

## Biology 2343 Exam 1 (sample from a past semester) – Evolution Unit

### Multiple Choice

1. An explanation of natural selection depends on the premise that *production of more offspring than resources can support leads to a struggle for existence*. Darwin borrowed this idea from:  
(a) Carolus Linnaeus                      (b) Thomas Malthus                      (c) James Hutton  
(d) Jean-Baptiste Lamarck              (e) Ernst Mayr
2. Identify the person who (1) wrote *Principles of Geology*, (which Darwin read during the voyage of the Beagle), and (2) was an early opponent of evolution but became convinced by Darwin's evidence for natural selection and later defended this theory?  
(a) Robert Fitzroy                      (b) Charles Lyell                      (c) John S. Henslow  
(d) Thomas Henry Huxley              (e) Alfred Russel Wallace
3. The Hardy-Weinberg theorem states that allele frequencies should remain constant in a population over generations. When this does not happen, which of the following is (by definition) true?  
(a) evolution                      (b) punctuated equilibrium              (c) quantitative variation  
(d) qualitative variation              (e) drug resistance
4. Genetic variation tends to be increased (and/or maintained) by which of the following?  
(a) mutation                      (b) sexual reproduction              (c) founder effect  
(d) both (a) and (b)                      (e) both (b) and (c)
5. Elaborate plumage and courtship displays in male birds (along with mating calls in frogs and crickets) could best be attributed to which selective pressure(s)? **Mark the best two answers.**  
(a) intersexual selection              (b) intrasexual selection              (c) hybridization  
(d) prezygotic reproductive barrier              (e) postzygotic reproductive barrier
6. As long as it is in the minority, scale-eating fish with mouths on the left side of their faces have an advantage over their right-mouthed competitors because they can take larger fish by surprise on the unexpected side of the body. This is an example of which concept? **Mark the best three answers.**  
(a) frequency dependent selection              (b) balancing selection              (c) polymorphism  
(d) prezygotic reproductive barrier              (e) postzygotic reproductive barrier
7. An adult domestic cat has a tendency toward "kitten-like" morphology and behavior compared to its European wild feline ancestor. This is an example of: **Mark the best two answers.**  
(a) prezygotic reproductive barrier              (b) postzygotic reproductive barrier              (c) artificial selection  
(d) neoteny (a form of heterochrony)              (e) bottleneck effect
8. Evolution cannot produce "perfect" organisms because:  
(a) mutations occur at random and are not often useful  
(b) selective pressures may change and/or may be in conflict with each other  
(c) past evolutionary history makes it impossible to go "back to the drawing board"  
(d) all of the above  
(e) none of the above
9. All species belonging to the "dog/bear" branch of mammalian carnivores have certain morphological characteristics and DNA sequences in common with each other, but which they do not share with the "cat" branch of mammalian carnivores. Which term best fits this description?  
(a) postzygotic reproductive barriers              (b) Hardy Weinberg assumptions              (c) heterochrony  
(d) shared primitive characteristics              (e) shared derived characteristics

**Matching – Please select the most appropriate answer for each.**

10. Early proponent of the phenomenon of evolution	(a) Carolus Linnaeus
11. Political economist; <i>Essay on the Principles of Population</i>	(b) Georges Cuvier
12. Observed that deeper layers of rock are older, and that there are corresponding changes and extinctions in the fossil record	(c) Jean-Baptiste Lamarck
13. Father of Taxonomy (invented binomial classification system)	(d) Thomas Malthus
14. Father of Modern Geology; proposed gradualism	(e) James Hutton

