

1. What is the function of naturally occurring restriction enzymes in bacterial cells?
 - A. They are used during DNA replication in the bacterial cell.
 - B. They are used to degrade the bacterial cell's DNA.
 - C. Restriction enzymes recognize and cleave DNA molecules that are foreign to the bacterial cell.
 - D. These enzymes are used to attach pieces of DNA into an opening created by ligase enzymes.
2. Which of the following is mismatched?
 - A. bioinformatics – the study of a genomic and proteomic information using computer analysis
 - B. polymerase chain reaction – process that separates DNA fragments according to size
 - C. genomics – the study of the genomes of humans and other organisms
 - D. proteomics – the study of species' proteins
3. Place the following steps in cloning DNA in the correct order.
 - 1 - use vector to deliver new rDNA to bacterial or other cells
 - 2 - use restriction enzymes to cut a plasmid and add the desired gene
 - 3 - isolate and cut out a desired gene using restriction enzymes
 - 4 - use DNA ligase to seal the new gene
 - 5 - allow bacterial cells to replicate and produce desired product
 - A. 1, 2, 3, 4, 5
 - B. 5, 3, 2, 4, 1
 - C. 2, 5, 3, 1, 4
 - D. 3, 2, 4, 1, 5
4. The function of a vector in genetic engineering is to
 - A. cut DNA into many fragments.
 - B. introduce rDNA into a host cell.
 - C. link together newly joined fragments of DNA.
 - D. make millions of copies of a specific segment of DNA.
 - E. separate fragments of DNA by their length and electrical charges.
5. The term “ligase” adds the suffix “-ase” to the Latin root word for
 - A. gene.
 - B. work.
 - C. cut.
 - D. bind.
 - E. copy-producing.

6. Which of the following molecules forms lengths of DNA with “sticky ends”?

- A. DNA ligase
- B. DNA polymerase
- C. RNA polymerase
- D. reverse transcriptase
- E. restriction enzyme

7. The function of DNA ligase in recombinant technology is to

- A. cut DNA into many fragments.
- B. carry DNA into a new cell.
- C. seal DNA into an opening created by restriction enzymes.
- D. make millions of copies of a specific segment of DNA.
- E. separate fragments of DNA by their length and electrical charges.

8. What enzyme is used to make cDNA from mRNA?

- A. DNA ligase
- B. helicase
- C. reverse transcriptase
- D. RNA polymerase
- E. restriction enzyme

9. The function of the polymerase chain reaction in genetic engineering is to

- A. cut DNA into many fragments.
- B. carry DNA into a new cell.
- C. link together newly joined fragments of DNA.
- D. make multiple copies of a specific segment of DNA.
- E. separate fragments of DNA by their length and electrical charges.

10. All of the following statements are true about restriction enzymes EXCEPT

- A. they are made by bacteria and viruses.
- B. hundreds of different ones have been isolated and purified.
- C. they produce single-stranded complementary ends that can join to two different DNA strands by complementary base pairing.
- D. each enzyme cuts DNA at a different specific base sequence.

11. What was the minimal requirement for "classic DNA fingerprinting" to associate a blood sample with the criminal, or to estimate the evolutionary similarity of an extinct quagga as closer to a zebra than a horse?

- A. one sample of DNA, PCR amplification, restriction enzymes, and gel electrophoresis
- B. one sample of DNA, restriction enzymes, a DNA synthesizer, and gel electrophoresis
- C. two samples of DNA, PCR amplification, restriction enzymes, and gel electrophoresis
- D. two samples of DNA, PCR amplification, a DNA synthesizer, and gel electrophoresis
- E. two samples of DNA, PCR amplification, restriction enzymes, and a DNA synthesizer

12. To carry out a polymerase chain reaction (PCR), you must have DNA polymerase and

- A. a blueprint or gene map of the sequence you wish to copy.
- B. the nucleotides to synthesize new DNA strands.
- C. a DNA synthesizer machine.
- D. a DNA probe.

13. A transgenic organism is

- A. one that contains a gene from another organism of the same or different species.
- B. one produced by cloning a mutant cell.
- C. one that acts as the donor for DNA to be moved into another organism.
- D. one produced by the polymerase chain reaction.
- E. any genetically modified organism resulting from laboratory research.

