

BIO 213 Diversity and Ecology
Second Exam, Spring 2001

Questions: 50

Time: 1 hour

NOTE:

Don't forget to write your social security number on the answer sheet.

Read the questions carefully, pay particular attention to what is asked of you.

Darken the circle corresponding to the correct answer.

In case more than one answer is correct pick the best or most inclusive answer.

1. The essence of R. A. Fisher's argument of why sex ratios generally tend to remain near 50:50 centers around the fact that.
 - (A) all sperm (both X and Y carriers) have an equal probability of fertilizing an egg
 - (B) 50:50 sex ratios are not adaptive but represent only remnants of a more primitive condition
 - (C) natural selection should favor equal innate mortality rates for both sexes
 - (D) Exactly as many sperm carry the X chromosome as carry the Y chromosome
 - (E) individuals of the sex in short supply are worth more (have a higher V_x) on average than individuals of the more plentiful sex

2. The term **facultative sexuality** applies to populations which have
 - (A) strong sex-specific selection
 - (B) asexual reproduction
 - (C) sexual and parthenogenetic individuals at different times
 - (D) both self-fertilization and cross-fertilization at the same time
 - (E) both isogamy and unisexuality at the same time

3. In experiments with *Tribolium* beetles, artificial selection for _____ resulted in _____, demonstrating that senescence does in fact evolve.
 - (A) higher mortality -- higher reproductive value
 - (B) lower mortality -- higher age-specific fecundity
 - (C) decreased longevity -- higher reproductive value
 - (D) early reproduction -- decreased longevity
 - (E) early reproduction -- higher total lifetime fecundity

4. Which of the following is an example of sequential hermaphroditism?
 - (A) anisogamy
 - (B) protogyny
 - (C) monogamy
 - (D) polyandry
 - (E) polygyny

5. Differences between sperm and egg are a prime example of
 - (A) isogamy
 - (B) monogamy
 - (C) polygyny
 - (D) anisogamy
 - (E) hermaphroditism

6. Which one of the following is generally true for a K-strategist?

- (A) type III survivorship
- (B) includes fugitive species
- (C) parental care of offspring
- (D) rapid development
- (E) small body size

7. Net reproductive rate (R_0) and intrinsic rate of natural increase (r) are

- (A) always the same
- (B) the same in stable populations but different in populations that are either growing or declining
- (C) equal to one and zero, respectively, in stable populations
- (D) greater than one and zero, respectively, in declining populations
- (E) two of the above

8. Survivorship curves cannot be

- (A) rectangular
- (B) inverse hyperbolic
- (C) exponentially increasing
- (D) different between the sexes
- (E) none of the above

9. Fugitive species can be characterized as:

- (A) good competitors
- (B) species in which local extinction and recolonization are rare
- (C) species with good dispersal abilities
- (D) species that generally occur in late successional stages
- (E) two of the above

10. Concerning the maximizing of one's fitness, the primary problem that males have is

- (A) sperm are cheap
- (B) a tendency to desert impregnated females
- (C) appraising their own worth
- (D) discerning who is the father of the offspring
- (E) that the sex ratio is skewed in favor of females

11. Inverse-hyperbolic survivorship curves imply

- (A) low mortality in earlier age classes and relatively steep mortality thereafter
- (B) high fecundity in earlier age classes and fairly low fecundity later on
- (C) constant decline in mortality with age
- (D) high juvenile mortality and relatively high survivorship at later ages
- (E) constant number of deaths but increased fecundity at later ages

12. Which of the following phenomena can be attributed to negative density dependence?

- (A) Decline in per-capita birth rates with increased population size
- (B) Increase in per-capita death rates with increased population size
- (C) Constant intrinsic rate of increase
- (D) Exponential population growth
- (E) A & B

13. Which of the following would lead to territoriality?

- (A) Shortage of resources
- (B) High costs of defense and low fitness benefits
- (C) High benefits from defense and low costs
- (D) A & B
- (E) A & C

14-20. These questions are based on the following data for an **sexually reproducing** population with a stable age distribution. The population is closed ie:- there is no immigration or emigration, so changes in population size are attributable solely to births and deaths.

