



**6. Evolutionary explanations for disease symptoms do NOT include:**

- a. constraints on adaptation
- \* b. mutations that occur to prepare a species for anticipated changes
- c. defenses and compensations
- d. fitness trade-offs

**7. The basic elements of a body plan do NOT include which of the following:**

- a. Number of embryonic cell layers
- b. Presence and nature of body cavity
- c. Number of openings to digestive tract
- d. Presence and nature of symmetry
- \* e. Planned modifications during future evolution

**8. A denitrifier**

- a. converts ammonia ( $\text{NH}_3$ ) to nitrite ( $\text{NO}_2^-$ ).
- \* b. converts nitrate ( $\text{NO}_3^-$ ) to nitrogen gas ( $\text{N}_2$ ).
- c. oxidizes nitrite ( $\text{NO}_2^-$ ) to nitrate ( $\text{NO}_3^-$ ).
- d. converts nitrogen gas ( $\text{N}_2$ ) to ammonia ( $\text{NH}_3$ ).

**9. The kingdom Animalia is \_\_\_\_\_**

- a. paraphyletic
- b. superphyletic
- c. polyphyletic
- \* d. monophyletic

**10. The pentaradially symmetrical echinoderms that you saw in lab were representatives of...**

- a. the protosomes
- \* b. the deuterostomes
- c. the cnidarians
- d. the porifera

**11. Which statement is FALSE? The malarial parasite *Plasmodium***

- \* a. spends most of its life-cycle as a diploid.
- b. infects both the liver and the blood in humans.
- c. is an extracellular parasite in mosquitoes.
- d. is an intracellular parasite in humans.

**12. The main idea of the “smoke-detector principle” is that...**

- a. smoke inhalation causes many diseases
- b. many disease symptoms are actually designed to send a warning signal
- \* c. a defensive reaction that sometimes occurs when not needed may be more beneficial than one that sometimes fails to occur when needed

**13. Which statement is FALSE?**

- \* a. The theory of evolution shows that there is no purpose to life.
- b. Science and religion both engage in a search for truth, but for very different kinds of truths.
- c. Evolution is both a fact and a scientific theory.
- d. The word “theory” in everyday English has a different meaning to “scientific theory”.

**14. All animals...**

- a. have symmetrical bodies
- b. are autotrophic
- \* c. are obligate heterotrophs
- d. are prokaryotes

**15. The group of animals that molt periodically is called the**

- a. insects
- b. arthropods
- \* c. ecdysozoans

**16. The original opening into an early embryo, called the blastopore, develops into:**

- a. the mouth in protostomes
- b. the anus in deuterostomes
- \* c. both of the above
- d. neither of the above.

**17. Which statement is TRUE?**

- a. Either the theory of evolution is true, or the book of Genesis is correct: there is no middle ground.
- b. The theory of evolution is in a state of crisis due to numerous anomalies and falsifications.
- \* c. Evolution makes consistent sense of a huge variety of observations that would otherwise seem random.
- d. Both the theory of evolution and intelligent design agree that living beings are perfect, and cannot be improved upon.

**18. Hyphae are**

- \* a. threadlike structures of multicellular fungi.
- b. unique to basidiomycetes.
- c. a symbiosis involving a fungus and a bacterium.
- d. the sexual organs of a fungus.

**19. Despite a long history of natural selection, humans continue to carry genes which cause the disease of sickle-cell anemia. This illustrates the fact that evolution is constrained by\_\_\_\_\_.**

- a. conservatism and gradualism
- \* b. fitness trade-offs
- c. natural selection
- d. evolutionary arms races

**20. The best explanation of any trait in biology, including a disease symptom is based on ...**

- a. proximate causation
- b. ultimate explanation
- \* c. both of the above
- d. none of the above

**21. Which statements is TRUE?**

- \* a. Most protists are aquatic.
- b. All protists are heterotrophs.
- c. Protists are more diverse than prokaryotes in their metabolism, while prokaryotes are more diverse than protists in their morphology.
- d. Protists never reproduce sexually.

**22. Dikaryotic cells**

- \* a. contain 2 nuclei per cell.
- b. come in exactly two different mating types.
- c. are produced by the endosymbiosis of two unrelated species.
- d. contain one diploid nucleus per cell, containing two sets of each chromosome.

**23. Humans continue to have an appendix, even though it is useless and even dangerous. This illustrates the fact that evolution is constrained by\_\_\_\_\_.**

- \* a. conservatism and gradualism
- b. fitness trade-offs
- c. natural selection
- d. evolutionary arms races

**24. Which statement is TRUE?**

- a. Falsifiability is an accurate description of how science is done: when a scientific theory does not correctly predict the results of an experiment, that theory is immediately abandoned.
- \* b. According to Kuhn, a paradigm is a specific, scientific way of doing things, learned by example eg constructing a phylogeny.
- c. Anomalous experimental results have no influence on the direction of science, according to Kuhn's view of scientific revolutions.
- d. Falsifiability is a very straightforward process of data failing to meet predictions, according to both Kuhn and Lakatos.

**25. Which statement is FALSE? Dinoflagellates**

- \* a. are a kind of euglenoid.
- b. sometimes live as endosymbionts eg in coral.
- c. are often bioluminescent.
- d. are important primary producers in the oceans.
- e. can cause "red tides".

**26. Which statement is FALSE?**

- a. The ancestor of mitochondria was a proteobacterium.
- b. The ancestor of chloroplasts was a cyanobacterium.
- \* c. A single species of bacteria can only form one type of cell.
- d. Firmicutes are a type of bacteria.