15. when adult males and adult females of the same species differ in their physical appearance	(a) polyploidy
16. favors intermediate variants by acting against both extremes	(b) genetic polymorphism
17. favors individuals on both extremes of phenotypic range	(c) genetic drift
18. favors individuals at one end of the phenotypic range	(d) homology
19. accumulation of inherited characteristics that enhance one's ability to survive and reproduce	(e) cline
20. variation in the relative rates of growth of various parts of the body (during development), which helps shape the organism	(ab) convergence
21. ancestral structure that has become obsolete; for example the hind limbs found in transitional whale fossils	(ac) gene flow
22. mutational change that results in individuals with more than two sets of chromosomes, sometimes leading to a distinct species	(ad) natural selection
23. existence of two or more distinct alleles at a given locus in a population's gene pool	(ae) vestigial
24. differential success in the reproduction of different phenotypes resulting from the interaction of organisms with their environment	(bc) allometric growth
25. random fluctuation in gene pool (e.g., bottleneck & founder effect)	(bd) disruptive selection
26. similar adaptations resulting from similar roles in similar habitats (for example, the tasmanian "wolf" is not a dog at all).	(be) directional selection
27. similar adaptations resulting from a common ancestor (for example, all canines have long snouts because their common ancestor did, too).	(cd) stabilizing selection
28. graded variation in a trait that parallels a gradient in the environment	(ce) sexual dimorphism
29. genetic input from other populations	(de) adaptation

30. first evolved, then diversified, around 3.8 billion years ago	(a) eukaryotes
31. first evolved, then diversified, around 1.5 billion years ago	(b) prokaryotes
32. first evolved, then diversified, around 2.2 billion years ago	(c) terrestrial organisms
33. first evolved, then diversified, around 500 million years ago	(d) mammals
34. first evolved, then diversified, around 65 million years ago	(e) multicellular organisms

### True or False – Choose (a) True or (b) False

35. Domain *archaea* is the *oldest branch* on the evolutionary tree of life.
36. An example of a *clade* would include both branches of the carnivorous mammals ("cat" and "dog/bear") along with their common ancestor.
37. Molecular data have revealed that *fungi* are *more closely related to animals* than to plants.
38. *Continental drift* and *adaptive radiation* contributed to the unusual *diversity of marsupials in Australia*.
39. *Natural selection* operates at the level of the *population*; *evolution* happens to *individuals*.
40. In nature, allele frequencies in populations *usually do tend to remain constant* across generations (just as predicted by the Hardy-Weinberg Theorem).
41. Inbreeding can result from the *bottleneck effect*, the *founder effect*, and *artificial selection*.
42. Heterochrony is caused by homeotic genes (such as the Hox gene complex).
43. For sexually reproducing organisms, the *biological species concept* is usually *avored* above alternative species concepts.
44. One example of a specific mechanism for sympatric speciation is autopolyploidy.
45. Balancing selection sometimes helps to maintain polymorphism in a population.
46. Parsimony is the simplest evolutionary hypothesis (fewest branching events), as used in the construction of a phylogenetic tree).
47. At the time when life first evolved on earth, conditions were much colder than they are now, and the atmosphere of newly formed earth probably contained more Oxygen than it does today.

### Thinking question (multiple choice)



Figure 1



Figure 2

- Tribbles exhibit phenotypic polymorphism for fur color and texture (Fig. 1).
- A particular population contains two possible textures (*short* vs. *fluffy*, Fig. 2).
- Previous studies have established that the fluffy allele (F) is dominant to short hair (f).

**10 tribbles in total population = 6 fluffy tribbles (4 homozygous dominant, and 2 heterozygous) + 4 short-haired tribbles (homozygous recessive genotype)**

48. Frequency of the short-haired allele =  
(a) 40% (b) 60% (c) 20% (d) 50 % (e) none of the above
49. Five generations later, the frequency of the short-haired allele is 50%. Has evolution occurred?  
(a) yes (b) no (c) we do not have enough information to answer this question
50. average heterozygosity for this population =  
(a) 40% (b) 60% (c) 20% (d) 50 % (e) none of the above

**Please do not ask for an answer key!** This is your chance to *practice* (using your notes and textbook if necessary), and you should compare responses with your classmates. I will be happy to entertain *specific individual questions* during office hours (or, if time allows, during lecture).