Please Read the Instructions First

Check your pages. There are 12 pages in this exam. You are responsible for making sure that you have all the pages. This examination is worth 85 points. Write your name, ID#, and Lab. Section on your scantron.

Multiple Choice Questions

1. Indicate your answers on the scantron sheet using a number 2 or a test scoring pencil. Press heavily, don’t stray out of the margins, and completely erase any changed answers.

2. If you think that a multiple choice question is ambiguous or confusing, use the “gripe sheet” at the end of the examination to explain the problem.

3. There are 30 multiple choice questions worth 2 points each.

Fill-in Questions

1. Use pen only (no grade corrections for pencil).

2. Write only one answer per question. You can elaborate on an answer, but you will not be given any credit if you write two different answers to the question.

3. Spelling rules: ½ credit for 2–3 letters wrong or transposed. No points will be given if the misspelling alters the meaning of the word.

4. There are 8 fill–in questions worth 25 points in total.
Choose the one best answer:

1. Which of the following statements about classification is true?
   a. a genus can belong to more than one family
   b. plants cannot be classified using the Linnean system of nomenclature
   c. the genus and species names of an organism should be italicized when written in a book
   d. the order we use for dogs, Carnivora, is different in Spanish
   e. the plural of phylum is phylums

2. The frequency of the J allele is 0.8 in a population with only two alleles at this locus. What will the frequency of heterozygotes be, if the population is in Hardy–Weinberg equilibrium?
   a. 0.04
   b. 0.16
   c. 0.32
   d. 0.64
   e. 0.80

3. From an evolutionary viewpoint, sexual reproduction is important because
   a. it creates variation across generations
   b. it permits allopatric populations to breed
   c. it promotes stasis
   d. new phenotypes may result when chromosomes in somatic cells crossover
   e. populations can return to Hardy–Weinberg equilibrium

4. Natural selection operates on
   a. clades
   b. communities
   c. genotypes
   d. individuals
   e. populations

5. Which of the following is NOT an example of stasis:
   a. crocodile
   b. horseshoe crab
   c. leaf beetle
   d. zebra
   e. all are examples of stasis
6. In a population of 1000 penguins, 75% of the individuals are homozygous for the fat storage gene (BB), 22% of individuals are heterozygous for the same gene (Bb) and the remaining 3% of the population is homozygous recessive (bb). What is the frequency of the B allele in this population?

a. 0.25  
b. 0.50  
c. 0.75  
d. 0.86  
e. 0.97

7. The goal of a classification scheme for organisms is to

a. describe fossils  
b. focus on adult characteristics and eliminate monophyletic groups  
c. indicate relatedness and common descent  
d. provide ample employment opportunities for taxonomists  
e. all of the above

8. Mendel’s genetic research involved

a. dominant and recessive alleles  
b. independent assortment  
c. segregation of traits  
d. b and c  
e. all of the above

9. The range of human skin colors is

a. a polygenic trait  
b. a polyploid trait  
c. an example of genetic drift  
d. produced by a pleiotropic gene  
e. produced by the alcohol dehydrogenase gene

10. If all the conditions for Hardy–Weinberg equilibrium are met, there should be no change in

a. allele frequencies  
b. crossover frequencies  
c. numbers of individuals in the population  
d. phenotype frequencies  
e. sex ratio of the population
11. You are hiking along the Pacific Crest Trail in the Sierras and you get lost. Suddenly, you are surprised to see a mother grizzly bear with her cubs. An old hermit tells you that all the grizzly bears went extinct in California 100 years ago except for 10 individuals that live near his cave. You believe him. What genetic information can you share with the hermit?

   a. Bringing grizzly bears from Alaska to mate with the California grizzlies would alter the allele frequencies of the California population.
   b. If they are all placed in a zoo, there will be a founder effect.
   c. If they are caught and undergo captive breeding, their genetic diversity will increase.
   d. There is hope for the population since bears and wolves are both in the Order Carnivora and they could mate to produce a new hybrid.
   e. This small population will have fewer than 5 total alleles per individual.

12. Which of the following types of selection is most likely to produce a new species?

   a. disruptive
   b. frequency–dependent
   c. sexual
   d. somatic
   e. stabilizing

13. Nocturnal coral reef fishes come out of their crevices at night and avoid sunlight. If the fishes that swim around in sunlight live in the same habitat, but hide at night, which of the following pre–zygotic reproductive isolating mechanisms would prevent matings between the two groups?

   a. gametic
   b. hybrid inviability
   c. mechanical
   d. spatial
   e. temporal

14. If a population of Hawaiian fruit flies gets isolated because a lava flow moves through the middle of their distribution, this would result in

   a. allopatric populations
   b. parapatric populations
   c. sympatric populations
   d. a, b, and c would occur simultaneously
   e. none of the above
15. Neoteny

a. is a type of paedomorphosis
b. and progenesis are types of paedomorphosis
c. may have occurred in the evolution of the vertebrates and humans
d. occurs when the soma clock slows down
e. all of the above

16. A flower species comes in 2 colors, purple and white. Color is controlled by a single gene with 2 alleles and the white allele is dominant. The flowers are pollinated by bees, but you notice that some bees prefer to visit white flowers while other bees prefer to visit purple flowers. You are going to estimate the genotypic and allelic frequencies in the flower population, but you suspect that:

a. dominant homozygotes have higher relative fitness than other genotypes
b. heterozygotes have higher relative fitness than other genotypes
c. most flowers are self-fertilized
d. the genotypic frequencies will not be in Hardy–Weinberg equilibrium
e. the population will be in Hardy–Weinberg equilibrium

17. The allele responsible for the color of the coat in Siamese cats is also responsible for crossed-eyes that occur in many members of this breed. This example best illustrates which of the following general principles:

a. co-dominance
b. heterozygote advantage
c. pleiotropy
d. quantitative genetics
e. the law of segregation

