2010-2011
SC/BIOL 1010 6.0 Section B
Winter Midterm Test
Feb. 16, 2011

- This test consists of **32 multiple choice items** (30 questions and 2 section/version indicators). There are **8 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 student number bubbling.)** Be sure to sign the sign-in sheet. **Your name must be written in permanent ink in all places.**
- Choose **the single best answer** out of the options for each question. Read each question (and all possible answers) carefully. Answer all questions on the scantron.
- **Calculators, cell phones, mp3 players and other electronic devices are NOT permitted, and must be put away.**
- **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 by 2:10 PM, you must remain at your seat until the exam is over and your test has been picked up.**
- Good luck!

Last name	First name
Student number	

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).***"

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

1. You are in Section **B** – please indicate this by filling in "B" on the scantron. (If you are NOT in Section B, 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**, which must be indicated on the scantron to get credit for test questions.
   A. **Pick me**!!! ✓
   B. No **X**
   C. No **X**
   D. No **X**
   E. No **X**

3. The global pattern of environmental diversity is that diversity
   A. decreases as you move from land to water.
   B. increases as you move from land to water.
   C. decreases as you move away from the equator toward the poles.
   D. increases as you move away from the equator toward the poles.
   E. is equally distributed at the equator and the poles.

4. Your friend believes astrology (*e.g.,* horoscopes) should be considered a scientific discipline and you want to explain to her why it is not. Which of the following arguments is the **MOST sound** reason why astrology is not considered a true scientific discipline?
   A. Astrology is not followed by anyone of true intelligence.
   B. Astrology cannot be tested and evidenced by controlled experiments.
   C. Astrology does not attempt to answer and explore unknown questions.
   D. Astrology is not taught at universities.
   E. Astrology is not based on any form of observations.

5. Evolution is defined as:
   A. A change in the frequency of alleles in a population over time.
   B. A change in the frequency of a morphological (physical) trait in a population over time.
   C. A progressive 'ladder' of changes from most primitve organisms to most advanced organisms.
   D. A change in a morphological trait of an individual during its lifetime.
   E. Survival of the fittest.

6. Which of the following organisms would be **most likely** to fossilize?
   A. A species of rat that lives in the desert.
   B. A species of clam found in a shallow marine habitat.
   C. A species of slug that lives in the rain forest.
   D. A species of flower found in Ontario forests.

7. Which of the following is **most** likely to result in microevolution?
   A. A man spends many hours in the gym exercising and is able to increase his body weight, muscle mass, and strength, which makes him more attractive to the opposite sex.
   B. Over a 20-year period, a region in Ontario has increasing numbers of mosquitoes while experiencing gradually increasing amounts of precipitation.
   C. A culture of bacteria containing bacteria able to break down toluene as a carbon source is used to clean up a toxic waste area.
   D. Some individuals in a population of moles are born with larger and stronger front paws. This gives them an advantage when digging their shelters (burrows) and finding food.
   E. Lee's excessive consumption of alcohol after retirement caused changes in his liver cells, leading to serious liver disease at the age of 76.

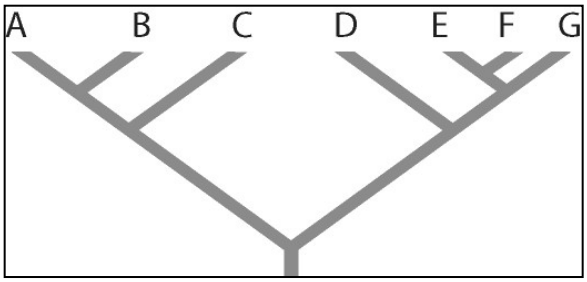

Figure 1

Refer to Figure 1 (above) for the following two questions.

8. In Figure 1, which of the following groupings forms a monophyletic group?
   A. Species A, B, C, D
   B. Species C and D
   C. Species D, E, and F
   D. Species E, F, and G
   E. All of the above groupings of species (Answers A-D) represent monophyletic groups.

9. Examine Figure 1 and consider the following statements. Based on this diagram, you can conclude that:
   1. All of these species 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.

10. The principle of parsimony can be used to construct/infer phylogenetic trees because
    A. once a trait changes, it is impossible for its condition to be reversed.
    B. all species within a paraphyletic group have an equal probability of evolving any particular trait.
    C. closely related species are always very similar to one another because of convergent evolution.
    D. similarity due to convergent evolution should be less common than similarity due to homology.
    E. the molecular clock, measuring changes in DNA, RNA and proteins, validates the principle of parsimony.