**27. All animals share a set of derived traits. These do NOT include:**

- a. Similarities in their small-subunit ribosomal RNAs
- b. Similarities in their Hox genes
- \* c. Symmetrical bodies
- d. Special types of cell-cell junctions
- e. A common set of extracellular matrix molecules

**28. The closest living relatives of the kingdom Animalia are the**

- a. plants
- \* b. fungi
- c. bacteria

**29. Protists are**

- a. single-celled plants.
- b. single-celled animals.
- c. single-celled fungi.
- \* d. a polyphyletic group of eukaryotes that are not plants, animals or fungi.

**30. The diphtheria-causing bacterium, *Corynebacterium diphtheriae* infects only the throat, but can still be deadly. This is because this bacterium has the qualities of \_\_\_\_\_ invasiveness and \_\_\_\_\_ toxigenicity.**

- \* a. low; high
- b. high; high
- c. low; low
- d. high; low
- e. moderate; moderate

**31. Diphtheria can be deadly even though it can cause very little fever. This indicates a probable role for**

- \* a. exotoxins.
- b. endotoxins.
- c. Gram-negative toxins.
- d. Gram-positive toxins.
- e. None of the above

- 32. The vertebrate eye suffers from detached retinas and a blind spot because...**
- a. the lens is in the wrong place.
  - b. eye infections cause this problem.
  - \* c. retinal nerves run in front of photoreceptor cells instead of behind them.
  - d. the vertebrate eye was inherited from the defective eye of the squid and other mollusks.
- 33. Complex hard skeletons, active locomotion, and bilateral symmetry are found in ...**
- a. the protostomes
  - b. the deuterostomes
  - \* c. both of the above
  - d. none of the above
- 34. Which statement is TRUE?**
- a. Most bacteria cause disease.
  - b. All infectious diseases are caused by bacteria.
  - \* c. Many of our antibiotics come from bacteria, where they occur naturally.
  - d. Bacteria can sometimes undergo sexual reproduction to form spores.
  - e. Bacteria all have cell walls.
- 35. Which of the following traits is only found in the absence of the others in the same animal?**
- a. moves rapidly through its environment.
  - b. lateral symmetry
  - c. cephalization
  - \* d. two embryonic cell layers
- 36. Which of the following is shared in common by all living animals**
- a. They are autotrophs
  - \* b. They are heterotrophs
  - c. They have organ systems, including a skeleton and muscles for motility
  - d. None of the above
- 37. The bilaterally symmetrical animals have...**
- \* a. a complete gut
  - b. no gut
  - c. a blind gut
- 38. The theory of intelligent design is**
- a. the best theory according to Occam's razor.
  - b. just as scientific as the theory of evolution.
  - c. scientifically proven.
  - \* d. a sufficient explanation for adaptation, but not for a range of other biological observations.
- 39. Which of these groups is extremely common and diverse both on land and in the sea?**
- a. The insects (hexapoda)
  - b. The vertebrates (vertebrata)
  - c. The cnidarians
  - \* d. The arthropods
- 40. Which of the following is NOT part of the evidence for the theory of evolution?**
- \* a. the Bible
  - b. experimental evolution in the laboratory
  - c. fossil record
  - d. phylogenetic trees
  - e. biogeography
- 41. A division of labor among different specialized cell types is characteristic of:**
- a. porifera
  - b. protists
  - \* c. animals

**42. An obligate aerobe**

- \* a. cannot survive without oxygen.
- b. cannot survive with oxygen.
- c. doesn't use oxygen, but can tolerate it.
- d. can switch between using oxygen and not using oxygen.

**43. A photoheterotroph gets**

- a. its energy from light, and its carbon from CO<sub>2</sub>.
- \* b. its energy from light, and its carbon from other organisms.
- c. its energy from inorganic substances and its carbon from CO<sub>2</sub>.
- d. both its energy and its carbon from other organisms.

**44. Which trait is NOT shared by all three domains of life?**

- a. translation according to a genetic code of nucleotide triplets
- b. semiconservative replication of DNA using one strand of the double helix as a template for the new strand
- \* c. DNA arranged in multiple discrete chromosomes
- d. using DNA to code for proteins

**45. Paramecium**

- a. cannot have sex without reproducing.
- b. cannot reproduce without having sex.
- \* c. can either have sex or reproduce, but does not do both at the same time.

**46. Which group on this list does not completely contain within it any of the other groups?**

- \* a. vertebrates
- b. deuterosomes
- c. bilaterally symmetrical animals
- d. eukaryotes

**47. Which statement is FALSE? Amoebas**

- a. move by using temporary projections called pseudopods.
- \* b. can be either cellular or acellular.
- c. have a body plan that has evolved multiple times through a process of convergent evolution.

**48. Intelligent design**

- a. has not generated a progressive research program.
- b. cannot explain instances of "bad design" such as the position of the human retina behind nerve cells.
- c. cannot be taught in US schools due to Constitutional restrictions on the separation of church and state.
- \* d. All of the above.

**49. Complex internal skeletons are found in the**

- \* a. deuterostomes
- b. protostomes
- c. both of the above
- d. neither of the above

**50. Falsifiability means that a theory**

- a. satisfies Occam's razor.
- b. generates a progressive research program.
- c. is false.
- d. is true.
- \* e. is clear about what would be necessary to prove it wrong.