Exam #3 BSC 2011 2004 Fall

NAME_____ **FORM A**

Before you begin, please write your name and social security number on the computerized score sheet. Mark in the corresponding bubbles under these. Fill in the Form (A or B), instructor (Winn), and course (BCS 2011-02) lines.
Select the **best** answer to each question: ONLY ANSWERS RECORDED ON THE COMPUTERIZED SCORE SHEET WILL BE GRADED

1. Which pattern of natural selection would decrease the amount of phenotypic variation in a trait without changing the mean value of the trait?
   a. positive directional selection
   b. negative directional selection
   c. stabilizing selection
   d. diversifying selection
   e. frequency-dependent selection

2. In a population of tropical birds, those with the shortest tails leave many offspring because they are good at escaping from predators. Those with long tails have many offspring because they are attractive mates. Birds with intermediate tails leave the fewest offspring. What kind of natural selection is occurring on tail length?
   a. positive directional selection
   b. stabilizing selection
   c. heterozygote advantage
   d. diversifying selection
   e. frequency-dependent selection

3. The Hardy-Weinberg rule tells us that in populations that meet a specific set of assumptions
   a. no evolution will occur
   b. it is possible to determine allele and genotype frequencies
   c. p + q + 1
   d. there will be no genetic variation at any locus
   e. genotype frequency will equal phenotype frequency for all loci

4. In a population at Hardy-Weinberg equilibrium, the frequency of the allele b is 0.3. What is the expected frequency of homozygotes for this allele?
   a. 0.42 b. 0.21 c. 0.18 d. **0.09** e. 0.03

5. The central role of variation among individuals in the theory of evolution by natural selection conflicts most with the role of variation among individuals in
   a. Essentialism
   b. The Enlightenment
   c. Uniformatarianism
   d. Catastrophism
   e. Progressionism

6. Which of the following is NOT true of Instantaneous speciation?
   a. it requires a large spontaneous genetic change

b. no geographic barrier is required
c. speciation happens through a single individual
d. it does not require reproductive isolation
e. all of these are true

7. The evolution of increased host resistance to a disease-causing bacteria causes natural selection on the bacteria to become more infectious, which in turn causes natural selection for increased host resistance. This pattern of reciprocal evolution is called
a. punctuated evolution
b. convergent evolution
c. co-evolution
d. sympatric evolution
e. instantaneous evolution

8. Which is NOT true of a population in which a particular locus is fixed?
a. no individuals are heterozygous at that locus
b. p + q = 1
c. **the population is not in Hardy-Weinberg equilibrium**
d. there is only one possible allele at that locus
e. p2 + 2pq + q2 = 1

9. Which is true of vestigial traits?
a. they have the same function in different species
b. the are evidence of extinction
c. they are caused by the environment rather than genetics
d. they have no current function
e. none of these is true of vestigial traits

10. Which of the following is a post zygotic mechanism of reproductive isolation?
a. birds with different mating rituals do not recognize each other as possible mates
b. embryos whose parents are different species fail to develop normally
c. pollen on the stigma of the wrong species cannot fertilize ovules because it fails to germinate
d. frogs that breed in temporary ponds have no opportunity to mate with frogs that mate in permanent ponds
e. none of these is a post zygotic isolating mechanism

11. In a human population that is in Hardy-Weinberg equilibrium, the frequency of the I^A allele is 0.5 and the frequency of the i allele is 0.3. All possible ABO blood groups are present in the population. What is the frequency of individuals with Type B blood?
a. 0.55 b. 0.25 **c. 0.16** d. 0.09 e. 0.05

12. Which of the following is NOT consistent with Punctuated Equilibrium?
a. evolutionary change has occurred at a constant rate through time
b. mutations with large effects play an important role in evolution
c. some species have gone extinct
d. there have been long periods of time with little evolutionary change

e. all of these are consistent with Punctuated Equilibrium

13. Which of the following is **not** an essential element of evolution by natural selection?
    a. more offspring are produced than can survive to become parents themselves
    b. individuals with some traits produce more offspring than others
    c. variation among individuals is caused by genetic differences
    d. there is variation among individuals of a species
    e. all of these are essential elements of evolution by natural selection

14. Which of the following CANNOT protect an allele from being lost from a population?
    a. tight linkage to a favorable allele at another locus
    b. greater fitness of heterozygotes than either homozygote at that locus
    c. interaction with alleles at a different locus
    d. the presence of an allele at the same locus that is dominant to it
    e. **all of these can protect the allele from being lost**

15. The defining difference between allopatric and sympatric speciation is
    a. the genetic mechanism by which reproductive isolation evolves
    b. the role of natural selection in speciation
    c. the effect of mutation on the development of reproductive isolation
    d. **the degree to which the ranges of the diverging populations overlap**
    e. the effect of gene flow on speciation

