutes** long.

The entire question booklet and your scantron must be submitted to receive a grade. **Indicate your full name and student number on the scantron and on this page. (Please double-check your <u>student number bubbling</u>.)** Be sure to sign the sign-in sheet. **Your name must be written in <u>permanent ink</u> in all places.**

Please **answer all questions on the scantron**. Choose **the single best answer** out of the options for each question. Read each question (and all possible answers) carefully.

Calculators, cell phones, mp3 players and other electronic devices are NOT permitted, and must be put away.

Students are reminded of the Code of Conduct agreement signed at the beginning of the course, in particular: "***I understand York University's Senate Policy on Academic Honesty and will abide by this policy (avoiding cheating, plagiarism and other forms of academic dishonesty).***"

Invigilators reserve the right to move students during the test. This may not reflect any suspicion of you (e.g., someone behind you may be looking at your paper). However, please note that aiding and abetting cheating is considered an academic honesty offense in itself.

IF YOU HAVE NOT FINISHED <u>BY 2:10 PM, YOU MUST REMAIN AT YOUR SEAT UNTIL THE EXAM IS OVER</u> AND YOUR TEST HAS BEEN PICKED UP.

Good luck!

Last name	First name
Student number	

Please check that you have bubbled your student number correctly on the scantron. Choose one answer for each question.

1. You are in Section **M** – please indicate this by filling in "B" on the scantron. (If you are NOT in Section M, see an invigilator immediately.)
   A. No **X**
   B. **Pick me**!!! ✓
   C. No **X**
   D. No **X**
   E. No **X**

2. You have exam version **A OR C**, which must be indicated on the scantron to get credit for test questions.
   A. **Pick me**!!! ✓
   B. No **X**
   C. **Pick me**!!! ✓
   D. No **X**
   E. No **X**

3. Every place on Earth receives the same number of hours of sunlight each year—an average of 12 hours per day. Why do different areas of the Earth receive different amounts of solar radiation?
   A. The height of the place above sea level is an important determinant of the amount of solar energy received.
   B. The angle of the sunlight is an important determinant of the amount of solar energy received.
   C. The density of the vegetation affects how much solar radiation a place will receive—the more grassland, the less solar radiation.
   D. The density of the vegetation affects how much solar radiation a place will receive—the more tall trees, the less solar radiation.
   E. Because of the curvature of the Earth, winds of the upper stratosphere can blow solar radiation away from an area before it reaches the ground.

Use the following for the **next two questions**. Pick which of the following terms the statement/question in each question describes/addresses/relates to (on the scantron, answer A, B, C, or D). Terms may be used more than once.

A. Organismal ecology
B. Population ecology
C. Community ecology
D. Ecosystem ecology

4. If salmon populations are declining, what will happen to populations of sea lions that depend on them for food? (On the scantron, choose answer A, B, C, D from above)

5. Male salmon fight over females during the breeding season. (On the scantron, choose answer A, B, C, D from above)

6. One of the more common definitions of a species is the 'biological species concept', which defines species by their reproductive isolation. That is, organisms that cannot interbreed are considered different species. However, one issue with this definition is it cannot be applied to bacteria because

   A. They are single-celled.
   B. They are pathogens.
   C. They reproduce asexually.
   D. They do not form species.

7. Which of the following is **NOT** an abiotic factor that could limit the distribution and abundance of life in Antarctica?

   A. Continental isolation
   B. Abundance of water and subsequent water balance of organsisms
   C. The extremely cold temperatures
   D. Abundance of detritovores

8. What is the general trend of biodiversity on Earth?

   A. As latitude increases, animal and plant diversity both increase.
   B. As latitude increases, animal and plant diversity both decrease.
   C. As latitude increases, animal, but not plant diversity increases.
   D. As latitude decreases, animal, but not plant diversity decreases.
   E. There is no effect of latitude on animal or plant diversity.

