

# ECOLOGY KEY

## Part 1: Principles of Ecology (57 possible points)

1. A
2. D
3. A
4. A
5. B
6. A
7. B
8. C
9. C
10. B
11. D
12. C
13. B
14. D
15. D
16. C
17. (1) no mutations, (2) random mating, (3) no natural selection, (4) large pop. size, (5) no gene flow **(1 point each)**
18. D
19. B
20. C
21. No;  $rB > C$ ,  $(0.125)(10) = 1.25 < 2$  **(1 point for stating “no” or “the act of altruism is not favored”, 1 point for equation  $rB > C$ , 2 points for correct calculation and inequality)**
22. Genetic diversity decreases as population stabilizes on a single trait **(2 points for mentioning allele frequency stabilizes on a single trait/phenotype/allele)**
23. Simultaneously favors two extremes of the distribution of a trait **(2 points for mentioning two extremes of a trait/of an allele frequency are favored)**
24. Favors single allele, causing a directional shift of allele frequency in its favor **(2 points for mentioning a single phenotype/trait/allele is favored)**
25. Breeders choose which variants pass on their genes **(2 points for mentioning which alleles are favored/passed on is based on the choice of a breeder/human and not nature)**
26. Individuals with certain characteristic are more likely to find mates **(2 points for mentioning certain characteristics increase one’s likelihood of sexually reproducing and thus passing on their genes/phenotype/trait/allele)**
27. Favors altruism by enhancing reproductive success of relatives **(2 points for mentioning enhanced reproductive success of relatives likely passes on altruist’s genes/phenotype/trait/allele)**
28. *Inclusive* = effect an individual has on proliferating its genes via altruism: allele in one individual promotes the survival and/or reproduction of other individuals that share that allele, in preference to individuals with a different allele **(1 point for mentioning altruism, 1 point for explaining how it increases fitness)**; *direct* = effect an individual has on proliferating its genes via reproduction by that individual: does not take into

account kin selection, only concerned with direct passage of genes from parent to offspring (1 point for mentioning reproduction, 1 point for explaining that it only pertains to direct passage of genes via sexual reproduction)

29. B

30. *Energetic* = hypothesizes that lengths of food chains are limited by inefficiency of energy transfer (2 points for correctly identifying inefficiency of energy transfer as the limiting factor); *Dynamic Stability* = long food chains are less stable because population fluctuations are magnified at higher trophic levels (2 points for correctly identifying magnified population fluctuations at higher trophic levels as the limiting factor) (If definitions are incomplete but they mention length of food chains at all, award 1 point)

31. A

32. D

33. E

34. B

35. A and B ( $CC_{A/B} = 0.32 > CC_{C/D} = 0.3076923077$ ) (1 point for identifying A and B as having greater similarity, 1 point for equation  $CC=2C/(S1+S2)$ , 2 points for correct calculation and inequality)

Part 2: Terrestrial Biomes (30 possible points)

36. Aridisols

37. B

38. Answers may vary, some possible choices include, but are not limited to: (1 point each for up to 2 points total)

(1) Hot deserts temperatures average 45° C during the day and can get as low as -18° C during the night, whereas cold desert temperatures average around -2° to 4° C (with extremes around -50° C).

(2) Evaporation rates are much higher in hot deserts.

(3) Hot deserts feature the presence of reptiles and amphibians, whereas cold deserts do not.

(4) Hot deserts occur in the North America (southern/western U.S. and in Mexico), as well as the Southern Asian, Neotropical, Ethiopian, and Australian realms. Cold deserts occur in Antarctic, Greenland, and Nearctic realms.

(5) Rainfall in hot deserts averages <15 cm per year, whereas rainfall in cold deserts averages 15 to 26 cm per year.

39. Chihuahuan, Great Basin Desert, Mojave Desert, Sonoran Desert

40. BWh and BWk

41. C

42. Desert surfaces receive a little more than twice the solar radiation received by humid regions and lose almost twice as much heat at night. Many mean annual temperatures range from 20-25° C. The extreme maximum ranges from 43.5-49° C. Minimum temperatures sometimes drop to -18° C. (2 points for explaining that low humidity causes greater extremes in temperature during the day and night, 2 points for providing temperatures within ±10° C of mean or within ±5° C of extremes)

43. D

44. C

45. Savannas that are caused by soil conditions and that are not entirely maintained by fire are called *edaphic savannas*. These can occur on hills or ridges where the soil is shallow, or in valleys where clay soils become waterlogged in wet weather. **(2 points for mentioning that they are defined by soil conditions)**
46. *Derived savannas* are the result of people clearing forest land for cultivation. **(2 points for mentioning that they are created by man as a result of deforestation)**
47. B
48. A
49. “seasonal forest” or “woodland”
50. Any two of the following answers are correct: **(2 points each for up to four points total)**
- (1) Fire is often the primary mode of decomposition, making it crucial for nutrient recycling.
  - (2) It activates plants that exhibit pyriscent serotiny.
  - (3) It clears undergrowth, and creates an ash bed that temporarily enriches soil nutrition, increasing the survival rates of post-fire seedlings.
  - (4) It also prevents woody plant species from encroaching on grasslands.

Part 3: Human Impact (17 possible points)

51. **Habitat destruction, Invasive species, Pollution, human over-Population, and Over-harvesting (2 points for entire correct answer)**
52. *Ecosystem services* encompass all the processes through which natural ecosystems help sustain human life. This includes purification of air and water, decomposition/detoxification of waste, reduction of the impact of extreme weather and flooding, pollination of crops, control of pests, and creation of soil. In 1997, ecologist Robert Costanza and his colleagues estimated the value of Earth’s ecosystem services at \$33 trillion per year, nearly twice the GNP of all the countries on Earth at the time (\$18 trillion). **(2 points for mentioning something to the extent of services that natural ecosystems provide that benefit humans for free, 2 points for estimate within ±\$3 trillion of the correct answer)**
53. *Desertification* is the degradation of moist land into a desert. **(2 point)** Some desertification is natural, but most is from erosion, climate change (global warming), or overgrazing. Slash and burn agriculture and overgrazing destroy plants (and their roots) **(1 point)**, resulting in soil erosion **(1 point)**, which leads to desertification.
54. E
55. C
56. i) Hydrogen power  
 ii) Geothermal power  
 iii) Nuclear fusion  
 iv) Wind power  
 v) Hydroelectric power