## **Bio 14 Student Reference Guide**

Prepared for Kingsborough Learning Center

Prepared by Arleta H. Marnik

## Questions

- 1. Two different species having a similar-looking structure that they use to perform a similar task is an example:
  - a) Divergent evolution
  - b) Convergent evolution
  - c) Selective evolution
  - d) Molecular evolution
- 2. The process in which dogs are selectively bred for favorable traits is called:
  - a) Reproductive selection
  - b) Random mating
  - c) Artificial selection
  - d) Directional selection
- 3. Possessing favorable traits to survive and reproduce in a population is called the theory of:
  - a) Natural selection
  - b) Disruptive selection
  - c) Speciation
  - d) microevolution
- 4. The type of speciation results from two populations of species separated geographically:
  - a) Allopatric speciation
  - b) Sympatric speciation
  - c) Prezygotic barriers
  - d) Postzygotic barriers
- 5. Examples of genetic drift is/are:
  - a) Bottleneck effect
  - b) Founder effect
  - c) Bottleneck effect and founder effect
  - d) All answers are wrong
- 6. What is the name of the father of evolution?
  - a) Wallace
  - b) Malthus
  - c) Lyell
  - d) Darwin
- 7. Oxygen appears in the atmosphere due to:
  - a) Photosynthetic cyanobacteria
  - b) Photosynthetic protocell
  - c) Photosynthetic algae
  - d) All answers are correct
- 8. The wings of fly and wings of birds are an example of:
  - a) Homologous structures
  - b) Analogous structures
  - c) Natural selection
  - d) Founder effect

- 9. The limb of a bat and a limb of a cat are an example of:
  - a) Analogous structures
  - b) Homologous structures
  - c) Adaptations
  - d) Vestigial structures
- 10. This type of selection does not bring variation to a population:
  - a) Sexual selection
  - b) Intrasexual selection
  - c) Asexual selection
  - d) Sexual dimorphism
- 11. An origin of new species from a common ancestor that occurs in the event of any new opportunity is called:
  - a) Biological species concept
  - b) Morphological species concept
  - c) Reinforcement
  - d) Adaptive radiation
- 12. A change in allele frequency in a population is called:
  - a) Macroevolution
  - b) Microevolution
  - c) Genes evolution
  - d) Chromosome evolution
- 13. In Hardy- Weinberg equilibrium p represents?
  - a) Heterozygotes
  - b) Homozygous recessive allele
  - c) Homozygous dominant allele
  - d) b and c are correct
- 14. In Hardy- Weinberg equilibrium q represents?
  - a) Heterozygotes
  - b) Homozygous recessive allele
  - c) Homozygous dominant allele
  - d) B and c are correct
- 15. The five conditions of H-W equilibrium to be met for not evolving population are:
  - a) Mutation, natural selection, gene flow, extremely large population size, random mating
  - b) No mutation, no natural selection, no gene flow, extremely large population size, random mating
  - c) No mutation, no natural selection, no gene flow, extremely small population size, random mating
  - d) No mutation, no natural selection, no gene flow, extremely large population size, no random mating
- 16. In Hardy- Weinberg equilibrium 2pq represents?
  - a) Homozygous
  - b) Heterozygous
  - c) Homozygous and heterozygous
  - d) Homozygous only

- 17. What is the Hardy Weinberg equilibrium equation?
  - a)  $p^2+2pq+q^2=1$
  - b)  $p^2+3pq+q^2=2$
  - c) 2p+2pq+2q=1
  - d) pq+2pq+pq=1
- In a population of 50 individuals, 15 are homozygous dominant (WW), 20 are heterozygous (Ww), and 15 are homozygous recessive (ww). Calculate the frequency of dominant and recessive alleles and determine what the percentage of homozygous dominant, recessive and heterozygous individuals is.

Alleles: 50 dominant + 50 recessives individuals: 25% dominant + 25% recessive + 50% heterozygotes

19. Sickle cell anemia is a recessive disease that affects about 90,000 people in the USA. The research shows that it affects approximately 1/600 African - Americans and 1/1700 Hispanics.

A) Calculate what % of African – Americans are affected by the disease? 0.0625

B) Calculate the frequency of the homozygous recessive genotype? 0.000625

C) What is the frequency of a recessive allele in the population? 0.02

D) What is the frequency of the dominant allele in the population? 0.98

E) What is the frequency of the heterozygotes?

