The Origin and Evolution of Microbial Life: Prokaryotes and Protists

1. A stromatolite is

a) a fossilized bacterial mat probably formed mainly by ancient heterotrophic bacteria

b) a fossilized bacterial mat probably formed mainly by ancient cyanobacteria

c) a living bacterial mat formed mainly by cyanobacteria

d) a living algal mat formed mainly by green algae

e) a living algal mat formed mainly by slime molds

2. Which of the following organisms first gave Earth its oxygen-containing atmosphere?

a) cyanobacteria

b) methanogens

c) early protozoans

d) plants

e) green algae

3. The "big bang" that produced the universe is thought to have occurred

a) 50 billion years ago

b) 40 billion years ago

c) 10 to 20 billion years ago

d) 5 to 10 billion years ago

e) 4.6 billion years ago

4. When the Earth first formed, it had an abundant atmosphere of hot hydrogen gas(H2). What happened to this atmosphere?

a) Most of it is still present as a component of the modern atmosphere.

b) Most of it combined with the oxygen in the early atmosphere to form water,

which rained
down and became the oceans.

c) It escaped into space because the Earth's gravitational field was not strong enough to hold it.

d) When the Earth melted, it burned.

e) It was mostly absorbed by molten rock during the Earth's molten period.

5. Earth's second early atmosphere, the one produced by outgassing of volcanoes and other vents, is thought to have consisted mainly of which of the following components?

a) hydrogen gas

b) water vapor, carbon monoxide, carbon dioxide, and nitrogen

c) water vapor, carbon dioxide, nitrogen, methane, and oxygen

d) water vapor, hydrogen, and oxygen

e) methane and ammonia

6. Which of the following was probably <u>not</u> present in the primitive Earth's atmosphere?

a) CH_4

b) NH_3

c) $C0_2$

d) O_2

e) H_2O

7. Which of the following groups are types of life in the order in which they are thought to have appeared on the Earth (from earliest to most recent)?

a) heterotrophic organisms, photosynthetic organisms, organisms tolerant of oxygen,
eukaryotic cells

b) organisms tolerant of oxygen, photosynthetic organisms, heterotrophic organisms,

eukaryotic cells

c) organisms tolerant of oxygen, eukaryotic cells, photosynthetic organisms, heterotrophic
organisms

d) photosynthetic organisms, organisms tolerant of oxygen, heterotrophic organisms,
eukaryotic cells

e) eukaryotic cells, organisms tolerant of oxygen, autotrophic organisms, photosynthetic organisms

8. Which one of the following is <u>not</u> true?

a) Some scientists suggest that meteorites and comets seeded Earth with organic molecules.

b) From the time of the ancient Greeks until the nineteenth century, it was widely accepted that life arose from nonliving matter on a regular and continuing basis.

c) The earliest life was much simpler than anything living today.

d) The first life on Earth likely appeared 1-2 million years ago.

e) Louis Pasteur, in 1862, confirmed that all life today comes from preexisting life.

9. Miller was the first to show that

a) the earliest forms of life were photosynthetic

b) eukaryotic life evolved from early prokaryotes

c) the primitive atmosphere contained ammonia and methane

d) amino acids and other organic molecules could have been generated on a lifeless Earth

e) the earliest forms of life had an RNA genome

10. If the atmosphere of the early Earth had been oxidizing instead of reducing, life might never have arisen. What is the main reason for this?

a) Aerobic respiration is too complex to have been invented by the earliest organisms.

b) Proteinoids do not form microspheres in the presence of oxygen.

c) Oxygen is corrosive and tends to destroy organic compounds by stripping off electrons; a reducing atmosphere tends to add electrons and thus fosters the buildup of organic compounds.

d) Atmospheric oxygen would have created an ozone layer, which would have blocked out
the ultraviolet light essential for the prebiotic synthesis of organic molecules.

e) The carbon dioxide to form carbon compounds would have been absent from an oxidizing atmosphere.

