

First test, Bio 203, Fall 2013

What lecture are you enrolled in? (2:00 / 5:00)

Who is your TA?

For each question, write the single best answer on your answer sheet. **Write your name on ALL pages of the test and your answer sheet.**

1 Who wrote the book, Origin of Species (1859)?

- a Charles Darwin
- b Charlie Murphy
- c Alfred Russel Wallace
- d Ernst Mayr
- e Robert Chambers

2 Which of the following is an example of a prezygotic isolating mechanism?

- a male bird songs, used to attract mates, differ between species of birds
- b species that are close relatives tend to be similar genetically
- c lizards and insects may have unusual male genitalia
- d matings between different species of toads tend to produce unhealthy offspring

3 Why does the presence of extinct forms and transitional features in the fossil record support the pattern component of the theory of evolution?

- a it supports the hypothesis that individuals change over time
- b it supports the hypothesis that weaker species are eliminated by natural selection
- c it supports the hypothesis that species evolve to become more complex and better adapted over time
- d it supports the hypothesis that species change over time

4 Allopatric speciation is likely to occur when...

- a polyploidy happens
- b a dispersal event is followed by different selection pressures on the two resulting populations
- c geographic separation still allows migration between populations

d insects begin to feed on different kinds of fruits

5 How was Natural Theology applied to explaining biological diversity?

a by classifying species according to evolutionary relationships in nature

b by classifying species along a scale according to their godliness

c by classifying species according to their genetic relationship (e.g., using DNA data)

d by classifying species according to their anatomical characteristics

e by allowing only the clergy to study biological diversity

6 Which of the following is an appropriate diagnosis for a species description?

a "Populations of the new species *Anolis kawhileonardi* are healthy and unlikely to go extinct in the near future due to their presence in multiple protected areas."

b "Populations of the new species *Anolis kawhileonardi* are healthy and unlikely to go extinct in the near future due to the generalist ecology of the species."

c "*Anolis kawhileonardi* may be distinguished from similar species by its extraordinarily elongate limbs."

d "*Anolis kawhileonardi* speciated via vicariance."

e "*Anolis kawhileonardi* is a valid species according to the phenetic species concept."

7 Assume you study a species of grasshopper that is variable in limb length. Assume that the aa genotype results in short limbs, AA results in long limbs, and Aa results in intermediate-length limbs. Which of the following would be most compatible with the idea of a genetic bottleneck?

a Short limbs are selected against, and as a result of many generations of this selective pressure the population eventually loses the a allele and becomes 100% AA.

b Long and short limbs are selected against, and as a result the population eventually becomes mostly heterozygote.

c The grasshopper population is reduced from 100000 individuals to 500 individuals by the destruction of habitat due to building of a shopping mall.

d An unseasonal hail storm causes extinction of the grasshopper species

8 A diploid population of rodents on an island is composed of fast (with genotype AA: 42%), slow (aa: 18%), and intermediate speed (Aa: 40%) individuals. Faster individuals are better at evading predators.

Ten AA individuals are trapped on in a piece of driftwood that is swept off the island during a storm, and this piece of driftwood comes to rest on a neighboring island that was previously uninhabited by these rodents.

These individuals colonize the island and reproduce over several generations, producing a population that is 100% fast (AA). During this time the genotype frequencies of the original population have stayed about the same (42%/18%/40%).

Comparing the recently colonized population to the population on the original island after all this occurred, what would you say has happened?

- a evolution but not natural selection
- b natural selection but not evolution
- c natural selection and genetic drift have worked in concert to produce an evolutionary pattern
- d natural selection and genetic drift have worked against each other to produce an evolutionary pattern
- e neither natural selection nor evolution occurred

9 Humans are altering the world by fragmenting natural habitats into tiny 'islands' as suburbs, ranches, and farms expand. Which speciation process is most likely to result from this fragmentation?