9. Why is the amniotic egg considered a key evolutionary innovation?

   A. It extends embryonic development, so that juveniles are more developed when they hatch.
   B. It has a shell with a single membrane that allowed gas exchange.
   C. It greatly increases the survival probabilities of an egg in a terrestrial environment.
   D. It enables eggs to float in an aquatic medium
   E. It prevents external fertilization, thus driving the evolutionary innovation of internal fertilization.

10. Which of the following questions would be **LEAST** helped by the application of the scientific method?

   A. Evaluating the relationship between violence in videogames and criminal behaviour in teens.
   B. Formulating a public policy on animal rights.
   C. Determining the best growing conditions for garden plants.
   D. Comparing the effectiveness of two potential cancer medications.
   E. Developing a more effective elementary school curriculum.

11. Some scientists have hypothesized that larger songbirds will lay more eggs than smaller songbirds. You set up an experiment, and find that there was no statistical significant difference in the average number of eggs laid by 50 pairs of large vs. 50 pairs of small songbirds. In this situation, which of the following would be true?

    A. The level of statistical significance used in analysis was probably not correct, as the results did not support the hypothesis.
    B. The design of the experiment does not test the original hypothesis, and the experiment should be redesigned.
    C. The experiment is a failure, as it did not yield what would be expected from the hypothesis.
    D. The original hypothesis may not be correct, and new hypotheses should be considered based on your observations.

12. A biologist doing a long-term study on a wild spider population observes increased variation in silk thickness produced by the spiders. Little information is available in the scientific literature about variation in spider silk thickness. After considering her observations, she proposes an idea of why such variation in silk thickness exists based on environmental factors. This is an example of a

    A. Hypothesis
    B. Theory
    C. Proposal
    D. Variable
    E. Control

13. Artificial selection is likely to produce population-level changes most quickly in organisms with:

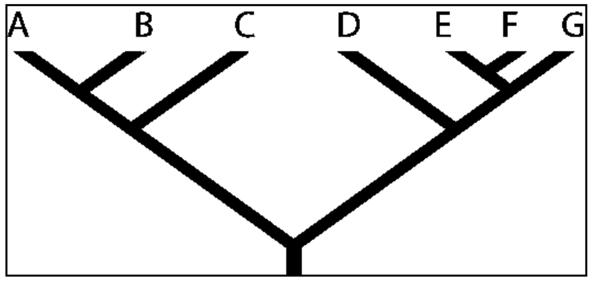
    A. a small litter size.
    B. a short generation time.
    C. a large body size.
    D. a large genome.
    E. a long life span.

14. Which of the following **BEST** represents mosaic evolution?

    A. Variation in rates of evolution of characters within a group.
    B. Mutation rate that indexes time of divergence among groups.
    C. Distantly related group used as a comparison in a phylogeny.
    D. Phenotypic similarities that arose in different lineages.
    E. Cladistic system of naming groups based on evolutionary relationships.

15. When considering organisms within the same taxon, which taxonomic level is the most inclusive?

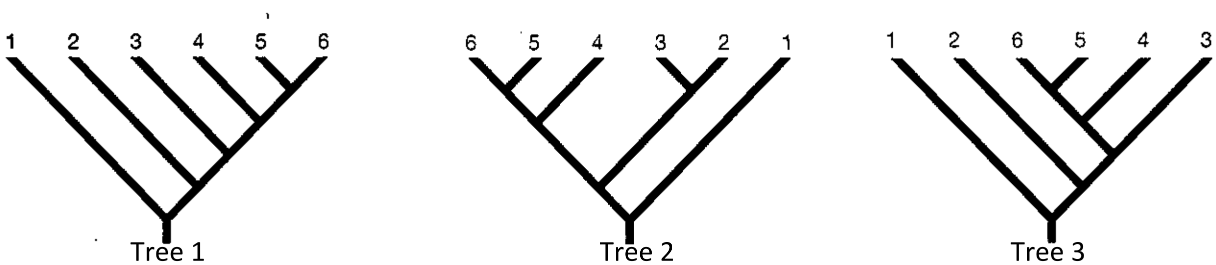
    A. Family
    B. Domain
    C. Species
    D. Genus
    E. Phylum