0.04

- 20. Eukaryotic cells appeared on the Earth.
  - a) 1.5 mya
  - b) 2.5 mya
  - c) 2.5 bya
  - d) 3.5 bya
- 21. Changes in allele frequencies are the result of:
  - a) Natural selection only
  - b) Mutation
  - c) Natural selection and mutation
  - d) Natural selection, genetic drift, gene flow, mutation
- 22. If the population of mice was predicted in white, grey, and black color and the introduced predator prefers only the white color mouse, that is called:
  - a) Stabilizing selection
  - b) Disruptive selection
  - c) Radial selection
  - d) Directional selection

- 23. This type of selection results from a predator prefers to kill individuals from both extremes of the population
  - a) Stabilizing selection
  - b) Disruptive selection
  - c) Radial selection
  - d) Directional selection
- 24. Very small circular RNA molecules that do not encode proteins are:
  - a) Virus
  - b) Protists
  - c) Bacteria
  - d) Viroid
- 25. Infectious proteins that cause mad cow disease in cattle are called:
  - a) Prions
  - b) Virus
  - c) Protists
  - d) Viroid
- 26. The most beneficial role of protists in the biosphere is their ability to work as:
  - a) Producers
  - b) Heterotrophs
  - c) Omnivores
  - d) Carnivores
- 27. The Fungi cell wall is composed of:
  - a) Sucrose
  - b) Cellulose
  - c) Chitin
  - d) Lactose
- 28. The fungi body is made of thin filaments called:
  - a) Lichens
  - b) Mycorrhizae
  - c) Hyphae
  - d) Chitin
- 29. Bacteria lack:
  - a) Ribosomes
  - b) Nucleus and membrane bonded organelles
  - c) Cell wall
  - d) Plasma membrane
- 30. Gram-positive bacteria after gram staining procedure appear:
  - a) Blue
  - b) Pink
  - c) Green
  - d) Purple

- 31. Gram-negative bacteria after gram staining procedure appear:
  - a) Blue
  - b) Pink
  - c) Green
  - d) Purple
- 32. Archaea that thrive in a very high pH is called:
  - a) Acidophile
  - b) Alkalophile
  - c) Thermophile
  - d) Halophile
- 33. Archaea that thrive in a very low pH is called:
  - a) Acidophile
  - b) Alkalophile
  - c) Thermophile
  - d) Halophile
- 34. Mutualistic symbiosis of fungi with protists is called:
  - a) Mycorrhizae
  - b) Lichens
  - c) Mycelium
  - d) All answers are wrong
- 35. The mutualistic relationship between plant roots and fungi:
  - a) Mycorrhizae
  - b) Lichens
  - c) Mycelium
  - d) All answers are wrong
- 36. The underground part of the fungi body is called:
  - a) Hyphae
  - b) Mycelium
  - c) Lichens
  - d) All answers are correct
- 37. The transfer of bacterial DNA from one cell to another through the pili is called:
  - a) Transcription
  - b) Transduction
  - c) Replication
  - d) Conjugation
- 38. The transfer of DNA into bacteria by bacteriophage is called:
  - a) Transduction
  - b) Transcription
  - c) Conjugation
  - d) Replication
- 39. Bacteria take up foreign DNA from the environment is called:
  - a) Transduction
  - b) Transformation
  - c) Conjugation
  - d) Transformation-Transduction