- a sympatric speciation due to reproductive isolation
- b speciation by vicariance
- c speciation by dispersal
- d speciation by polyploidy
- e sympatric speciation due to ecological differences
- f a and e

10 Which of the following is characteristic of allopatric speciation?

- a large populations
- b sexually reproducing populations
- c geographic isolation
- d isolation through adaptation of alleles
- e the sudden appearance of new species
- f ecological difference leading to reproductive isolation

11 Intermediate-sized sparrows have higher survival during a storm than those of extreme sizes (there is a genetic basis for size in sparrows). This pattern of survivorship suggests...

- a genetic drift
- b sympatric speciation
- c directional selection
- d disruptive selection
- e stabilizing selection

12 Which of the following is a potentially adequate general definition of the evolutionary process?

- a survival of the fittest over very long periods of time
- b changes in gene frequencies in a population over time
- c increasing complexity of species over time
- d we know God had nothing to do with the appearance of biodiversity, so we choose evolution
- e change in individuals during their lifetimes is passed on to offspring over long periods of time

13 Why are "vestigial" traits considered evidence of the pattern of evolution?

- a the current function of such traits is absent (or reduced) relative to the function of this structure in a presumed ancestor. It is difficult for theories of biodiversity that do not allow for species ancestry (e.g., theories of special creation) to account for such useless structures.
- b vestigial structures represent cases of 'evolution in action,' where we can observe evolution happening during human lifetimes.
- c vestigial structures give direct evidence of natural selection
- d vestigial structures give direct evidence of genetic drift
- e vestigial structures show that there are no 'higher' or 'lower' organisms, as is required or assumed by biodiversity explanations focused on special creation. Each species contains imperfections such as these that render all species approximately equally complex.

14 What is a "God of the gaps" argument?

- a use of God, or divine creation, to attempt to disprove evolution
- b God is invoked as an explanation when a scientific explanation is lacking
- c God is said to deal with the cognitive manifestations of gaps in our knowledge, rather than the physical realities of those gaps
- d An argument that states that a God concept is unlikely to explain all natural phenomena, such as evolution

15 What was Linnaeus' contribution to evolutionary thought?

- a a mechanism for evolutionary change that turned out to be incorrect
- b evidence for the pattern of evolution
- c an acceptable (at that time) naturalistic interpretation of biodiversity
- d genetic aspects of the modern synthesis
- e a and b
- f none of the above

16 What is uniformitarianism?

- a species evolve at uniform rates over geologic time, not in big jumps
- b species evolve rapidly relative to geologic time
- c the same geologic processes operating today were operating over all of earth's history
- d slow geologic processes such as plate tectonics may cause speciation

17 In his early formulation of the theory of natural selection, Charles Darwin was directly influenced by...

- a Alfred Russel Wallace
- b Charles Lyell
- c Anaximander
- d Ernst Mayr
- e a and b
- f a, b, and d
- g a, b, and c

18 What is Naval researcher Patrick Matthew's contribution to evolutionary theory?

- a he published evidence for evolution (the evolutionary pattern, of all species related to each other) before Darwin.
- b he described how barnacles negatively impact hull resilience during boat storage.
- c he published on evolution by natural selection before Charles Darwin

- d he described the Hardy-Weinberg relationship.
- e he traveled extensively in Southeast Asia and sent specimens to Darwin

19 Imagine that you study a diploid population of fruit-eating bats and collect information on the genetics of this population. You don't know anything about the current mating behavior or past evolutionary history of the population; just the genetic information and the number of individuals in the population. Which of the following is a true statement about a particular studied gene?

- a if you know the allele frequencies of this gene in the population, you are able to calculate the genotype frequencies of the population
- b if you know the genotype frequencies at this gene in the population, you are able to calculate the allele frequencies of the population
- c if you know the allele frequencies for this gene in the population, you can deduce whether the population is in Hardy-Weinberg equilibrium
- d if you know the genotype frequencies at this gene in the population, you can deduce whether the population is in Hardy-Weinberg equilibrium
- e a and c are true
- f b and d are true
- g a, b, c, and d are true
- h none of the above are true

20 You are at a party and you suspect that 160 of the 200 people at that party are

jerks. Assuming jerks are not associating selectively (e.g., jerks don't preferentially tend to hang with jerks), what is the probability that the first two people you meet are not jerks?