age	# of females	average # of daughters per mother
newborns	1000	0
1-yrs	300	0
2-yrs	250	2
3-yrs	200	3
4-yrs	100	1

14. The pattern of survivorship you see with respect to females in this population is most likely to be

- (A) Type I
- (B) Type II
- (C) Type III
- (D) none of the above
- (E) can't say

15. From the replacement rate, and assuming no density-dependence, you conclude that the population

- (A) remains constant through time
- (B) declines exponentially
- (C) declines linearly
- (D) increases exponentially
- (E) cannot be predicted

16. The difference between gross- and net- reproductive rates

- (A) is 4.8
- (B) represents the effects of declining survivorship with age
- (C) represents the effects of a peak in fecundity at age 3
- (D) A and B
- (E) A and C

17. Life-expectancy of a newborn is

- (A) 0.55
- (B) 1.85
- (C) Lower than life expectancy of a 1-yr old
- (D) A and C
- (E) B and C

18. Reproductive value of a 4-year old is

- (A) 0.1
- (B) 0.5
- (C) 0.6
- (D) 1
- (E) 6

19. If resources were not limiting, natural selection in this population

- (A) would favor early reproducers
- (B) would favor late reproducers
- (C) would not act on this population
- (D) would decrease fecundity
- (E) would decrease survivorship in all age classes

20. Currently, the average age at which all offspring are born is

- (A) 2
- (B) 2.6
- (C) 2.8
- (D) 3.2
- (E) 4

21. Which of the following is a result of epigamic (intersexual) selection?

- (A) Females are attracted to brightly colored males
- (B) The evolution of monogamy
- (C) Male sticklebacks exhibit parental care
- (D) Females are often more choosy about mates than males
- (E) All of the above

22. In some animals (e.g. stickleback fish) paternal investment in offspring exceeds maternal investment. The evolution of this phenomenon may be due to:

- (A) sexual dimorphism
- (B) kin selection
- (C) reciprocal altruism
- (D) intrasexual selection
- (F) external fertilization

23. Ecological specialists

- (A) perceive their resources in a fine-grained manner
- (B) perceive their resources in a coarse-grained manner
- (C) are “jacks of all trades but masters of none”
- (D) (A) and (C)
- (E) none of the above

24. *Mola Mola*

- (A) is an agamid
- (B) lives in the Kalahari desert
- (C) deposits a clutch of 200 million eggs per female
- (D) is found in Borneo
- (E) has high juvenile survivorship.

25. In which of the following cases would the residual reproductive value be the lowest?

- (A) In a bird that is just about to migrate to the tropics to overwinter
- (B) In salmon that have just finished spawning
- (C) In a newborn insect
- (D) In a newborn mammal
- (E) In offspring just after the period of parental care

26. *Gambelia*

- (A) are Teiids
- (B) eat other lizards
- (C) are arboreal
- (D) are active, widely foraging lizards
- (E) are found in Australia.

27. *Nucras tessellata*

- (A) are Lacertids
- (B) live in the Kalahari desert
- (C) eat scorpions
- (D) are active during the heat of the day
- (E) all of the above

28. *Zonosaurus*

- (A) are found in Borneo
- (B) live in Australia
- (C) are found in the Kalahari desert
- (D) are found in the Amazonia
- (E) are found in Madagascar.

29. *Dracaena*

- (A) are Lacertids
- (B) eat other lizards
- (C) are arboreal
- (D) are from Amazonia
- (E) are found in Australia.

30. Having a stable age distribution implies that the population is **necessarily**

- (A) increasing
- (B) decreasing
- (C) constant
- (D) fluctuating
- (E) none of the above

31. For a population at equilibrium

- (A) $R_0 = 1, r = 0$
- (B) $R_0 = 0, r = 1$
- (C) $R_0 = 0, r = 0$
- (D) $R_0 = 1, r = 1$
- (E) none of the above

32. If the birth and death rates of a population are density independent, the curve obtained by plotting population size against time will be:

- (A) linear
- (B) logistic
- (C) logarithmic
- (D) exponential
- (E) none of the above