- 40. The bacterial cell wall is made up of:
  - a) Peptidoglycan layer
  - b) Sugar layer
  - c) Peptide layer
  - d) Lipid layer
- 41. A thin layer of peptidoglycan covered by cell membrane from either side is characteristic for:
  - a) Gram-positive bacteria
  - b) Gram-negative bacteria
  - c) All bacteria
  - d) None of the bacteria
- 42. These structures are formed in a bacterial cell when occurring harsh environmental conditions:
  - a) Exospores
  - b) Endospores
  - c) Spores
  - d) Sporangia
- 43. Genetic information in the form of rings carried by a bacterial cell is called:
  - a) Plastid
  - b) Gene
  - c) Chromosome
  - d) Plasmid
- 44. The bacteriophage foreign DNA assembled into bacterial DNA is an example of:
  - a) Lysogenic cycle
  - b) Lytic cycle
  - c) Binary fusion
  - d) Binary fission
- 45. What is the name of the virus that infects bacteria?
  - a) Bacteriophage
  - b) Coronavirus
  - c) Staph infection
  - d) Rotavirus
- 46. Malaria is caused by:
  - a) Bacteria: Staphylococcus aureus
  - b) Bacteria: Staphylococcus
  - c) Red algae
  - d) Protist: Plasmodium falciparum
- 47. How did protists become diverse?
  - a) By binary fission
  - b) By reproduction
  - c) By replication
  - d) By primary and secondary endosymbiosis
- 48. What is an ancestor of fungi?
  - a) An aquatic, single-celled, flagellated protist
  - b) Bacteria
  - c) Virus
  - d) Plant

- 49. Fungi that produce sporangiospores for asexual reproduction:
  - a) Basidiomycota
  - b) Zygomycota
  - c) Ascomycota
  - d) Chytrids
- 50. Fungi sexual reproduction undergoes in the order:
  - a) Plasmogamy Heterokaryotic stage Karyogamy
  - b) Karyogamy Heterokaryotic stage Plasmogamy
  - c) Plasmogamy Karyogamy Heterokaryotic stage
  - d) All answers are wrong
- 51. What is the name of the most popular classification system?
  - a) Classical
  - b) Nonclassical
  - c) Baltimore
  - d) Baltic
- 52. To which domain belong protists?
  - a) Prokaryotes
  - b) Eukaryotes
  - c) All answers are correct
  - d) All answers are wrong
- 53. Land plants evolved from:
  - a) Animals
  - b) Brown algae
  - c) Protists Archaeplastida
  - d) Viruses
- 54. Type of asexual reproduction used by prokaryotes:
  - a) Binary fission
  - b) Binary fusion
  - c) Replication
  - d) Transcription
- 55. The rounded structure of bacteria is called:
  - a) Bacilli
  - b) Cocci
  - c) Spirochetes
  - d) a and b are correct
- 56. Helical structure of bacteria is:
  - a) Bacilli
  - b) Cocci
  - c) Spirillum
  - d) Tetrad
- 57. Red algae belong to:
  - a) Archaeplastida
  - b) Archaea
  - c) Plastida
  - d) B and c are correct

- 58. Which supergroup fungi and animals belong to?
  - a) Unikonta
  - b) Excavata
  - c) Chromalveolata
  - d) Rhizaria
  - e) Archaeplastida
- 59. Unikonts that include protists closely related to fungi and animals are classified as:
  - a) Amoebozoans and Opisthokonts
  - b) Alveolates and Stramenophiles
  - c) a and b are correct
  - d) a and b are wrong
- 60. The closest relatives of the land plants are:
  - a) Golden algae
  - b) Diatoms
  - c) Brown algae
  - d) Red algae and green algae
- 61. Chromalveolates originated by:
  - a) Primary endosymbiosis
  - b) Secondary endosymbiosis
  - c) Tertiary endosymbiosis
  - d) All answers are wrong
- 62. The plant hormone that promotes cells division is called:
  - a) Cytokinin
  - b) Ethylene
  - c) Abscisic acid
  - d) Gibberellins
- 63. The plant hormone that promotes the ripening of fruit is called:
  - a) Ethylene
  - b) Cytokinin
  - c) Gibberellins
  - d) Abscisic acid
- 64. The plant hormone responsible for dormancy in seeds is called:
  - a) Cytokinin
  - b) Abscisic acid
  - c) Gibberellins
  - d) Ethylene
- 65. Plant shoots growing up against gravity is an example of:
  - a) Positive gravitropism
  - b) Negative gravitropism
  - c) Lack of gravitropism
  - d) Strong gravitropism