16. Examine the figure above and consider the following statements. Based on this diagram, you can conclude that:

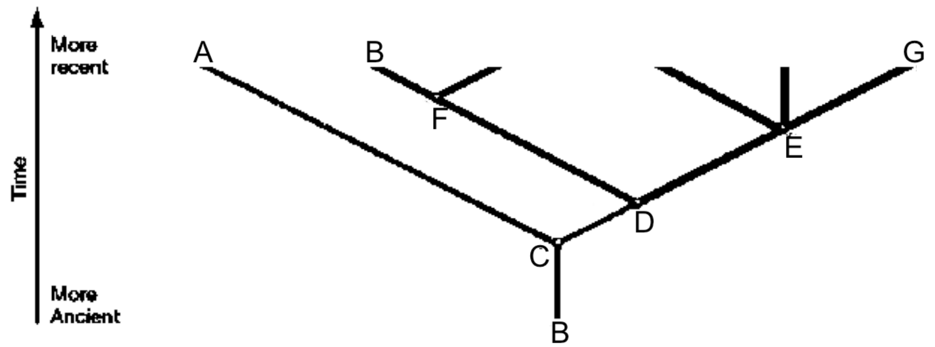
    1. All of these species (A, B, C, D, E, F, and G) share a common ancestor.
    2. Species C is more closely related to Species D than is Species G is to Species D.
    3. Species A and Species B are descended from Species C.
    4. Species F is more evolved than Species D.
    5. Species E and Species F share a more recent common ancestor than do Species D and Species G.

    A. Only 1 is true.
    B. Only 2 is true.
    C. Both 1 and 5 are true.
    D. Both 3 and 4 are true.
    E. All of the statements (1-5) are true.
    F. None of the statements (1-5) are true.



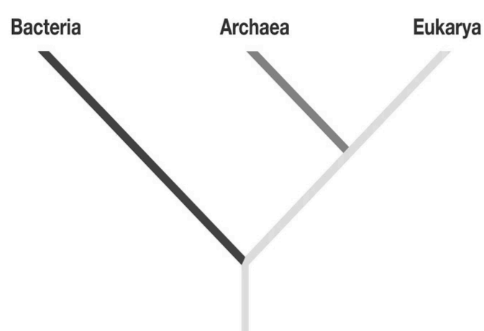
17. On the phylogenetic trees above (Trees 1-3), species are indicated by the numbers 1-6. Which of the following statements is accurate concerning the three phylogenetic trees depicted above?

    A. Trees 1 and 2 depict the same relationship among the species, whereas Tree 3 depicts a different set of relationships.
    B. All three trees (Trees 1, 2 and 3) depict the same relationship among the species.
    C. Trees 1 and 3 depict the same relationship among the species, whereas Tree 2 depicts a different set of relationships.
    D. All three trees (Tree 1, Tree 2, and Tree 3) depict different relationships among the species.



18. In the diagram above, which of A-G represents an outgroup? (On scantron, answer A, B, C, D, E, F, or G)

19. Which of the following statements most accurately explains why analogous traits are not informative for constructing phylogenetic trees?
    A. Analogous traits define monophyletic groups because they define shared derived characters.
    B. Analogous traits typically evolve due to adaptations of different organisms to the same habitat (e.g., aquatic environments); organisms in similar habitats are likely related phylogenetically.
    C. Analogous traits develop from homologous structures, and are therefore useful in constructing phylogenies.
    D. Analogous traits represent convergent evolution, and do not represent shared derived characters and thus are not the result of shared ancestry.