14. Plants are being genetically engineered to have

- A. a requirement for more fertilizer.
- B. an increased water requirement.
- C. the ability to produce human proteins.
- D. increased susceptibility to herbicides.
- E. All of the choices are correct.

15. A common method used to introduce rDNA into bacterial host cells is

- A. viral infection.
- B. bacteriophage infection.
- C. plasmid transfer.
- D. microinjection of DNA.
- E. laser irradiation of cells in a fluid containing DNA.

16. Transgenic _____ have been given suicide genes that cause them to self-destruct when the job for which they are engineered has been accomplished.

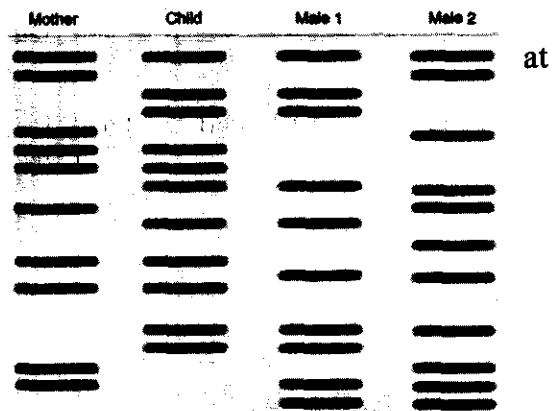
- A. animals
- B. bacteria
- C. plants
- D. fungi
- E. All of the choices are correct.

17. What is the function of gel electrophoresis in genetic engineering?

- A. cut DNA into many fragments
- B. carry DNA into a new cell
- C. link together newly joined fragments of DNA
- D. make millions of copies of a specific segment of DNA
- E. separate fragments of DNA by their length and electrical charges

18. DNA fingerprinting may be used to establish paternity. Analyze the banding pattern pictured right to determine the father of the child.

- A. Male 1
- B. Male 2



19. With both bacterial and eukaryotic cells constantly dying and breaking down around us, and with a tremendous load of fragmentary DNA washing around in the fluid world, why aren't genes being transferred among various living organisms at a massive scale daily?

- A. DNA that is not protected inside a protein coat or membrane is very vulnerable.
- B. Living cells maintain a very effective barrier to the introduction of large molecules.
- C. Since a vector appears necessary to snatch up DNA from one protected source and inject it into a cell, "naked" DNA is apparently vulnerable and unable to cross membranes easily.
- D. All of the choices are correct.
- E. None of the choices are correct, since DNA is readily exchanged among all organisms in nature.

20. When bone marrow stem cells are removed from the patient, infected with a virus that carries a normal gene, and returned to the patient, this is an example of

- A. PCR.
- B. chemotherapy.
- C. viral disinfection.
- D. in vivo gene therapy.
- E. ex vivo gene therapy.

21. Transgenic plant products include all of the following EXCEPT

- A. soybeans that are resistant to a common herbicide.
- B. an antibody produced by soybeans to treat genital herpes.
- C. suicide genes that cause the plants to self destruct after their product has been produced.
- D. antibodies produced by corn plants that deliver radioisotopes to tumor cells

22. All of the following are true regarding transgenic animals EXCEPT

- A. foreign genes are micro-injected into eggs, fertilized in vitro, and the zygotes are placed in host females to develop.
- B. the process has inserted bovine growth hormone into fish, cows, and other animals.
- C. the process has been used to develop organisms that are partially animals and partially plant.
- D. the product desired by the transgenic procedure may be secreted in the milk of female offspring.

23. It is estimated that humans have approximately _____ bases in our genome.

- A. 3 billion
- B. 2.5 million
- C. 180 million
- D. 12 trillion

24. Human gene therapy

- A. includes the insertion of genetic material into human cells for the treatment of a genetic disease.
- B. has been used for treatment of children who have severe combined immunodeficiency.
- C. has been used in a trial to treat familial hypercholesterolemia.
- D. All of the choices are correct.

25. The introduction of normal genes into an afflicted individual for therapeutic use is called

- A. human cloning.
- B. proteonomics.
- C. gene therapy.
- D. genetic profiling.

26. Which of the following is NOT involved in natural selection?

- A. There is always competition for resources.
- B. Organisms differ in reproductive success.
- C. There are inheritable variations in populations.
- D. The desired traits are chosen by a breeder.

27. The theory of _____ proposed that a series of catastrophes or mass extinctions followed by repopulation could explain why species change over time.

