BY 123 SI
Mock Exam IV

1. Which of the following, if any, may be components of a virus?
    a. Protein
    b. Phospholipid bilayer
    c. Single Stranded RNA
    d. Double Stranded DNA
    e. All of the above
2. A microbiologist analyzes chemicals obtained from an enveloped RNA virus that infects monkeys. He finds that the viral envelope contains a protein characteristic of monkey cells. Which of the following is most likely the explanation?
    a. The virus is a prophage
    b. The viral envelope forms as the virus leaves the host cell
    c. Its presence is a result of the monkey's immunological response
    d. The virus forced the monkey to make proteins for its viral envelope
    e. The virus fools its host by mimicking its proteins
3. HIV, the virus that causes AIDS, only infects certain cells within the immune system. This is because:
    a. The virus is not very mobile within the body and only comes into contact with a limited number of immune cells
    b. The virus binds to specific receptors that are only present on certain immune cells
    c. Other cells produce toxins that destroy the virus before infection can take place
    d. Infection requires the presence of a specific DNA sequence that is only present in the genome of certain immune cells
    e. The virus gets into all cells, but the viral RNA is immediately destroyed in all but a small number of immune system cells
4. Which of the following can a virus do without a host cell?
    a. Produce ATP for energy
    b. Transcribe DNA
    c. Synthesize proteins
    d. Produce nucleotides for use in replication and transcription
    e. None of the above
5. Cancer cells often have protein receptor molecules on their surfaces that differ from those on normal body cells. Given this fact, how might viruses be used to treat cancer?
    a. Viruses sometimes cause cancer. This is a bad idea
    b. Viruses could be engineered to infect only cancer cells by altering viral surface proteins to recognize only the receptors on cancer cells
    c. Viruses are pathogenic and will infect the host. This treatment will not work

    d. Viruses could be used to carry genes exclusively to the normal body cells. These genes could encode proteins that would help destroy the cancer cells
    e. Viruses could be engineered to attach to the surface receptors on cancer cells to alert the immune system to the presence of cancer
6. When a virus infects an E. coli cell, what part of the virus enters the bacterial cytoplasm?
    a. Only the nucleic acid
    b. The entire virus
    c. The protein capsid only
    d. The tail fibers
    e. The protein capsid and enclosed nucleic acid
7. The phage reproductive cycle that kills the bacterial host cell is a _____ cycle, and a phage that always reproduces this way is a _____ phage.
    a. Lytic, lysogenic
    b. Lytic, virulent
    c. Lysogenic, temperate
    d. Virulent, lytic
    e. Lysogenic, virulent
8. Restriction enzymes help defend bacteria against viral infections by _____
    a. Cutting viral DNA once it has entered the cell
    b. Preventing entry of the viral DNA into the cell
    c. Preventing the synthesis of viral capsomeres in the cell
    d. Preventing the binding of the virus to the cell surface
    e. Preventing integration of the viral genome into the host chromosome
9. What is the origin of the phospholipid membrane that envelops many animal viruses?
    a. It is "stolen" from the host cell and contains only host cell proteins and phospholipids
    b. It is "stolen" from the host cell but it contains some proteins encoded by the viral genome
    c. It is assembled in the ER based on signals sent out by the viral genome
    d. It is produced by viral enzymes and contains only viral proteins and phospholipids
    e. It is assembled from free phospholipids floating in the cell's cytoplasm
10. Emerging viruses can originate from which of the following sources?
    a. Animal viruses
    b. The mutation of existing human viruses
    c. Viruses previously confined to small, isolated populations that can now spread due to technological or social changes such as the development of affordable international travel
    d. All of the above
    e. None of the above
11. Which statement is a correct comparison of a "regular" RNA virus and an RNA retrovirus?
    a. Only RNA retroviruses produce DNA using DNA replicase

b. Only the regular RNA virus performs transcription
c. Only the regular RNA virus produces DNA from an RNA template
d. Both produce protein coats via translation of mRNA
e. Only the RNA retrovirus performs translation

12. Which of the following is an example of a process of evolution?
    a. The existence of homologous traits such as the forelimbs of mammals
    b. The large number and diversity of species of marsupials in Australia
    c. The changes in organisms over time observed in the fossil record
    d. Herbivory
    e. The observed match between organisms and their environments
13. During periods of rapid environmental change, what may happen to a species that was well suited to the former environment?
    a. The species may go extinct
    b. Individuals with particular traits that provide an advantage in the new environment will have higher reproductive success
    c. The population may change so much in adapting to the new environment that it is considered a new species
    d. Both A and C
    e. All of the above
14. Evolution is observed in:
    a. Species
    b. Genotype
    c. Individual
    d. Population
    e. Morph
15. According the theory of evolution, anatomical and molecular homologies should ____
    a. Be completely independent of each other
    b. Produce similar patters of evolutionary relatedness
    c. Yield very different hierarchical patterns
    d. Link all the species currently present on earth
    e. Be understood to have come about by chance alone
16. When they were first sold, aerosol insecticides were highly effective in killing flies and mosquitoes. Now, several decades later, a much smaller proportion of these insects die when sprayed. The reason fewer insects die when the are sprayed is that _____
    a. Mosquitoes that survive spraying develop an immunity to the insecticide
    b. Many mosquitoes today are descendants of mosquitoes with insecticide-resistant characteristics
    c. Mosquitoes are deliberately adapting themselves to this man-made change in the environment
    d. The original spraying has caused a permanent mutation, giving the insects genetic resistance to the spray
    e. All of the above