20. Many biologists typically use the terms prokaryote and eukaryote to categorize living organisms; these divisions are based on the observation that prokaryotes do not possess membrane bound organelles. According to the tree above, if the term prokaryotes is used as a taxonomic classification, it reflects a
    A. Monophyletic taxon
    B. Paraphyletic taxon
    C. Polyphyletic taxon
    D. The type of taxon is impossible to determine with the provided tree.

21. Malthus's Essay on the Principle of Populations was key to both Darwin and Wallace's formulation of a mechanism for evolutionary change. Which of the following statements best summarizes Malthus's idea?

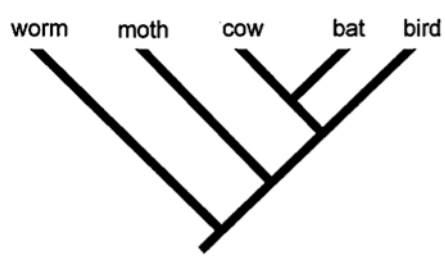
    A. Populations produce more offspring than their environment can support, resulting in competition for resources.
    B. Populations always produce less offspring than their environment can support, resulting in decreased competition.
    C. Populations of animals are able to pass to their offspring characteristics acquired in their lifetimes.
    D. On average, populations produce the number of individuals that their environment can support.
    E. Populations that are isolated cannot support themselves because they cannot generate resources.

22. Gradualism and uniformitarianism influenced Darwin's thinking by generating the idea that

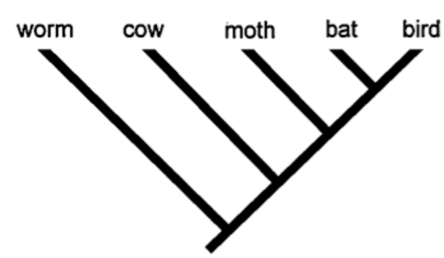
    A. The Earth is very old, so processes have been influencing life for a long time.
    B. The same processes have always been changing the Earth's surface.
    C. The Earth is very old, so gradual processes can act slowly and subtly
    D. Slow and subtle processes can produce substantial changes over a long time period.
    E. Sudden changes in processes can produce substantial results over a long time period.

23. Which of these theories by Lamarck did Darwin reject in his theory of evolution?

    A. The concept that species change.
    B. The passing of changes from one generation to the next.
    C. The relationship between organisms and their environment.
    D. The mechanism by which species change.



TREE A



TREE B

24. ~~Given that worms and moths are invertebrates and cows, bats, and birds are vertebrates. Taking this information into account, and~~ Applying the principle of parsimony to the trait "ability to fly," which of the two phylogenetic trees above is better?

    A. Tree A
    B. Tree B
    C. Both trees are equally parsimonious.

25. Darwin described evolution with the phrase "descent with modification." What did he mean?

A. Evolution takes a long time—it is not an instantaneous process.
B. Evolution is not a "special" process—it is a natural phenomenon that is going on today.
C. Closely related species are similar at the genetic, developmental, and structural levels.
D. Populations living today are related (genetically) to populations that lived in the past, but they are not identical.
E. Both C and D are correct.
F. All of the above (A-D) are correct.

26. Which one of the following was **NOT** one of Darwin's observations?

A. Most individuals have an equal chance to survive and reproduce.
B. Changes in populations are gradual and take place over long periods of time.
C. Members of the same species may exhibit considerable variation.
D. Some characteristics are heritable and passed on to offspring.
E. Some characteristics afford their possessor a better chance at survival.

27. Many crustaceans (*e.g.,* lobsters, shrimp, and crayfish) use their tails to swim, but crabs have reduced tails that curl under their shells and are not used in swimming. This is an example of

A. artificial selection.
B. an extinction.
C. an acquired characteristic.
D. a vestigial trait.
E. natural selection.

28. Which of the following statements represents an important contrast between background extinctions and mass extinctions?