16. One method systematists use to reconstruct the evolutionary relationships among species is to compare their morphological similarity. Which of the following presents a challenge to that approach?
    a. some species pairs share a common ancestor more recently than others
    b. related species may share a mutation inherited from the same ancestor
    c. some similarity is caused by response to a common selection pattern rather than by relatedness
    d. allopatric and sympatric speciation can contribute to speciation in the same group
    e. None of these is a problem for systematists using morphological similarity

17. Darwin's theory of evolution by natural selection was unique because
    a. it was the first to challenge the idea of special creation
    b. **it was the first to propose a believable mechanism for species change**
    c. it was the first to suggest that all species share a common ancestor
    d. it was the first to suggest that organisms are adapted to the environment
    e. it was the first to propose that species are not constant

18. Which of the following is **not** true of non-random mating?
    a. positive assortative mating increases the frequency of homozygotes
    b. it does not change allele frequency in a population
    c. inbreeding is a form of non-random mating
    d. **negative assortative mating increases the frequency of homozygotes**
    e. all of these are true

19. Which of the following presents a problem for using the Biological Species Concept to define species?

a. the existence of polymorphism
b. **groups that only reproduce asexually**
c. species that have very different morphology at different times during their lives
d. species that are morphologically identical but do not interbreed
e. none of the above is a problem of the Biological Species Concept

20. In a population that has just been reduced to a small size by a natural disaster, you find a total of 6 survivors. Four have the genotype AA, 1 is Aa, and 1 is aa. What is p in this gene pool?

a. 0.25 b. 0.40 c. 0.50 d. 0.60 **e. 0.75**

21. Which of the following is NOT true of natural selection?

a. it leads to adaptation
b. it is not the same thing as evolution
c. it occurs too slowly to be studied directly
d. it can prevent the amount of variation in a population from decreasing
e. it can decrease the amount of variation in a population

22. Which of the following is homologous to the wing of a bat?

a. the wing of a butterfly
b. the tail fin of a fish
c. the tail of a kangaroo
d. the wing of a maple seed
e. a human arm

23. Which of the following did NOT contribute to resolving the paradox of variation?

a. the discovery that one allele can dominate another
b. the discovery of spontaneous heritable genetic changes
c. finding that some patterns of natural selection do not decrease variation
d. **the discovery of large scale endemism**
e. all contributed to resolving the paradox

24. Which of the following would be most likely to cause genetic drift

a. a spontaneous change in chromosome number in a population
b. movement of individuals from one population to another
c. the production of more offspring by brighter colored individuals
d. a tendency of individuals to prefer to mate with their relatives
e. **the initiation of a new population by a small number of individuals**

25. Which of the following is an example of a cline?

a. **an increase in the population mean ear length with increasing temperature**
b. a difference in the frequency of homozygotes between 2 populations
c. an increase in population size through time in a favorable environment
d. stronger selection for faster prey when predators are more common
e. none of the above

26. In a population in Hardy-Weinberg equilibrium, 25% of the individuals express the recessive phenotype. What is the expected frequency of heterozygotes?

a. 0.05 b. 0.10 c. 0.25 **d. 0.50** e. 0.75

27. Most hybrids are sterile because

a. they have lower fitness than either of their parent species
b. their gametes are incompatible with those of both parent species
c. they do not recognize the mating rituals of either parent species
d. **their chromosomes cannot pair correctly during meiosis**
e. none of the above

28. The formation of a new species by hybridization followed by polyploidy is an example of

a. punctuated equilibrium
b. allopatric speciation
c. speciation by the peripheral isolates model
d. **instantaneous speciation**
e. gradual speciation

29. You compare the DNA sequences for the same gene among Species A , B, and C. You find that Species A is different from B at 10 base pairs and species A is different from species C at 18 base pairs. What does this suggest about the evolutionary history of these species?

a. Species C has had a greater mutation rate in the past
b. Species A and C do not share a common ancestor
c. The history of this group is described better by punctuated equilibrium than by gradual evolution
d. Natural selection was not important in causing reproductive isolation among these species
e. **Species A shares a common ancestor with B more recently than with C**

30. Darwin used the success of artificial selection as evidence that

a. all species have a common ancestor
b. there is genetic variation in natural populations
c. the fossil record is incomplete
d. **the traits of a species can change over time**
e. none of the above

31. Which would not be likely to change allele frequency in a population?

a. differences in the survival of different genotypes
b. individuals choosing mates with genotypes similar to their own
c. the introduction of individuals from a different population
d. a large reduction in population size by extreme weather
e. all are equally likely to change allele frequency

32. The allele frequency at a flower color locus in a population of alpine plants changes when a landslide kills most of the individuals in the population. This is an example of

a. gene flow
b. catastrophism
c**. a bottleneck effect**
d. Hardy-Weinberg equilibrium
e. a founder effect

33. Which does NOT provide evidence of genetic variation in natural populations
a. inbreeding depression
b. results from electrophoresis studies
c. multiple ABO blood types in Human populations
d. response to artificial selection by natural populations
e. **phenotypic plasticity**