- 66. In the life cycle of nonvascular plants, antheridia and archegonia are produced by:
  - a) Sporophyte
  - b) Gametophytes
  - c) Meiosis
  - d) mitosis
- 67. Which nonvascular plant life cycle requires moisture for a sperm to reach an egg?
  - a) Angiosperms
  - b) Gymnosperms
  - c) Liverworts
  - d) Moss
- 68. Where is the primary growth in the tree?
  - a) Apical meristem
  - b) Buds
  - c) Roots
  - d) Leaves
- 69. What is the role of phloem?
  - a) Sugar transport from the source (leaf) to the sink (storage root)
  - b) Water transport from the sink to the source
  - c) Sugar transport from the sink to the source
  - d) Water transport from the source to the sink
- 70. What is the role of the xylem?
  - a) Water transport from the sink (storage root) to the source (leaf)
  - b) Sugar transport from the sink to the source
  - c) Water transport from the sink to the source
  - d) Sugar transport from the source to the sink
- 71. Dead cells of xylem are called:
  - a) Collenchyma
  - b) Sclerenchyma
  - c) Tracheids
  - d) Parenchyma
- 72. Living cells of phloem are called:
  - a) Tracheids
  - b) Sieve-tube elements
  - c) Parenchyma
  - d) Collenchyma
- 73. The loss of water vapor from plants is called:
  - a) Sieve-tube elements
  - b) Tracheids
  - c) Collenchyma
  - d) Transpiration

- 74. What plant cells are responsible for the plant's metabolic functions, such as synthesis and storage?
  - a) Parenchyma cells
  - b) Collenchyma cells
  - c) Tracheids
  - d) Sieve-tube elements
- 75. What are the plant cells that support young growing parts of the plant?
  - a) Collenchyma cells
  - b) Sclerenchyma cells
  - c) Parenchyma cells
  - d) All answers are wrong
- 76. What plant cells support old not growing parts of the plant?
  - a) Sieve-tube elements
  - b) Sclerenchyma cells
  - c) Tracheids
  - d) Collenchyma cells
- 77. The rate of transpiration is regulated by:
  - a) Stomata
  - b) Roots
  - c) Adhesion
  - d) Cohesion
- 78. Which plant group has a life cycle dominated by the gametophyte?
  - a) Mosses and other nonvascular plants
  - b) Angiosperms
  - c) Gymnosperms
  - d) Vascular seeds plants
- 79. In the plant life cycle, which stage is haploid?
  - a) Gametophyte
  - b) Sporophyte
  - c) Rhizoids
  - d) Mitosis
- 80. Which plant groups include seed plants?
  - a) Angiosperms and gymnosperms
  - b) Seedless vascular plants
  - c) Nonvascular plants
  - d) Angiosperms only
- 81. What is the angiosperms' unique double fertilization?
  - a) One sperm cell fuse with an egg and produces a zygote, and another produces a triploid cell
  - b) Two sperm cells fuse with an egg and produce a zygote
  - c) Three sperm cells fertilize an egg and produce a zygote
  - d) No sperm cell fertilizes an egg and produces a zygote

- 82. The sporophyte in plants produces haploid spores by the process of:
  - a) Double fertilization
  - b) Meiosis
  - c) Mitosis
  - d) Cross-pollination
- 83. Which part of a flower becomes a fruit:
  - a) Ovary
  - b) Ovule
  - c) Petal
  - d) Sepal
- 84. What is the ploidy level in flowering plants?
  - a) 1n
  - b) 2n
  - c) 3n
  - d) 4n
- 85. Which animal phyla does not belong to Eumetazoan?
  - a) Porifera
  - b) Cnidaria
  - c) Mollusca
  - d) Rotifera
- 86. Which invertebrate has a radial symmetry?
  - a) Arthropoda
  - b) Cnidaria
  - c) Mollusca
  - d) Brachiopoda
- 87. Which tetrapod has shelled eggs and is an ectotherm?
  - a) Reptiles
  - b) Ray-Finned Fishes
  - c) Amphibians
  - d) Mammals
- 88. What is the name of genes that function to regulate the development of body plan in animals?
  - a) Hox genes
  - b) Genes
  - c) Genomics
  - d) 23 pairs of chromosomes
- 89. Mouth development from a blastopore is characteristic for:
  - a) Protostomes
  - b) Deuterostomes
  - c) Coelomates
  - d) Acoelomates
- 90. Anus development from a blastopore is characteristic for:
  - a) Protostomes
  - b) Deuterostomes
  - c) Pseudocoelomates
  - d) Coelomates