11. In the experiments of Miller, and those of other scientists, it was shown that

a) simple cells could be produced in the laboratory using a "soup" of small organic molecules

b) amino acids and sugars could be produced from the inorganic components thought to have been on the primitive Earth

c) living cells could survive in the primitive Earth's atmosphere

d) microspheres could be formed from amino acids

e) given the conditions of early Earth, life would still require additional materials from
meteorites and asteroids

12. Which of the following properties of clay might have made it an important site for the
polymerization of organic polymers on the early Earth?

a) Clay contains enzymes that can act as catalysts.

b) Electrically charged sites in the clay tend to concentrate amino acids and other organic molecules from dilute solutions.

c) Clay contains sufficient water to stimulate polymerization.

d) Most particles of clay contain amino acids that can be added to existing amino

acids to
form polymers that resemble proteins.

e) None of the choices are correct.

13. Which one of the following does not suggest that the earliest organisms may have had an RNA genome?

a) Short RNA sequences have been created in test tubes under conditions simulating the
environment of the early Earth.

b) Eukaryotic mitochondria have an RNA genome.

c) Short, new complementary RNA molecules sometimes assemble spontaneously when
polymerized RNA is added to a solution of free RNA monomers.

d) Some RNA molecules act as enzymes, and some of these are known to catalyze RNA polymerization of a limited sort.

14. The first membrane-enclosed systems probably contained cooperative associations between

a) DNA and RNA.

b) DNA and polypeptides.

c) RNA and polypeptides.

d) DNA, RNA, and polypeptides.

e) RNA, lipids, and carbohydrates.

15. Prokaryotes _____eukaryotes.

a) cannot cause disease in

b) only cause disease in

c) evolved after

d) include the protistan

e) are approximately 10 times smaller than

16. Bacterial cell walls contain a unique substance called

a) cellulose

b) peptidoglycan

c) phospholipid

d) glycogen

e) proteinoid

17. Evidence for the closer relationship of archaea to eukaryotes than to bacteria includes all of the following <u>except</u>

a) similar rRNA sequences

b) the presence of introns

c) similar RNA polymerase

d) the presence of peptidoglycan in the cell wall

e) lack of sensitivity to antibiotics

18. Prokaryotes are classified into

a) Domain Monera and Domain Archaea.

b) Kingdom Bacteria and Kingdom Archaea.

c) Domain Bacteria and Domain Archaea.

d) Kingdom Protista and Kingdom Monera.

e) Domain Bacteria and Domain Monera.

19. Pairs of rod-shaped bacteria are called

a) cocci

b) bacilli

c) diplobacilli

d) spirochetes

e) vibrios

20. Curved bacterial cells that are shaped like commas are called

a) cocci.

b) bacilli.

c) diplobacilli.

d) spirochetes.

e) vibrios.

21. By far the largest group of bacteria are the _____. They obtain both energy and carbon from _____.

a) autotrophs ... inorganic molecules

b) chemoautotrophs…decaying organic material

c) chemoheterotrophs…organic molecules

d) photoautotrophs ... light

e) parasites ... a living host

22. Autotrophic bacteria obtain their carbon and energy from which of the following sources?

a) carbon from $C0_2$; energy from sunlight

b) carbon from $C0_2$; energy from certain inorganic chemicals

c) carbon from $C0_2$; energy from sunlight or energy from certain inorganic chemicals

d) both carbon and energy from organic molecules

e) carbon from organic molecules; energy from sunlight

23. Which one of the following statements <u>is not</u> true?

a) Archaea are one of the most abundant cell types below 1,000 meters in the oceans.

b) Archaea that thrive in extremely hot places are known as thermophiles.

c) Archaea that thrive in anaerobic places are known as anaerophiles.

d) Archaea that thrive in extremely salty places are known as halophiles.

e) Human intestinal gas is largely produced by archaea in our intestines.

24. The short, thin appendages that help prokaryotes adhere to surfaces, such as rocks or cells, are called

a) flagella

b) pili

c) cilia

d) mesosomes

e) plasmids

25. You culture the dried soup from a 4,000-year-old cooking pot found in an Egyptian tomb and obtain a distinctive species of prokaryote. You immerse a test tube of these bacteria in boiling water for several hours, but the colony grows back. This species is probably

a) halophilic

b) acidophilic

c) endospore-forming

d) a spirochete

e) a cyanobacteria

26. Which of the following organisms are common soil inhabitants and grow in the form of a filamentous mass of branching cell chains that superficially resembles a fungus?

a) actinomycetes

b) basidiomycetes

c) yeasts

d) halobacteria

e) cocci

27. Which of the following produce a number of antibiotics?

a) E. coli

b) Proteus

c) Streptomyces

d) Halobacterium

e) None of the choices are correct.

