CHAPTER 13 – BSC 1005 (General Education Biology Lecture, Professor Chiappone)
HOW POPULATIONS EVOLVE (Simon et al. 2013, 5th edition)

SAMPLE QUESTIONS

1. Natural selection ________.
   (a) results in evolutionary adaptation
   (b) is the result of sampling error
   (c) is a very rare phenomenon
   (d) does not affect allelic frequencies
   (e) prepares organisms for future changes in the environment

2. Which of the following statements about the voyage of the Beagle is true?
   (a) Its purpose was to identify the fastest route from the Atlantic to the Pacific Ocean.
   (b) It lasted almost two years
   (c) It turned into a tremendous opportunity for Darwin to collect fossils, plants, and animals
   (d) It ended sadly with the sinking of the ship off the coast of Australia, almost four years into its journey
   (e) none of the above

3. While on the Beagle, Darwin was influenced by a book by Charles Lyell that suggested that Earth was ________ and sculpted by geologic processes that ________ today.
   (a) old . . . continue
   (b) old . . . no longer occur
   (c) young . . . continue
   (d) young . . . no longer occur
   (e) none of the above

4. In The Origin of Species, Darwin argued that the mechanism of descent with modification was _____.
   (a) artificial selection
   (b) natural selection
   (c) inheritance of acquired characteristics
   (d) uniformitarianism
   (e) none of the above

5. The oldest known fossils are from about ________ years ago.
   (a) 3.5 billion
   (b) 6,000
   (c) 4.0 million
   (d) 3.0 trillion
   (e) 1.0 billion

6. Your family is taking a long driving vacation across the Midwestern and western United States. As you travel, you notice that the flowers, birds, and trees of the Midwest and the Rocky Mountains are very different. As you ponder why, you remember that such differences in the distribution of species are part of the field of ________.
   (a) paleontology
   (b) anthropology
   (c) geology
   (d) biogeography
   (e) morphology
7. Which of the following are homologous?
   (a) the forelimb of a dog and the hind limb of a cat
   (b) the forelimb of a dog and the forelimb of a cat
   (c) wings of a butterfly and wings of a sparrow
   (d) the mouth of a mosquito and the beak of a hummingbird
   (e) the wings of a dragonfly and the wings of a hawk

8. Natural selection results in __________.
   (a) increased genetic variation
   (b) offspring better adapted to a future environment
   (c) a decrease in the size of a population
   (d) offspring adapted to their current environment
   (e) an increase in the size of a population

9. Which one of the following statements is true?
   (a) Natural selection works on variation already present in a population.
   (b) Natural selection works on non-heritable traits.
   (c) Individuals evolve through natural selection.
   (d) Organisms evolve structures that they need.
   (e) None of the statements are true.

10. The modern synthesis was a fusion of __________.
    (a) population ecology and genetics
    (b) molecular biology and comparative anatomy
    (c) genetics and evolutionary biology
    (d) biogeography and comparative embryology
    (e) the fossil record and genetics

11. The smallest unit of evolution is the __________.
    (a) species
    (b) order
    (c) population
    (d) phylum
    (e) class

12. Which one of the following can create new alleles?
    (a) sexual recombination
    (b) natural selection
    (c) sexual reproduction
    (d) mutation
    (e) genetic drift

13. If the frequency of one allele in a population is 0.7, what is the frequency of the alternate allele?
    (a) 0.09
    (b) 0.49
    (c) 0.21
    (d) 0.30
    (e) 0.42

14. In the Hardy-Weinberg formula, what does $2pq$ represent?
(a) frequency of the dominant allele
(b) frequency of heterozygotes
(c) frequency of the recessive allele
(d) frequency of the homozygous dominants
(e) frequency of the heterozygous recessives

15. The original source of genetic variation that serves as the raw material for natural selection is
   ________.
   (a) mutation
   (b) genetic drift
   (c) gene flow
   (d) sexual recombination
   (e) random fertilization