- 91. Birds and mammals that are warmed by heat generated by metabolism are:
  - a) Exotherms
  - b) Endotherms
  - c) Ectotherms
  - d) All answers are wrong
- 92. The animals that gain heat from an external source are:
  - a) Ectotherms
  - b) Exotherms
  - c) Endotherms
  - d) All answers are correct
- 93. Animals having three germ layers are:
  - a) Triploblastic
  - b) Diploblastic
  - c) Pseudocoelomates
  - d) Monoblastic
- 94. What is the human population's mathematical growth?
  - a) Logarithmic
  - b) Logistic
  - c) Exponential
  - d) K- shape
- 95. All of the feeding relationships in an ecosystem is called:
  - a) Food chain
  - b) Food web
  - c) Trophic pyramid
  - d) Trophic level
- 96. What population growth will result from the population of insects given an ample amount of food:
  - a) Exponential
  - b) Logarithmic
  - c) K-shape
  - d) Logistic
- 97. The maximum number of individuals that the environment can support is called:
  - a) Carrying capacity
  - b) S-shape
  - c) K-shape
- 98. How much energy available is passed on to the next trophic level?
  - a) 1%
  - b) 10%
  - c) 20%
  - d) 50%
- 99. What type of mimicry is if the harmless species resemble the harmful species?
  - a) Batesian mimicry
  - b) Mullerian mimicry
  - c) Both answers are wrong

100. A graph of the population growth where the amount of food limits the number of offspring that can survive is called:

- a) S-shape curve
- b) Logarithmic shape
- c) Exponential shape

## Answers:

- 1. Two different species having a similar-looking structure that they use to perform similar tasks is an example:
  - b) Convergent evolution
- 2. The process in which dogs are selectively bred for favorable traits is called:
  - c) Artificial selection
- 3. Possessing favorable traits to survive and reproduce in a population is called the theory of:
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- 18. In a population of 50 individuals, 15 are homozygous dominant (WW), 20 are heterozygous (Ww), and 15 are homozygous recessive (ww). Calculate the frequency of dominant and recessive alleles and determine what the percentage of homozygous dominant, recessive and heterozygous individuals is.
  - 50 individuals=100 alleles

15 WW = 30 dominant alleles 20 Ww = 20 dominant + 20 recessive alleles 15 ww = 30 recessive alleles Total number of dominant alleles = 30+20=50, 50% of 100 alleles Total number of recessive alleles = 20+30=50, 50% of 100 alleles p=0.5; q=0.5p+q=10.5+0.5=1p2+2pq+q2=1p2= (0.5)2=0.25 homozygous dominant individuals=25% q2= (0.5)2=0.25 homozygous recessive individuals=25% 2pq=2x0.5x0.5=0.5 heterozygous individuals=50%

19. Sickle cell anemia is a recessive disease that affects about 90,000 people in the USA. The research shows that it affects approximately 1/600 African - Americans and 1/1700 Hispanics.

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A) Calculate what % of African – Americans are affected by the disease?
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 $q^2 = 1/1600 \times 100 = 0.0625$ 

B) Calculate the frequency of the homozygous recessive genotype?

 $q^2 = 1/1600 = 0.000625$ 

C) What is the frequency of recessive alleles in the population?

 $q^2 = 1/1600 = 0.000625$ 

q = 0.02

D) What is the frequency of the dominant allele in the population?

p + q = 1 p = 1 - q p = 1 - 0.02 = 0.98E) What is the frequency of the heterozygotes?  $2pq = 2 \times 0.02 \times 0.98 = 0.04$ 

20. Eukaryotic cells appeared on the Earth.

- c) 2.5 bya

- 21. Changes in allele frequencies are the result of:
  - d) Natural selection, genetic drift, gene flow, mutation
- 22. If the population of mice was predicted in white, grey, and black color and the introduced predator prefers only the white color mouse, that is called:
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- 42. These structures are formed in a bacterial cell when occurring harsh environmental conditions:
  - b) Endospores
- 43. Genetic information in the form of rings carried by a bacterial cell is called:
  - d) Plasmid
- 44. The bacteriophage foreign DNA assembled into bacterial DNA is an example of:
  - a) Lysogenic cycle
- 45. The name of viruses that infect bacteria:
  - a) Bacteriophage
- 46. Malaria is caused by:
  - d) Protist: Plasmodium falciparum
- 47. How did protists become diverse?
  - d) By primary and secondary endosymbiosis