28. Cyanobacteria

a) are photosynthetic archaea

b) evolved from archaea

c) are chemoautotrophs

d) are of the same nutritional type as the earliest forms of life

e) bloom in lakes contaminated with organic wastes

29. Which one of the following causes food poisoning and toxic shock syndrome?

a) E. coli

b) Staphylococcus aureus

c) Bacillus anthracis

d) Clostridium botulinum

e) Proteus vulgaris

30. A patient comes to the doctor because of a large, bull's-eye-shaped, red rash that has a clear patch in the center. Originally there was an insect bite in the middle of the rash. The patient lives in a rural area of the United States where deer are common. Which of the following diseases will the physician immediately suspect?

a) syphilis

b) anthrax

c) smallpox

d) Lyme disease

e) malaria

31. Which of the following is the basis for determining the causative agent of most infectious diseases?

a) Koch's postulates

b) Pasteur's laws

c) trial and error

d) process of elimination

e) None of the choices are correct.

32. Which one of the following statements is not true?

a) Bioterrorism dates back to the Middle Ages.

b) The United States studied and bred a variety of strains of bacteria for use as weapons.

c) In 1975, the U.S. signed the Biological Weapons Convention pledging never to develop or store biological weapons.

d) *Bacillus anthracis* is easy to obtain, easy to grow in the laboratory, and forms resistant
endospores that can be stored for years.

e) Human exposure to anthrax through the skin or lungs almost certainly leads to death.

33. Which one of the following is not true?

a) Bioremediation is the use of prokaryotes (and other organisms) to.clean up pollution.

b) Prokaryotic decomposers are the mainstays of human sewage-treatment facilities.

c) Some cyanobacteria convert nitrogen compounds from the atmosphere into nitrogen gas that plants can take up and use.

d) Prokaryotes have had a greater impact on the environment and on biological

evolution
than all other forms of life combined.

e) Some naturally occurring oil-eating bacteria can be used to clean up oil spills.

34. The term for a close association between two or more species is

a) symbiosis

b) interdependence

c) associative living

d) colonialism

e) mutualism

35. According to the endosymbiotic theory of the origin of chloroplasts, autotrophic prokaryotic cells

a) incorporated heterotrophic cells

b) were incorporated by heterotrophic cells

c) supplied the host cell with A TP from aerobic respiration in return for nutrients

d) lost their ability to photosynthesize

e) None of the choices are correct

36. Which of the following points supports the endosymbiotic theory of eukaryotic cell development?

a) Mitochondria have their own DNA molecules

b) The ribosomes of mitochondria are identical to the ribosomes in other parts of the eukaryotic cell

c) All of the DNA in eukaryotic cells is confined to the nucleus

d) Mitochondria are surrounded by a single membrane

e) All of the choices are correct

37. Which of the following may have evolved from membrane infolding in early prokaryotic cells?

a) the cell membrane

b) endoplasmic reticulum

c) chloroplasts

d) the nuclear envelope

e) endoplasmic reticulum and the nuclear envelope

38. Which one of the following statements is not true?

a) Protists are more complicated than any prokaryotes.

b) Most protists are aerobic.

c) Photosynthetic protists are called protozoa.

d) The first protists arose from prokaryotes.

e) Biologists now think that protists constitute several kingdoms in the Domain Eukarya.

39. Plasmodium, the organism that causes malaria, is a(n)

a) amoeba.

b) apicomplexan.

c) spirochete.

d) cellular slime mold.

e) dinoflagellate.

40. Which of the following causes African sleeping sickness?

a) Plasmodium

b) Paramecium

c) Balantidium

d) Trypanosoma

e) Entamoeba

41. While on a camping trip in Southern California, you drink untreated mountain water. After a few days you develop persistent, chronic diarrhea. Microscopic examination of a fecal sample from you is most likely to reveal

a) Plasmodium.

b) Trypanosoma.

c) Paramecium.

d) Giardia.

e) Amoeba.