17. A population of zooplankton is exposed to a small number of predatory fish that feed on the larger-sized (adult) zooplankton. Which of the following predictions would most likely occur based on the principles of natural selection?
    a. The predatory fish will evolve smaller mouths so that they do not drive their prey to extinction
    b. The zooplankton will become sexually mature at larger sizes
    c. The predatory fish will evolve poor eyesight so as to preserve their food supply
    d. Adult zooplankton will start to reach sexual maturity when they are still relatively small
    e. Both A and C
18. For a trait to evolve by natural selection there must be:
    a. Variation among individuals
    b. A mechanism of inheritance
    c. Fitness differences among individuals based on that trait
    d. A and B
    e. All of the above
19. The Hardy- Weinberg principle states that the genotypes in the next generation will be p^2, 2 pq, and q^2 after one generation of?
    a. Mutation
    b. Assortative mating
    c. Random mating
    d. Selection
    e. Inbreeding
20. Genetic drift:
    a. Occurs in all populations
    b. Has the greatest affect in large populations
    c. Will increase genetic variation in isolated populations
    d. Can lead to loss of alleles in isolated populations
    e. Both B and C
    f. Both A and D
21. Disruptive selection favors:
    a. Intermediate phenotypes
    b. Phenotypes only at one end of the range
    c. No phenotypes
    d. Phenotypes at both ends of the range
    e. None of the above
22. Increase or decrease in a trait by selection may not occur if:
    a. There is no genetic variation in the population
    b. Genes determining the trait have pleiotropic effects
    c. Genes determining the trait interact with other genes
    d. All of the above
23. Large female fish and frogs lay more eggs than small ones. Will there be continual selection for increased size in these population?
    a. Yes

b. No, because there is a trade-off between size and survival; large individuals do not live as long as smaller ones
c. No, because only a small proportion of eggs survive anyway because of predation etc
d. No, because egg production is not a genetically determined trait
e. None of the above

24. Two or more alleles for a gene may be maintained in a population by the balance between:
    a. Mutation and selection
    b. Drift and selection
    c. Selection and gene flow
    d. None of the above
    e. All of the above
25. A few individuals of a new yellow morph of a species of waterboatman is introduced into a population. Its frequency increases to about 50% then remains constant. This is an example of
    a. Directional selection
    b. Negative frequency-dependent selection
    c. A balance between drift and selection
    d. Positive frequency-dependent selection
    e. Impossible to tell
26. It is observed in a population that the variance of a trait has decreased over time and then remains constant. This is likely the result of
    a. Directional selection
    b. Chance
    c. Stabilizing selection
    d. Disruptive selection
    e. None of the above
27. It is found that artificial selection to increase beak length in chickens also reduces skill thickness. This is an example of:
    a. Stabilizing selection
    b. Pleiotropy
    c. Epistasis
    d. Both A and C
    e. Both B and C
28. Which example below would most likely exhibit a cline?
    a. Male bowerbirds decorate stations to attract females
    b. Seals have flippers that make them great swimmers but make their movements on rocks and land very cumbersome
    c. Rabbits that live in colder regions tend to have smaller ears than rabbits of the same species that live in warmer regions
    d. Individuals who are heterozygotic for the sickle-cell disease allele have a greater resistance to malaria
    e. Cows are selectively bred to gain a higher milk yield
29. Which of the following can form entirely new alleles?
    a. Genetic drift

b. Natural selection
c. The environment
d. Sexual recombination
e. Mutation

30. In a large population of bonobos, the frequency of the recessive allele is initially 0.1. There is no migration and no selection. What is the frequency of the dominant allele? Assume that there are two alleles of this gene
    a. 90%
    b. 20%
    c. 50%
    d. 99%
    e. 10%
31. A population of 15 birds inhabits a fairly new island. Ten of the birds are dark brown and five of them are light brown. By chance, two of the dark brown birds and three of the light brown birds die before producing any offspring. All of the birds in the next generation are dark brown. This change in phenotypic frequency can be attributed to
    a. Natural selection
    b. Genetic drift
    c. A cline
    d. Gene flow
    e. Sexual selection
32. An earthquake hits a small island. All but a small group of closely related lizards are eliminated, and the survivors spread out over the island. This is an instance of
    a. Founder effect
    b. Gene flow
    c. Mutation
    d. Bottleneck effect
    e. Natural selection
33. Which of the following is the best example of gene flow?
    a. Wind blows pollen from one population of plants to another and cross-fertilization occurs
    b. A small population of humans colonizes a newly formed island
    c. A fire drastically reduces the size of a white-tailed deer population. The remaining individuals spread out throughout the remaining forest
    d. An earthquake results in the formation of a canyon, splitting a population of toads apart
    e. Genes are shuffled by the crossing over of chromosomes during meiosis
34. A population of squirrels is preyed on by small hawks. The smaller squirrels can escape into burrows. The larger squirrels can fight off the hawks. After several generations, the squirrels in the area tend to be very small or very large. What process is responsible for this outcome?
    a. Directional selection

b. Balancing selection
c. Hardy-Weinberg equilibrium
d. Disruptive selection
e. Stabilizing selection