- 48. What was an ancestor of fungi?
  - a) An aquatic, single-celled, flagellated protist
- 49. Fungi that produce sporangiospores for asexual reproduction:
  - b) Zygomycota
- 50. Fungi sexual reproduction undergoes in the order:
  - a) Plasmogamy Heterokaryotic stage Karyogamy
- 51. What is the name of the most popular classification system?
  - c) Baltimore
- 52. To which domain belong protists?
  - b) Eukaryotes
- 53. Land plants evolved from:
  - c) Protists Archaeplastida
- 54. Type of asexual reproduction used by prokaryotes:
  - a) Binary fission
- 55. The rounded structure of bacteria is called:
  - b) Cocci
- 56. The helical structure of bacteria is:
  - c) Spirillum
- 57. Red algae belong to:
  - a) Archaeplastida
- 58. Which supergroup fungi and animals belong to:
  - a) Unikonta
- 59. Unikonts that include protists closely related to fungi and animals are classified as :
  - a) Amoebozoans and Opisthokonts
- 60. The closest relatives of the land plants are:
  - d) Red algae and green algae
- 61. Chromalveolates originated by:
  - b) Secondary symbiosis
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  - b) Negative gravitropism
- 66. In the life cycle of nonvascular plants, antheridia and archegonia are produced by:
  - b) Gametophytes
- 67. Which nonvascular plant life cycle requires moisture for a sperm to reach an egg?
  - · d) Moss

-

- 68. Where is the primary growth in the tree?
  - a) Apical meristem
- 69. What is the role of phloem?
  - a) Sugar transport from the source (leaf) to the sink (storage root)

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  - a) Water transport from the sink (storage root) to the source (leaf)
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  - b) Sieve-tube elements
- 73. The loss of water vapor from plants is called:
  - d) Transpiration
- 74. What plant cells are responsible for the plant's metabolic functions, such as synthesis and storage?
  - a) Parenchyma cells
- 75. What are the plant cells that support young growing parts of the plant?
  - a) Collenchyma cells
- 76. What plant cells support old not growing parts of the plant?
  - b) Sclerenchyma cells
- 77. The rate of transpiration is regulated by:
  - a) Stomata
- 78. Which plant group has a life cycle dominated by the gametophyte?
  - a) Moses and other nonvascular plants
- 79. In the plant life cycle, which stage is haploid?
  - a) Gametophyte
- 80. Which plant groups include seed plants?
  - a) Angiosperms and gymnosperms
- 81. What is the angiosperms' unique double fertilization?
  - a) One sperm cell fuses with an egg and produces a zygote, and another produces a triploid cell.
- 82. The sporophyte in plants produces haploid spores by the process of:
  - b) Meiosis
- 83. Which part of a flower becomes a fruit:
  - a) Ovary
- 84. What is the ploidy level in flowering plants?
  - c) 3n
- 85. Which animal phyla does not belong to Eumetazoan?
  - a) Porifera
- 86. Which invertebrate has a radial symmetry?
  - b) Cnidaria
- 87. Which tetrapod has shelled eggs and is an ectotherm?
  - a) Reptiles
- 88. What are the names o genes that regulate the development of body plan in animals?
  - a) Hox genes
- 89. Mouth development from a blastopore is characteristic for:
  - a) Protostomes
- 90. Anus development from a blastopore is characteristic for:
  - b) Deuterostomes

- 91. Birds and mammals that are warmed by heat generated by metabolism are:
  - b) Endotherms
- 92. The animals that gain heat from an external source are:
  - a) Ectotherms
- 93. Animals having three germ layers are:
  - a) Triploblastic
- 94. What is the human population's mathematical growth?
  - c) Exponential
- 95. All of the feeding relationships in an ecosystem are called:
  - b) Food web
- 96. What population growth will result from the population of insects given an ample amount of food:
  - a) Exponential
- 97. The maximum number of individuals that the environment can support is called:
  - a) Carrying capacity
- 98. How much energy is available passed on to the next trophic level?
  - b) 10%
- 99. What type of mimicry is if the harmless species resemble the harmful species?
  - a) Batesian mimicry

100. A graph of the population growth where the amount of food limits the number of offspring that can survive is called:

- a) S-shape curve