42. You collect a protist off a rotting log and grow it in a petri dish containingE. coli, which it eats. For a while the protists multiply as single cells. Then the E. coli run short, and the protists aggregate to form a clump, which rises up to become a stalked structure with a globular head. What kind of protist have you got?

a) an actinomycete

b) a plasmodial slime mold

c) a cellular slime mold

d) an apicomplexan

e) a dinoflagellate

43. Plasmodial slime molds

a) look very much like certain fungi

b) are common in wet environments with decaying matter

c) contain many nuclei in one mass of cytoplasm

d) All of the choices are correct

e) None of the choices are correct

44. Which one of the following statements about algae is <u>not</u> true?

a) The vast majority of algae lack chloroplasts.

b) Many algae are unicellular, some are multicellular, and others live in colonies.

c) Dinoflagellates often cause red tides and massive fish kills.

d) Diatoms are unicellular, photosynthetic algae with a cell wall containing silica.

e) Ancient green algae most likely gave rise to the first plants.

45. Which one of the following statements about seaweeds is <u>not</u> true?

a) Seaweeds lack true stems, leaves, and roots.

b) Red algae are the largest and most complex seaweeds.

c) Kelp is a type of brown seaweeds.

d) Red seaweeds are common on coral reefs.

e) Multicellular green algae reproduce by alternation of generations.

46. Which one of the following statements about the evolution of multicellularity is <u>not</u> true?

a) The organisms linking multicellular organisms to their unicellular ancestors were probably unicellular protists that lived as colonies.

b) Today's multicellular organisms descended from several different kinds of unicellular
protists.

c) Current evidence suggests that animals and plants evolved from a common protist.

d) Compared to unicellular life, a multicellular organism has cells that perform specialized
functions and are dependent upon each other.

e) Somatic cells are nonreproductive cells.

47. The first multicellular organisms appeared about _____million years ago and the first multicellular life on land appeared about _____million years ago.

a) 2,000…900

b) 1,500…900

c) 1,200…500

d) 600…200

e) 120…50

48. Which of these is arranged in the appropriate sequence from the earliest to the most recent?

a) origin of Earth, origin of prokaryotes, beginning of the accumulation of atmospheric
oxygen, oldest eukaryotic cell fossils, origin of multicellular eukaryotes, colonization ofland by plants and fungi, first humans

b) origin of Earth, origin of prokaryotes, oldest eukaryotic cell fossils, beginning of the
accumulation of atmospheric oxygen, origin of multicellular eukaryotes, colonization of
land by plants and fungi, first humans

c) origin of Earth, beginning of the accumulation of atmospheric oxygen, origin of
prokaryotes, oldest eukaryotic cell fossils, origin of multicellular eukaryotes, colonization
of land by plants and fungi, first humans

d) origin of Earth, origin of prokaryotes, oldest eukaryotic cell fossils, origin of multicellular
organisms, colonization of land by plants and fungi, beginning of the accumulation of
atmospheric oxygen, first humans

e) origin of prokaryotes, origin of Earth, beginning of the accumulation of atmospheric
oxygen, oldest eukaryotic cell fossils, origin of multicellular eukaryotes, colonization of
land by plants and fungi, first humans

49. Which of these events occurred during the Cenozoic?

a) origin of prokaryotes

b) beginning of the accumulation of atmospheric oxygen

c) origin of eukaryotes

d) first humans

e) colonization of land by plants

50. In a prokaryotic cell, the _____ the site of protein synthesis.

a) ribosomes are

b) cell wall is

c) pili are

d) capsule is

e) nucleoid region is

51. What name is given to the rigid structure that surrounds and supports a prokaryotic cell?

a) capsule

b) pili

c) cell wall

d) nucleoid region

e) plasma membrane

52. What name is given to the surface appendages that allow a prokaryotic cell to stick to a surface?

a) nucleoid region

b) pili

c) flagella

d) plasma membrane

e) ribosomes