- a .40
- b .16
- c .20
- d .32
- e .04

21 you survey two islands, separated by 25 kilometers of ocean, and find that the only beetle present on both islands differs between the islands in appearance. Each population looks different—one is all solid black, one has all individuals with orange spots. What is reasonable to conclude?

- a speciation by vicariance
- b speciation by dispersal
- c sympatric speciation
- d gene flow
- e migration
- f a or b seem possible, the others seem unlikely
- g d or e seem most likely but cannot be distinguished from each other given this information

h none of the above

22 Critique the following statement: "My pet turtle Reggie used to be afraid of me. But now, after five years in my care, Reggie comes to the edge of my pond when he sees me because he expects food. This is an interesting case of evolution occurring rapidly, due to artificial selection."

- a evolution cannot proceed that rapidly (i.e., in five years)
- b we don't know whether a mutation caused the behavior; thus, we can't tell if evolution has occurred
- c individuals cannot evolve
- d it's not artificial selection if you haven't actively selected for a particular trait
- e we need more information if we are to assess whether evolution has occurred

23 What is a difference between a 'phenetic' and 'phylogenetic' species concept?

- a phenetic concepts use morphology; phylogenetic concepts are based on genetic data.
- b phenetic concepts are based on overall similarity; phylogenetic concepts focus on only genetic data.
- c phenetic concepts are 'natural'; phylogenetic concepts are 'operational'
- d phylogenetic concepts incorporate ideas about evolution; phenetic concepts do not

24 Hope the test is going OK. Would you like a free point?

- a Yes
- b No

25 Which of the following is true of Charles Darwin and Alfred Russel Wallace?

- a both were influenced by the economist Thomas Malthus
- b both were members of Victorian England 'high society' throughout their careers
- c both traveled extensively around South America
- d both wrote of rejecting the teachings of Lyell
- e they collaborated extensively before 1859, but not after
- f they collaborated extensively throughout their careers
- g all of the above
- h none of the above
- i b and c
- j b and e
- k b and f
- l a, b, and c

26 Alfred Russel Wallace's figurative "line" separating islands in his study area illustrates...

- a dispersal
- b vicariance
- c sympatric speciation
- d Aristotle's great chain of being
- e mutation
- f a or b
- g a, b, or c

27 Isolation and divergence are occurring in apple maggot flies. How?

- a preference for alternative fruits causes vicariance, followed by genetic drift
- b dispersal, followed by genetic drift
- c ecological divergence followed by reproductive isolation and disruptive selection
- d morphological divergence followed by reproductive isolation and directional selection
- e reproductive isolation followed by directional selection
- f photosynthesis

28 Alfred Russel Wallace collected museum specimens mainly in...

- a Southeast Asia, including Sulawesi
- b Ecuador, including the Galapagos Islands
- c England, including Limey Park
- d the United States, including mainly the California Coast and Southern Arizona
- e the United States, including mainly the Hawaiian islands

29 Assume there is a population of snakes where individuals occur in two color versions, green and black. Green individuals (genotype = aa) tend to mate with other green individuals (aa) and black individuals (genotypes Aa and AA) tend to mate with other black individuals. Black individuals make up 75% of the population. Is this population in Hardy-Weinberg (HW) Equilibrium?

- a unlikely; assumptions of HW are not satisfied
- b unlikely; homozygotes produce different phenotypes
- c probably; no selection is occurring
- f probably; frequency of dominant phenotype fits with HW expectation
- g need more information if HW is to be assessed

30 What is a holotype?

- a a museum specimen unassigned to a particular species
- b the ideal form, according to Plato's typological species concept
- c the first individual of a new species to be discovered
- d a single individual specimen chosen to represent a species

31 The average height of humans in industrialized nations has increased steadily over the past 100 years. This trait has clearly changed over time. Most physicians and human geneticists hypothesize that the change is due to better nutrition and a reduced incidence of disease. Has human height evolved?