35. Birds with average-size wings survived a severe storm more successfully than other birds in the same population with longer or shorter wings. If severe storms occur regularly, then over time, one should expect these storms to bring about
    a. The bottleneck effect
    b. Stabilizing selection
    c. Gene flow
    d. Directional selection
    e. Disruptive selection
36. How does natural selection fashion organisms?
    a. Chance and the environment interact with natural selection, so that the best available traits are selected for
    b. Neutral traits are often selected for because they will eventually produce alleles that confer an advantage
    c. Sexual selection acts to make organisms better adapted to their environments
    d. The best traits for the current environment arise in the population and are selected for
    e. Brand new body plans arise often, giving natural selection many new possibilities to work with
37. If two populations of a species have been isolated for a period of time, what will occur of they come into contact?
    a. They will interbreed freely with each other
    b. They may not mate at all with each other
    c. They may mate with each other, but the offspring will be less viable than either parent
    d. All of the above
38. Natural selection is more likely to play a role in the evolution of reproductive isolation than genetic drift because:
    a. Genetic drift will only be effective in small populations
    b. Differentiation will occur very slowly with genetic drift
    c. Differentiation will occur much more rapidly under natural selection
    d. All of the above
39. Suppose you find two sympatric species of bird that mate readily in the laboratory and produce fertile offspring, but appear to be distinct species in nature. This would indicate that:
    a. They also interbreed freely with each other in nature but this has just not been observed
    b. They are in fact the same species
    c. There are pre-zygotic isolating mechanisms that keep them reproductively isolated
    d. The biological species concept is inadequate in this instance

e. None of the above

40. Two distinct species of fish are very similar in appearance when they are allopatric, but when they are sympatric there are considerable differences in color pattern. What is the most likely cause of this?
    a. They are hybrids
    b. Reinforcement of isolating mechanisms
    c. Selection by predators
    d. All of the above
    e. A and C
41. Two species of water lilies in the same pond do not interbreed because one blooms at night and the other during the day. The reproductive barrier between them is an example of
    a. Hybrid breakdown
    b. Gametic isolation
    c. Temporal isolation
    d. Ecological isolation
    e. Mechanical isolation
42. Which of the following is an example of a post-zygotic reproductive barrier?
    a. The sperm of a marine worm can only penetrate eggs of the same species
    b. One species of flower grows in forested areas, another in meadows
    c. Two pheasant species perform different courtship dances
    d. Two fruit flies of different species produce sterile offspring
    e. One species of frog mats in April, but another mates in May
43. There are two groups of pine trees that appear to be very similar phenotypically and genotypically. However, one releases pollen in January, when the female structures of that group are receptive, and one in March. What kind of reproductive barrier is this?
    a. Gametic isolation
    b. Mechanical isolation
    c. Hybrid inviability
    d. Temporal isolation
    e. A geographic barrier
44. Which of the following organisms is most likely to be subject to allopatric speciation?
    a. Mountain lions in the canyons of Wyoming and in the canyons of Utah
    b. Pine trees in Alaska and pine trees on the island of Madagascar
    c. Fruit flies on bananas and fruit flies on oranges
    d. Bacteria in a hospital and bacteria in a nursery
    e. Whale populations of the same species located on opposite sides of the Atlantic ocean
45. In the case of the Lake Victoria cichlids, a sympatric speciation has been shown to be driven by
    a. Sexual selection
    b. Post zygotic barriers
    c. Polyploidy

d. Habitat differentiation
e. Mechanical isolation

46. What is the first thing that must happen in order for speciation to occur?
    a. The populations must become reproductively isolated
    b. A catastrophic event must cause geographic separation of two populations
    c. A hybrid zone must be established
    d. One of the populations must become polyploidy
    e. Gene flow between populations must be interrupted
47. Abiotically produced vesicles display which of the following rudimentary qualities necessary for life?
    a. The ability to maintain an internal chemical environment different from their surroundings and to reproduce sexually
    b. The ability to synthesize organic molecules from inorganic molecules
    c. The ability to accurately replicate and build macromolecules
    d. The ability to perform simple reproduction and metabolism
    e. The ability to perform simple metabolism and to assemble nucleic acids from nucleotides
48. The miller and Urey abiotic synthesis experiment showed that
    a. The earliest life-forms introduced large amounts of oxygen into the atmosphere
    b. Simple organic molecules can form spontaneously under conditions like those thought to prevail early in Earth's history
    c. Life can be created in a test tube
    d. Long chains of DNA can form under abiotic conditions
    e. The "concentration gap" probably prevented simple organic molecules from polymerizing