11. Mass extinction is
    A. a rapid decrease of ecological diversity.
    B. the loss of part of a population.
    C. the permanent loss of major groups of organisms.
    D. the temporary loss of major groups of organisms.
    E. All of the above (A-D).

12. Which of the following observations helped Darwin shape his concept of descent with modification?
    A. Fewer species live on islands than on the continent nearest those islands.
    B. South American temperate plants are more similar to tropical plants of South America than to European temperate plants.
    C. Species diversity declines with increasing distance from the equator.
    D. Earthquakes are catastrophic events that can reshape life on Earth because of resulting mass extinctions.
    E. Birds can be found on islands beyond the birds' maximum nonstop flight distance.

13. The theory of plate tectonics describes movement of the plates of the Earth's crust through time. Which of the following statements is **true**?
    A. The plates have stopped moving, so the continents are now in their final locations.
    B. When the plates move, climates on the continental plates change.
    C. All distributions of animals on land can be explained by past plate movements.
    D. When the plates move there is no effect on climate, nor species distribution.

14. Why are the wings of penguins (swimming birds) **NOT** considered to be vestigial traits?
    A. Because they are not useful for flight.
    B. Because they represent convergent evolution with the wings of flying birds.
    C. Because they have a function in swimming.
    D. Because they are the result of evolution.

15. Eagles, crocodiles, frogs and squirrels all have the same basic internal organs (kidneys, stomach, heart, etc.). This similarity among these members of the Superclass Tetrapoda is an example of:
    A. structural homology.
    B. developmental homology.
    C. genetic correlation.
    D. convergent evolution.
    E. vestigial trait.

16. 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.

17. Convergent evolution can occur only when two species
    A. have a recent common ancestor.
    B. have at one point in time, lived in the same geographic area.
    C. evolve under similar selective pressures.
    D. merge to become one species.
    E. have similar functioning structures that become homologous.

18. A farmer uses triazine herbicide to control pigweed in his field. For the first few years, the triazine works well, and almost all the pigweed dies; but after several years, the farmer sees more & more pigweed. Which of these explanations best describes this observation?
    A. The herbicide caused mutations in the pigweed DNA, so that the pigweed is now resistant to the herbicide.
    B. Natural selection caused the pigweed to undergo mutations, creating a new triazine-resistant species.
    C. Triazine-resistant pigweed now has more efficient photosynthesis because of exposure to triazine.
    D. Some individuals were resistant to triazine before exposure; only triazine-resistant weeds survived and reproduced, so each year more pigweed was triazine-resistant.

19. What types of changes in the regulation of development can lead to morphological changes that can be significant in evolution?
    A. Changes in timing of developmental gene expression.
    B. Changes in location of developmental gene expression.
    C. Changes in regulation of development are not useful to evolution.
    D. Both A and B.
    E. None of the above (A-C).

20. Which statement about allele frequencies is **NOT** true?
    A. The sum of all allele frequencies at a locus (gene) is always 1.
    B. Changes in an allele's frequency do not affect the frequencies of other alleles for that gene.
    C. If there is only a single allele at a locus (gene), its frequency is 1.
    D. If an allele is missing from a population, its frequency in that population is 0.
    E. If there is only a single allele at a locus (gene), it is considered to be a fixed allele.

21. Which one of the following statements is **correct** regarding mutations?
    A. Mutations have no effect on genetic variation.
    B. Mutations provide the source for genetic variation that other evolutionary forces may act upon.
    C. Mutations occur at a high rate promoting major changes in the gene pool from one generation to the next.
    D. Mutations are insignificant in the evolutionary process.
    E. Mutations are generated in response to the environmental conditions.

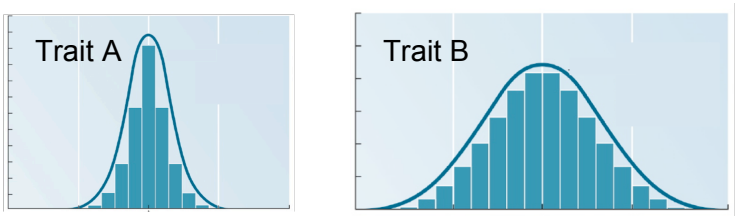

Figure 2

22. Examine the graphs (above) in Figure 2, which describe variation for two different traits. What can you conclude based on the information in the graphs?
    A. Trait A is more important in growth of organisms than is Trait B.
    B. Trait B is more important in survival of organisms than is Trait A.
    C. Traits A and B exhibit the same amount of variation.
    D. Trait A likely has a larger environmental component than does Trait B.
    E. Trait B likely has a larger environmental component than does Trait A.

