

Origin of Life & Earth's Early History

1. The hypothesis of Panspermia proposes that meteors or cosmic dust may have brought _____ to Earth.
2. All living organisms on Earth are characterized by cellular organization, growth, reproduction, and _____.
3. In Oparin's bubble theory, the chemical-concentrating bubble-like structures were called _____.
4. Organelles such as the nucleus are not present in _____ organisms.
5. Prokaryotes were the only organisms for about _____ billion years after life began on Earth.
6. The early atmospheric condition of primitive Earth was thought to contain ample hydrogen atoms which was conducive to bond formation and is referred to as a _____ atmosphere.
7. _____ are bacteria that are able to grow "without air" or that are poisoned by oxygen.
8. Endosymbiotic bacteria relationships evolved into more complex cell types called _____, which possessed nuclear membranes and membrane-bound organelles.
9. Most recent molecular studies have led to the addition of a sixth kingdom, Archaea, containing certain groups of _____ with unusual cell walls, membranes and eukaryote-like genetic mechanisms.
10. Through reconstruction of the conditions of the primitive Earth in simulation experiments, scientists have concluded that certain key _____ of life could have been created as a by-product of its conditions at birth.
11. Eukaryotic, mostly unicellular (few multicellular), photosynthetic or heterotrophic, such as amoebas and algae, are classified into a kingdom called _____.
12. Thomas Cech coined the term _____ to describe RNA molecules that behaved like enzymes.
13. Oparin suggested the theory of
 - A. biogenesis
 - B. primary abiogenesis
 - C. natural selection
 - D. coacervates
 - E. protobionts

14. When phospholipid molecules are placed into water, microspheres form spontaneously. These microspheres are called
- A. protons
 - B. anaerobes
 - C. archaeobacteria
 - D. eukaryotes
 - E. coacervates
15. Early cyanobacteria evolved a form of photosynthesis that permanently changed the Earth's atmosphere by releasing which of the following gases?
- A. carbon dioxide
 - B. nitrogen
 - C. oxygen
 - D. ozone
 - E. carbon monoxide
16. The only "origin of life on Earth" theory or possibility that permits testable scientific hypotheses is
- A. alien origin
 - B. special creation
 - C. spontaneous origin
 - D. double helix
 - E. atomic
17. Spontaneous origin proponents hypothesize that life evolved from inanimate matter. According to this view, the force leading to life was
- A. selection
 - B. resistance to radiation
 - C. ability to live on land
 - D. ability to reproduce
 - E. all of the above
18. The age of the Earth according to modern estimations is
- A. 8 billion years
 - B. 4.5 billion years
 - C. 3.5 billion years
 - D. 1.5 billion years
 - E. a few thousand years

19. The oldest microfossils are of
- A. bacteria
 - B. eukaryotes
 - C. insects
 - D. pollen grains
 - E. small animals
20. Life apparently originated on Earth about
- A. 1 million years ago
 - B. 6000 years ago
 - C. 4.5 billion years ago
 - D. 8 billion years ago
 - E. 3.5 billion years ago
21. According to geochemists which of the following would have been the most unlikely condition on the primitive Earth?
- A. atmospheric cooling
 - B. crust formation
 - C. gas cloud encircling the Earth
 - D. high levels of oxygen
 - E. water, carbon dioxide, and nitrogen among the early gases
22. It is generally agreed that the early Earth's reducing atmosphere contained
- A. carbon dioxide, methane, nitrogen gas
 - B. hydrogen sulfide, water, ammonia
 - C. more than traces of free oxygen
 - D. a, b, and c are true
 - E. only a and b are true
23. Scientists believe that our atmosphere has progressively changed as some living organisms began to harness sunlight energy to split water molecules to form complex carbon molecules. This activity led to an increase in
- A. water
 - B. ammonia
 - C. oxygen
 - D. ozone
 - E. carbon dioxide

24. The first step in the origin of life is thought to be the formation of organic compounds from atmospheric components, using all of the following forms of energy except
- A. catabolism
 - B. lightning
 - C. radioactive decay
 - D. solar radiation
 - E. volcanic eruption
25. An experimental test of the hypothesis to explain the origin of the first organic compounds on Earth might include all of the following sequential steps (starting with a and proceeding to e) except
- A. assemble an atmosphere with H_2 , CH_4 , NH_3 , and H_2S
 - B. place this atmosphere over liquid water
 - C. inoculate with a few bacteria to get the process started
 - D. increase the temperature of the gases
 - E. provide energy with electrical spark discharges
26. Among the products of the Miller-Urey experiments and subsequent experiments by others, it was shown that which of the following could be produced in simulated primitive Earth conditions?
- A. ammonia and water
 - B. amino acids
 - C. CO_2 and H_2O
 - D. formaldehyde and hydrogen sulfide
 - E. methane and oxygen
27. Both in Miller-Urey experiments and subsequent experiments by others, it was shown that which of the following could be produced in simulated primitive Earth conditions?
- A. amino acids
 - B. adenine and other nucleotides
 - C. living bacteria
 - D. living eukaryotes
 - E. only a and b
28. The characteristics of life include all of the following except
- A. complexity
 - B. death
 - C. multicellularity
 - D. sensitivity to environment
 - E. inheritance