- a yes, because average height in the population has changed over time
- b no, because changes in height due to nutrition and reduced incidence of disease are not heritable
- c yes, because height is heritable
- d no, because height is not heritable
- e yes, because greater height tends to be favored by natural selection

32 Which of the following is a central thesis of Gould and Lewontin in their "Spandrels" paper?

- a selection and mutation interact to produce evolutionary change; these forces should not be considered in isolation
- b selection is the primary force of evolutionary change
- c the strength of migration as an evolutionary force has been underappreciated in evolutionary studies
- d not all traits may be explained by adaptation for current utility
- e the strength of mutation as an evolutionary force has been underappreciated in evolutionary studies
- f adaptive explanations for a population must account for that population's current environment

33 Publications that describe new species most commonly employ which of the following species concepts in analyzing their data?

- a biological
- b phenetic

- c evolutionary
- d ecological
- e sympatric

34 The resistance of bacteria to antibiotics is an example of

- a evolution by natural selection
- b evolution by drift
- c evolution by migration
- d statis
- e bacteria outwitting otherwise wiley antibiotics

35 If a population includes 60% A alleles and 40% B alleles, what is the proportion of homozygotes under Hardy-Weinberg equilibrium?

- a .16
- b .24
- c .36
- d .48
- e .52
- e can't tell from this information

36 Which of the following was NOT one of Charles Darwin's contributions to biology?

- a he was the first to present evidence that species are related to each other
- b he proposed the mechanism of natural selection
- c he facilitated acceptance of the idea of evolution
- d he studied barnacles

37 A biologist who favors the biological species concept wants to determine whether two populations of butterflies, A and B, are separate species. Which of the following lines of evidence would she find most convincing?

- a She finds that members of population A prefers to live on trees, whereas members of population B prefer to live on grasses
- b She performs a phylogenetic analysis of DNA and finds that population A and population B each form separate groups on her phylogenetic tree
- c She notes that all members of population A possess red wings with orange edges, whereas members of population B possess red wings with yellow edges.

d She collects individuals from each population and attempts to breed them together; she finds that all mixed (A + B) offspring are born dead.

38 Which of the following describes a difference between 'operational/criterion' and 'conceptual/natural' definitions for understanding what a species is?

a conceptual definitions are not suitable for asexual species because they focus on reproduction; operational definitions are suitable for any species because they allow for the use of other traits.

b conceptual definitions focus on genetic data, which are more likely to reveal evolutionary patterns; most operational criteria use morphology.

c conceptual definitions describe what natural phenomena we are trying to understand; operational criteria give us the means to recognize these phenomena in nature.

d the morphospecies concept (operational) is a special case of the phenetic species concept (conceptual)

39 You observe a population of 100 individuals AA, 300 individuals AB, and 100 individuals BB. Is this population in Hardy-Weinberg equilibrium?

a yes

b no

c can't tell; need information on allele frequencies

d can't tell; depends on the environment

e can't tell; depends on what happens in future generations

f not applicable; need to specify dominant ($A = p$) and recessive ($a = q$) alleles

40 What is the 'modern synthesis'?

a a synthesis of recent and ancient ideas about evolution

b the integration of theories about evolution by natural selection with ideas about inheritance of traits

c a modern review of how Linnaeus and Aristotle contributed to ideas about evolution

d George Gaylord Simpson and Ernst Mayr's explanation of how genotype contributes to phenotype

Extra Credit

X1 Which of the following is a product or company that was endorsed by Billy Dee Williams?

a Apple computers

b Colt45 malt liquor

c Taco Bell Limeade Sparklers

d Target shopping center

X2 Select the name of either the current UNM men's or the current UNM women's basketball coach.

- a Bob Davie
- b Steve Alford
- c Bobby Knight
- d Michael Cooper
- e Craig Neal
- f Yvonne Sanchez
- g Pat Summit
- h Geno Auriemma