16. Genetic drift is the result of ________.
   (a) natural selection
   (b) chance
   (c) a large gene pool
   (d) differential reproductive success
   (e) environmental variation

17. After surviving a bottleneck, a population recovers to the point where it consists of as many
    individuals as it did prior to the bottleneck. Which of the following statements is most likely to apply to
    this population?
    (a) The post-bottleneck population exhibits less genetic variation than the pre-bottleneck
        population.
    (b) The bottleneck subjected the population to stabilizing selection.
    (c) The post-bottleneck population has less of a chance of going extinct than did the pre-
        bottleneck population.
    (d) The post-bottleneck population exhibits more genetic variation than the pre-bottleneck
        population.
    (e) The post-bottleneck population has the same probability of going extinct, as did the pre-
        bottleneck population.

18. Which of the following is the most likely explanation for a particular human population with a higher
    incidence of polydactyly (extra fingers/toes) than the human population as a whole?
    (a) directional selection
    (b) diversifying selection
    (c) founder effect
    (d) stabilizing selection
    (e) bottleneck effect

19. What does Darwinian fitness measure?
    (a) physical health
    (b) longevity
    (c) physical strength
    (d) reproductive success
    (e) population size

20. Which of the following is an example of disruptive selection?
    (a) The birth weight at which newborn humans are most likely to survive and the average weight
of newborn humans are about the same.
(b) There is an increase in antibiotic-resistant strains of bacteria.
(c) There is an increase in the number of different breeds of dog.
(d) Garter snakes with different coloration patterns behave differently when threatened.
(e) A catastrophe wipes out nearly 99% of a population.

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22. Examine the relationships between the elephants in the figure below. Which one of the following pairs is most closely related?
(a) *Loxodonta cyclotis* and *Elephas maximus*
(b) *Deinotherium* and *Platybelodon*
(c) *Barytherium* and *Stegodon*
(d) *Loxodonta africana* and *Loxodonta cyclotis*
(e) *Mammut* and *Stegodon*
23. The figure below shows the percent of selected DNA sequences that match between a chimpanzee and other primates. This data support the hypothesis that the chimpanzee's closest living relative is

(a) humans
(b) gorillas
(c) orangutans
(d) gibbons
(e) Old World monkeys

Primate

Percent of selected DNA sequences that match a chimpanzee's DNA

<table>
<thead>
<tr>
<th>Primate</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>Chimpanzee</td>
<td>92%</td>
</tr>
<tr>
<td>Human</td>
<td>96%</td>
</tr>
<tr>
<td>Gorilla</td>
<td>100%</td>
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</tbody>
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Read the following scenario to answer the following questions.

Over the past 60 years, many amphibian species have experienced significant population declines and some species have become extinct. Scientists suspected that local human activities such as the destruction of wetlands, regional pollution, and deforestation were the main reasons for these losses. However, research over the past 20 years reveals significant amphibian population declines in protected areas of the world, such as nature preserves and parks. These global declines suggest widespread problems including increased ultraviolet radiation, acid rain, and disease. In Switzerland, for example, 14 of the 20 native amphibian species are threatened with extinction.

24. Some biologists urge the collection of the few remaining individuals of some of the most threatened amphibian species, to preserve them if they become extinct in the wild. If such captive breeding programs could produce thousands of individuals from just a few of the remaining survivors, the species will still be threatened because of ________.
   (a) a bottleneck effect
   (b) the founder effect
   (c) mutations
   (d) natural selection
   (e) artificial selection

25. Chytridiomycosis is a fungal disease first identified in 1998 as a cause of massive amphibian deaths. In some severely impacted populations, a few individuals have survived, perhaps because of some natural resistance. If these resistant individuals continue to survive and prosper, new resistant populations might emerge. This would be an example of ________.
   (a) genetic drift
   (b) natural selection
   (c) artificial selection
   (d) the founder effect
   (e) sexual selection