- A. descent with modification
- B. inheritance of acquired traits
- C. uniformitarianism
- D. catastrophism

28. Two fossilized remains are found and scientists assume the two organisms are different but related. Which of the following would determine the relatedness of these two organisms?

- A. homologous structures
- B. vestigial structures
- C. biogeography
- D. All of the choices could be examined to determine relatedness.

29. Darwin's theory of natural selection to explain evolution is also known as

- A. descent with modification.
- B. inheritance of acquired characteristics.
- C. uniformitarianism.
- D. catastrophism.

30. "Evolution" is a Latin term that comes from the root word meaning

- A. species.
- B. new.
- C. anti-religious.
- D. fossils.
- E. unrolling.

31. Which of the following ideas was most commonly held in the eighteenth century?

- A. evolution by natural selection over time
- B. genetic change through mutation
- C. the fixity of species
- D. changes in a species through adaptation to the environment

32. What is the *scala naturae*?

- A. a species of horse
- B. the first theory of evolution
- C. a sequential ladder of life, with humans at the top
- D. another name for the theory of special creation

33. Cutting off the tails of mice over several generations should cause the tails of their offspring to become shorter, according to the ideas of which of these scientists?

- A. Darwin
- B. Lamarck
- C. Cuvier
- D. Lyell

34. Over many generations man has chosen certain desirable characteristics in dogs by allowing dogs possessing those characteristics to reproduce. In this way, 150 breeds of dogs, all in the same species, have descended from wolves. This process is referred to as

- A. natural selection.
- B. inheritance of acquired traits.
- C. artificial selection.
- D. convergent evolution.

35. Most of Darwin's observations about changes in species over time and in different environments took place in and near

- A. North America.
- B. Africa.
- C. South America.
- D. Asia.
- E. Greenland

36. Darwin's observation that there were Patagonian hares but no rabbits in South America would be considered _____ evidence.

- A. anatomical
- B. biochemical
- C. fossil
- D. biogeographical

37. A line of evidence NOT considered by Darwin in his development of the theory of natural selection is

- A. comparative anatomy.
- B. biogeography.
- C. the fossil record.
- D. comparative biochemistry.

38. When he arrived at the Galápagos Islands, Darwin did **not** observe the amazing tool-using “woodpecker finch” that can modify twigs to pry out grubs. Because there are no true woodpeckers on the Galápagos Islands, this behavior allows this finch to exploit an untapped food source. However, not all members of this species exhibit this behavior, which is probably learned from watching other finches. Therefore,

- A. young isolated at hatching will not know how to do this.
- B. it is probably not “hardwired” in the brain as a behavior passed on genetically.
- C. there must be a great advantage to reaching this food source for this learned behavior to be repeated by most descendants of each generation.
- D. as an acquired characteristic, in a strict sense this is not part of the adaptive radiation of finches on the Galápagos.
- E. All of the choices are correct.

39. A population must have _____ for natural selection to occur.

- A. a stable environment
- B. abundant resources
- C. many individuals
- D. inheritable variation

40. Fossils like Archaeopteryx offer evidence linking

- A. reptiles and mammals.
- B. fish and amphibians.
- C. birds and mammals.
- D. birds and reptiles.

41. What evidence would be studied by a biogeographer?

- A. plate tectonics
- B. amount of genetic similarity among current populations
- C. ocean currents and wind patterns
- D. ranges and migration patterns of animals
- E. All of the choices are correct.

42. Homologous structures such as the bones in wings, flippers, and arms would be studied in the field of

- A. comparative anatomy.
- B. biogeography.
- C. the fossil record.
- D. comparative embryology.
- E. comparative biochemistry.

43. All of the following are examples of natural selection EXCEPT

- A. the distribution of dark and light colored peppered moths in Britain.
- B. a rise in bacterial resistance to antibiotics.
- C. the reduction in beak length of scarlet honeycreepers when they changed food sources.
- D. the 150 breeds of dogs developed from ancestral wolves.
- E. B and D are not examples of natural selection.

44. Birds and insects both have wings, but we do not consider this similarity as evidence of relatedness because

- A. bird wings function on different physics principles of lift.
- B. insect wings are vestigial.
- C. the wings are not homologous structures with a common ancestral origin.
- D. they did not evolve in the same region or live at the same time period.
- E. there is no fossil link between these groups.