A. Background extinctions occur only sporadically, whereas mass extinctions happen on a regular, periodic basis.
B. Background extinctions are caused by rapid changes in the environment, whereas mass extinctions occur primarily in response to biological competition.
C. During mass extinctions, adaptations for survival and competition make little difference in the likelihood of extinction, whereas the opposite is true of background extinctions.
D. Mass extinctions tend to take out large-bodied organisms, whereas smaller organisms tend to be removed by background extinction.

29. Which of the following would you expect if two continental landmasses converge and are united during continental drift, then the collision should cause

A. A net loss of intertidal zone and coastal habitat.
B. The extinction of any species adapted to intertidal and coastal habitats.
C. An overall increase in the surface area located in the continental interior.
D. An increase in climatic extremes in the interior of the new super-continent.
E. All of the above would likely occur.

30. Suppose that the dying wish of a famous creepy eccentric man was that his remains be fossilized. His family has come to you for expert advice. What steps would you recommend to maximize the chances that his wish will be fulfilled?

   A. The body should be placed in an environment where burial is slow and decomposition is rapid.
   B. The body should be buried immediately, and dug up every few years to check on the fossilization process and apply new layers of bacteria and fungi if not completely fossilized.
   C. The body should be left out in the desert; the drying winds speed up fossilization.
   D. The body should be placed in an aquatic environment with low levels of oxygen and high sedimentation.

31. The upper forelimbs of bats (mammals) and birds (classified with reptiles) have fairly similar skeletal structures. However, bat wings have a thin flap of skin stretched between the bones of the fingers and the arm, while bird wings consist of feathers extended all along the arm. How would you describe these relationships?

   A. The forelimb skeletons of birds and bats are homologous, as are the wings.
   B. The forelimb skeletons of birds and bats are due to convergent evolution, whereas the wings are homologous.
   C. The forelimb skeletons of birds and bats are homologous, whereas the wings are due to convergent evolution.
   D. The forelimb skeletons of birds and bats are due to convergent evolution, as are the wings.

32. The DNA sequences of the Black turnstone, Caspian tern and the Ruddy turnstone are compared. It is found that the Black turnstone has 90% sequence similarity to the Ruddy turnstone, while the Caspian tern has 72% similarity to the Ruddy turnstone. What can you say about these organisms?

   A. The Black turnstone and the Ruddy turnstone are more closely related than the Caspian tern and the Ruddy turnstone.
   B. The Caspian tern and the Ruddy turnstone are more closely related than the Black turnstone and the Ruddy turnstone.
   C. The Caspian tern and the Black turnstone are more closely related than either is to the Ruddy turnstone.
   D. The Caspian tern and the Black turnstone are equally distantly related to the Ruddy turnstone.

33. Anatomical (structural) homology in vertebrate forelimbs is considered to be evidence for evolution because

   A. differences among vertebrate forelimbs suggest that they evolved independently.
   B. similarities among vertebrate forelimbs suggest that they have evolved convergently.
   C. the anatomy of the vertebrate forelimb is not currently evolving under natural selection.
   D. similarities among vertebrate forelimbs suggest that they evolved from a common ancestor.
   E. bones have a better chance of becoming fossils than do soft body parts.

34. Evolutionary theory predicts that species are related (species come from pre-existing species), not independent. Four of the following examples provide support for this prediction. Which one does NOT support this claim?

A. The sequence of cytochrome c, a protein that functions in the transformation of energy within cells, is more than 80% similar in fish, mice, chimpanzees and humans.
B. Chick, human, and whale embryos all have a notochord, post-anal tail and pharyngeal pouches.
C. All prokaryotes (*e.g.,* bacteria) & eukaryotes (*e.g.,* animals & plants) use DNA to carry their genetic information.
D. Many organisms, including dinosaurs, went extinct in the Cretaceous period, following a huge asteroid impact.
E. Ground squirrel species found on the north & south sides of the Grand Canyon are very similar to each other in size and colour.

END OF TEST