23. Which of the following observations led to Darwin's major inferences?
    A. Members of a population vary in their heritable traits
    B. Body parts that are not used deteriorate over time
    C. Although organisms can produce huge numbers of offspring, many of these offspring do not survive
    D. Both A and C.
    E. All of the above (A-C).

24. In some human populations, birth weight depends, in part, on variation in alleles, and babies of intermediate weight survive best. Which of the following statements correctly summarizes the results of selection in this case?
    A. Average birth weight increased; total phenotypic variation decreased; allele frequencies changed.
    B. Average birth weight remained the same; total phenotypic variation decreased; allele frequencies changed.
    C. Average birth weight remained the same; total phenotypic variation decreased; allele frequencies did not change.
    D. Average birth weight decreased; total phenotypic variation remained the same; allele frequencies did not change.
    E. Average birth weight remained the same; total phenotypic variation remained the same; allele frequencies did not change.

25. In a population of fish, body colouration varies from a light shade, almost white, to a very dark shade of green. If the stream environment included several areas of sandy, light-coloured bottom areas and areas with lots of dark-coloured vegetation
    A. both the light and dark-coloured fish would have a selective advantage and increased survival due to disruptive selection.
    B. both the light and dark-coloured fish would have a selective advantage and increased survival due to directional selection.
    C. only the light-coloured fish would have a selective advantage due to stabilizing selection.
    D. only the dark-coloured fish would have a selective advantage due to directional selection.
    E. colour would offer no selective advantage to any fish.

26. Natural selection acts at the level of interactions between
    A. species in the community.
    B. individual organisms and their genes.
    C. species and their genes.
    D. individual organisms and their environment.
    E. a species and their environment.

Remember that natural selection acts at the level of the individual, although the effects of natural selection (microevolution) are observed at the level of the population (ultimately, the species). Natural selection can only select for/against phenotypes (we discussed this quite a bit in class).

27. Evolution by natural selection is a powerful force of change. What keeps organisms from becoming perfectly adapted to their environment?
    A. Mutations are random with respect to the needs of the organism; if mutations that created a 'perfectly adapted' organism never occurred, then none of the organisms can evolve to be perfectly adapted.
    B. Environments change, so different alleles become more fit.
    C. Environments change quickly; natural selection may be too slow to adapt a population to a changing environment.
    D. Mutations constantly introduce new variation into a population.
    E. All of the above are important reasons that natural selection does not lead to perfectly adapted organisms.

28. 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.

29. Which of the following would a biologist consider **most** important in determining which salamanders are the most fit?
    A. Large body size and the ability to move quickly away from predators.
    B. The longest lifespan.
    C. The ability to learn new behaviours.
    D. Large numbers of offspring surviving to reproductive age.
    E. Long lifespan and large numbers of offspring.
    F. Ability to compete for food.

30. What is an adaptation?
   A. A trait that improves the fitness of its bearer, compared with individuals without the trait.
   B. An ancestral trait – one that was modified to form the trait observed today.
   C. A trait that allows the organism bearing it to produce offspring.
   D. An individual's attempt to conform to its environment.
   E. The cause of natural selection.

31. In a small population of pumas, you observe the evolution of increased tail length over a 10-year period. Based on this you can conclude
   A. Longer tails are an adaptive trait.
   B. Longer tails are a homologous trait.
   C. Longer tails are a vestigial trait because they have changed over time.
   D. Longer tails may be an adaptive trait, but you cannot be certain.

32. Which of the following is an example of a fitness trade-off?
   A. Male guppies that have flashy colourful ventral (bottom) fins attract the most females.
   B. Organisms with broad geographic distributions and large populations are more likely to be preserved than rare species
   C. Long-horned cattle have greater difficulty moving through heavily forested areas compared with cattle that have short or no horns, but long-horned cattle are better able to defend their young against predators.
   D. Many crustaceans, such as lobsters & crayfish, use their tails to swim, but crabs have reduced tails that curl under their shells and aren't used in swimming.
   E. Legs originally evolved in an amphibian-like organism for swimming purposes, but then turned out to be appropriate for locomotion on land.

END OF TEST