33. The **polygyny threshold** is defined as

- (A) the minimum difference in cost of producing a male versus a female which determines the sex ratio in the next generation
- (B) the minimum difference in habitat quality of territories held by males in the same region that is sufficient to favor bigamous matings by females
- (C) the point at which, after a few minutes of resistance, a female submits to a male that already has a mate
- (D) a particular time near the end of the breeding season when a female decides that it is better to mate with a male that already has a mate than to risk not being mated at all
- (E) a territorial boundary set up by a polygynous male which restricts his females from becoming part of the neighboring male's group of females

34. If we were walking through the woods and came across a traditional breeding ground (lek) of ruffed grouse, we would see

- (A) several alpha males competing for a majority of the copulations
- (B) females choosing males that are closest to them
- (C) evidence for polygyny
- (D) little variance in male mating success
- (E) great variance in female mating success

35. The phenomenon in which per-capita birth rates decline with increase in density

- (A) illustrate positive density dependence
- (B) illustrate negative density dependence
- (C) illustrate density independence
- (D) none of the above
- (E) all of the above

36. Data showing positive correlation between percentage change in density and population density exist for

- (A) insects
- (B) fish
- (C) birds
- (D) humans
- (E) non-human mammals

37. All the following explanations for population cycles involve interactions **among** species except

- (A) Predator-prey oscillation
- (B) parasite-load
- (C) food quantity
- (D) time lags
- (E) food quality

38. All the following may be defended except

- (A) nesting territories
- (B) feeding territories
- (C) home ranges
- (D) mating territories
- (E) C and D

39. Which of the following explain patterns in bird reproductive tactics?

- (A) determinate clutch size
- (B) indeterminate clutch size
- (C) nidicolous chicks
- (D) nidifugous chicks
- (E) all of the above

40. Tradeoffs between current reproductive effort and residual reproductive value

- (A) are convex upward for iteroparous organisms
- (B) are convex upward for semelparous organisms
- (C) are concave upward for semelparous organisms
- (D) A and B
- (E) A and C

41. The prey-diversity hypothesis has been invoked to explain

- (A) Small mammal cycles in the tundra
- (B) tradeoffs between growth and reproduction
- (C) epigamic selection in birds
- (D) latitudinal gradients in avian clutch size.
- (E) none of these

42. A cohort of newly born individuals has a size of 400 and a sex ratio of 0.25. If there is no mortality during the period of parental care, the tertiary sex ratio will be

- (A) 0.25
- (B) 0.20
- (C) 0.4
- (D) 0.15
- (E) cannot say

43. If the secondary sex ratio in the above population is 0.5, we can definitely conclude that there was

- (A) higher mortality of daughters during period of parental care
- (B) higher mortality of sons during period of parental care
- (C) equal investment in sons and daughters during period of parental care
- (D) absence of parental care for daughters
- (E) none of the above.

44. Possible explanation(s) for the observed primary sex ratio:

- (A) Sons are energetically cheaper to produce
- (B) Daughters are energetically cheaper to produce
- (C) The population has a deficit of females
- (D) A and C
- (E) B and C

45. The total rate of increase of populations growing in a density-dependent way predicted by the logistic model

- (A) would be greatest at low population sizes
- (B) would be greatest at the carrying capacity
- (C) would be greatest at half the carrying capacity
- (D) would be greatest when $(1 - n/k) = 1$
- (E) would be greatest when death rates are negatively density dependent.

Questions 46-50

- (A) Age distribution
- (B) Density-dependant mortality
- (C) Intrinsic rate of increase, r
- (D) Carrying capacity, K
- (E) Survivorship

Which of the above would be used to characterize each of the following situations?

NOTE: USE EACH ANSWER ONLY ONCE!

46. Several pairs of fish are introduced to a newly created reservoir and they multiply rapidly.

- (A) (B) (C) (D) (E)

47. The average blacktail deer lives through 6 % of its life span, while the average human completes 67 % of his/her life span.

- (A) (B) (C) (D) (E)

48. Local sanitary conditions improve, resulting in a decrease in populations of many garbage feeding insects.

- (A) (B) (C) (D) (E)

49. Houseflies have a better chance of surviving in an uncrowded container than in a crowded one.

- (A) (B) (C) (D) (E)

50. In declining populations of hawks, the immature birds are relatively rare.

- (A) (B) (C) (D) (E)