18. What of the following is NOT one of the three conditions required for evolution as a result of selection?

a. different phenotypes exhibit differential survival & reproduction
b. individual variation in phenotypic traits
c. mutation rates for the most common phenotype are low
d. offspring phenotypes resemble those of their parents (traits have a genetic basis)

19. After hunters reduced the elephant seal population to about 20 individuals, the population eventually rebounded. This would be an example of

a. a genetic bottleneck
b. a norm of reaction
c. anagenesis
d. cladogenesis
e. diversifying selection
20. Which of the following examples would **NOT** be an example of convergent evolution?

a. Darwin’s finches
b. feeding in whales and flamingos
c. spiny, succulent stems in plants of the family Cactaceae and spiny, succulent stems in plants of the family Euphorbiaceae
d. streamlined body forms such as whales, tunas, and penguins
e. tasmanian wolf and North American wolf

21. When organisms leave one population to mate in another, what results?

a. gene flow
b. stabilizing selection
c. homoplasy
d. parapatric speciation
e. geographic isolation

22. A population of rats is resistant to the poison Warfarin. Resistance is dominant and controlled by a single locus. The population has the following genotypic frequencies: RR = 0.06; Rr = 0.56; rr = 0.38. What is the frequency of the ‘r’ allele in this population?

a. 0.24
b. 0.34
c. 0.52
d. 0.61
e. 0.66

23. Consider a large, randomly mating population of mosquitos in which there are two patterns, solid black and striped. The solid black allele (B) is dominant to the striped allele (b). If the frequency of striped mosquitos in the population is 0.47, what proportion of the population do you expect to be solid black, assuming that the population is in Hardy–Weinberg equilibrium?

a. 0.10
b. 0.44
c. 0.46
d. 0.53
e. The correct answer cannot be calculated from the information provided.
24. Aphids (pest insects) are killing a farmer’s broccoli crop, so she applies insecticide to her crop. Almost all of the targeted aphids are killed (say 99.9%). The aphid population then increases rapidly again, and the farmer reapplies the pesticide. This time less than 1% of the pests are killed. What do you think happened?

a. The insecticide caused mutations for resistance and a new species of pesticide–resistant insect was created.
b. The population of insects randomly drifted into a new, pesticide–resistant genotype.
c. The behavior of the insect changed and they flew away.
d. The application selected for pesticide–resistant genotypes.
e. All of the above.

25. A polyphyletic taxonomic group would contain

a. all the birds, but not the crocodiles
b. all the organisms which share a recent common ancestor
c. animals where more than one gene determines a trait
d. animals where one gene has multiple phenotypic effects
e. descendants of more than one recent ancestor

26. Organisms that are capable of self–fertilization will produce

a. all identical offspring
b. fewer heterozygotes
c. homozygote abundance
d. reasonable, functional zygotes
e. b, c, and d

27. Your instructor is fanatic about music by The Who. If he only decided to have children with a woman who also liked The Who, this would be an example of: [Note that insanity is not a choice.]

a. attempting to reduce his relative fitness
b. diversifying selection
c. ecological isolation
d. negative assortative mating
e. positive assortative mating

28. Which of the following would **NOT** be considered a process that contributes to macroevolution?

a. changes in the ploidy level
b. extinction
c. heterochrony
d. mutation
e. All of the above contribute to macroevolution.
29. Any genetic and resulting phenotypic change in organisms from generation to generation is a definition of:

a. a population  
b. evolution  
c. founder effect  
d. macroevolution  
e. microevolution

30. An example of homologous characters would be

a. gill arches in fishes and reptiles  
b. hard shells of limpets and barnacles  
c. mammary glands in marsupials and placental mammals  
d. a and c  
e. a, b, and c

Fill-in questions:

31. What was the Cambrian explosion and why was it important? (2 pts)

32. Using the letters A through H as labels, draw an imaginary cladogram that shows a paraphyletic grouping. Circle the part of the cladogram that is a paraphyletic group. (4 pts)
33. a. Draw a graph of diversifying selection. Label both axes and use an arrow or arrows to indicate where selection is acting. (2 pts)

b. Using a plant or animal, name one example of diversifying selection. (1 pt)

34. a. A population of peppered moths has the following genotypic frequencies: aa: 0.16, Aa: 0.04, AA: 0.80. The frequency of the ‘a’ allele in this population is (show your work for full credit) (2 pts)

\[ p_a = \frac{2 \times 0.16 + 0.04}{2} = \frac{0.36}{2} = 0.18 \]

frequency of ‘a’ is _________
b. Is this population in Hardy–Weinberg equilibrium? (show your work for full credit) (3 pts)

yes or no __________

35. a. If marsupials originated in South America, how did they get to Australia? (1 pt)

b. Based on your answer to 35 (a), why do we have a few marsupials in North America instead of zero? (1 pt)

36. What is the taxonomic principle of parsimony? (2 pts)
37. For each of the five conditions of Hardy–Weinberg equilibrium, name the condition and make-up a specific example where that condition would be violated. (5 pts)

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<th>Specific Example of Violation</th>
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38. The rate of evolutionary change where evolution proceeds in long periods of stasis followed by sudden periods of very rapid speciation is called (2 pts)

HAVE A NICE 4TH OF JULY WEEKEND!
**Name:** ___________________________

Last       First

**ID#** __________________________

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**Gripe Sheet**

**Instructions:**

1. Put your **name** at the top of the page.

2. If you think that a question is ambiguous or confusing, indicate the question number, the answer you gave, and the reason that you gave this answer.

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<thead>
<tr>
<th>Question #</th>
<th>Answer you gave</th>
<th>Gripe</th>
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