29. All living organisms possess
- A. photosynthesis
 - B. cellular organization
 - C. growth and metabolism
 - D. reproduction and heredity
 - E. only b, c, and d
30. Coacervates have all of the following except
- A. they enclose a small amount of water
 - B. they divide
 - C. they grow
 - D. they have a two-layer outer boundary
 - E. they show heredity
31. Oparin, in his theory of "primary abiogenesis" suggested cell predecessors as
- A. microspheres
 - B. protocells
 - C. protobionts
 - D. coacervates
 - E. liposomes
32. It has recently been discovered that enzyme-like catalysis can be carried out not only by enzymes but also by
- A. sugars
 - B. DNA
 - C. phospholipids
 - D. RNA
 - E. steroids
33. The most primitive bacteria that exist today are
- A. amoeba
 - B. eubacteria
 - C. archaebacteria
 - D. algae
 - E. nitrogen-fixing bacteria
34. Bacteria that lack the peptidoglycan in their cell wall are
- A. coacervates
 - B. eukaryotes
 - C. living fossils
 - D. archaebacteria
 - E. fungi

35. Probably the energy source for the first photosynthetic cells was
- A. chemical bond energy
 - B. lightning
 - C. radioactive decay
 - D. geothermal energy
 - E. sunlight
36. Oxygen concentration of 1% of 1 billion years ago increased to the present level of 21% because of photosynthetic activity of
- A. fungi
 - B. cyanobacteria
 - C. plants
 - D. protists
 - E. animals
37. The oldest fossils of eukaryotes have been estimated to be
- A. 6000 years old
 - B. 8 billion years old
 - C. 4.5 billion years old
 - D. 1.5 billion years old
 - E. 1995 years old
38. The kingdom not containing eukaryotes is
- A. protista
 - B. archaeobacteria
 - C. fungi
 - D. animalia
 - E. planta
39. Multicellularity and endosymbiotic relationship is not observed in
- A. animalia
 - B. planta
 - C. bacteria
 - D. fungi
 - E. protista
40. Recent molecular studies have added a new sixth kingdom for prokaryotes that lack peptidoglycan in their cell walls. It is called
- A. yeast kingdom
 - B. paramecium kingdom
 - C. amoeba kingdom
 - D. archaeobacteria kingdom
 - E. eubacteria kingdom

41. One of the theories about the origin of life is panspermia. Panspermia proposes that
- A. Extraterrestrials from extreme distances from Earth seeded the developing planet with primitive life forms, which eventually evolved into what we know today.
 - B. Meteors and/or cosmic dust clouds carried various primitive life forms to the Earth, which eventually evolved into what we know today.
 - C. Meteors and/or cosmic dust clouds carried various complex organic molecules to the Earth, which eventually evolved into what we know today.
 - D. Extraterrestrials from extreme distances from Earth seeded the developing planet with complex organic molecules, which eventually evolved into what we know today.
 - E. Spontaneous generation of life followed either an extraterrestrial visit or a meteor deposition of inorganic molecules.
42. Of the following primitive Earth conditions and chemical reactions, which one do biochemists know was important to the formation of amino acids and subsequent formation of complex carbon molecules that are common to life?
- A. There had to be a reducing atmosphere rather than one with oxygen, otherwise formation of those molecules would have been extremely difficult.
 - B. There had to be an atmosphere with oxygen rather than a reducing atmosphere, otherwise formation of those molecules would have been extremely difficult.
 - C. Cellular respiration was necessary for the reducing atmosphere to form, otherwise photosynthesis would not have been able to occur.
 - D. Sulfide molecules from deep-sea vents interacted with available atmospheric oxygen, producing a reducing atmosphere that would have encouraged amino acid formation.
 - E. Silicate surfaces provide excellent substrates for cellular respiration, thus increasing the available atmospheric oxygen, which in turn promoted evolution of inorganic molecules into animate forms.
43. The "Bubble Theories" all propose that
- A. The organic molecules that formed in the soupy mixture of ancient oceans had to find some form of protection or become disassociated again and again and, thus, bubble formation offered some forms of protection.
 - B. The organic molecules had to combine with various gases that were present in the prebiotic atmosphere, such as methane and nitrogen, to obtain enough buoyancy to reach the surface.
 - C. The organic molecules united into gaseous envelopes, which covered the surface of the ancient oceans and thus were propelled farther out into the deeper water by waves.
 - D. The organic molecules were surrounded by various carbohydrates, which would produce a "lifting effect," which would in turn cause the "bubbles" and their trapped organic molecules to rise in the water column.

44. Even though archaeobacteria are considered the most primitive forms of life so far discovered on Earth, they still
- A. utilize sunlight as a primary energy source
 - B. utilize ATP as their energy-carrying molecule
 - C. reproduce normally in oxygen-rich environments
 - D. create their nuclear membranes from peptidoglycans
 - E. have difficulty maintaining the cell wall surrounding their cells.
45. Archaeobacteria live in hostile-to-life environments. Scientists debate about which ones might be the "relics" of the first organisms on the Earth. Based on our knowledge of reconstructing the conditions on the early Earth, which one of these archaeobacteria might be the oldest?
- A. methanogens
 - B. extreme halophiles
 - C. extreme thermophiles
 - D. extreme peptidoglycans
 - E. cyanobacteria
46. The fossil record reflects a change in cells and cell structures dating at least 1.5 billion years ago. There was a shift toward a cell type referred to as eukaryotic. Organisms described as eukaryotic have which of the following in common?
- A. They are all anaerobic.
 - B. They are all autotrophic.
 - C. They all utilize photosynthesis.
 - D. They all have a membrane-bound nucleus.
 - E. They are all unicellular.
47. Diversity among the vast numbers of organisms that have arisen on the Earth can be attributed to all the following except
- A. sexual reproduction
 - B. multicellularity
 - C. a membrane-bound nucleus
 - D. for the development of the endoplasmic reticulum
 - E. for the ability to utilize the same gene sequences to produce their proteins
48. Which of the following was demonstrated by the Miller-Urey experiment?
- A. Life began in the oceans.
 - B. Life can be started experimentally in the laboratory.
 - C. Organic molecules important to life could have been formed from a vast array of simple chemicals.
 - D. Life began on the pre-biotic Earth 3.5 billion years ago.

49. One day while Dr. Rogers was working in his taxonomic laboratory, a package arrived with the following label: "Beware, the contents of this package contains a eukaryotic, multicellular, nonmotile, nonphotosynthetic life form. Open with extreme caution." Dr. Rogers quickly closed the doors and windows of his laboratory and opened the package. To which two kingdoms of life could this life form belong?
- A. Archaeobacteria
 - B. Animalia
 - C. Fungi
 - D. Plantae
 - E. Protista
50. Archaeobacteria share all of the following characteristics except
- A. unicellular structure
 - B. considered prokaryotes
 - C. contain a peptidoglycan cell wall
 - D. include human pathogens
 - E. c and d are correct

51. The current bubble hypothesis for the evolution of life does not include

- A. volcanic eruptions under the ocean releasing gases in bubbles
- B. bubbles of oxygen mixed with volcanic produced bubbles
- C. complex organic molecules mixed into the ocean from rain
- D. energy sources included UV, radiation, and lightning
- E. gases concentrated inside bubbles

52. Many scientists believe that life on Earth originated

- A. on the surface of clay particles
- B. at deep-sea vents
- C. under the frozen ocean
- D. in the foam produced at the ocean's edge
- E. all of the above

53. Archaeobacteria are most likely to be found today in

- A. hot sulfur springs
- B. in the Dead Sea
- C. in a small pond in the Tropical Rain Forest
- D. a and b only
- E. all of the above

54. Match each of the following.

- | | |
|--|--------------------|
| _____ A. Names of early environmentally isolated, chemical concentrating structures. | 1. archaeobacteria |
| _____ B. Cellular organelle containing organisms; include all organisms except bacteria. | 2. cyanobacteria |
| _____ C. Blue-green algae; a type of bacteria important in the history of life on Earth. | 3. protobionts |
| _____ D. The most primitive bacteria that exist today; methane producing bacteria; absence of peptidoglycan cell-wall. | 4. eukaryotes |

Answer Key

No. in Test	Correct Answer
1	life
2	heredity; or sensitivity; or regulation; or homeostasis
3	protobionts; or microspheres; or protocells; or micelles; or liposomes; or coacervates
4	prokaryotic
5	2
6	reducing
7	Anaerobes
8	eukaryotes
9	bacteria
10	molecules
11	protista
12	ribozyme
13	B
14	E
15	C
16	C
17	A
18	B
19	A
20	E
21	D
22	E
23	C
24	A
25	C
26	B
27	E
28	C
29	E
30	E
31	C
32	D
33	C

34	D
35	E
36	B
37	D
38	B
39	C
40	D
41	C
42	A
43	A
44	B
45	C
46	D
47	E
48	C
49	C
50	E
51	B
52	E
53	D
54	1-C, 2-D, 3-B, 4-A