Name _____ 16 The Origin and Evolution of Microbial Life Test Date _____

Study Guide

You must know:

- **The age of the Earth and when prokaryotic and eukaryotic life emerged.**
- **Characteristics of the early planet and its atmosphere.**
- **How Miller and Urey tested the Oparin-Haldane hypothesis and what they learned.**
- **Methods used to date fossils and rocks.**
- **Evidence for endosymbiosis.**
- **How continental drift can explain the current distribution of species.**
- **The key ways in which prokaryotes differ from eukaryotes with respect to genome, membrane-bound organelles, size and reproduction.**
- **Mechanisms that contribute to genetic diversity in prokaryotes, including transformation, conjugation, transduction, and mutation.**
- **How chloroplasts and mitochondria evolved through endosymbiosis.**

1. Summarize the early history of the Earth and the beginnings of life by numbering the following events in sequence.

_____ A. Formation of the seas

_____ B. Loss of Earth's original hydrogen (H2) atmosphere

_____ C. Formation of Earth

_____ D. Melting of Earth, followed by formation of core and crust

_____ E. Oldest known fossils

_____ F. The "Big Bang"-formation of the universe

_____ G. 0_2 from photosynthetic prokaryotes produces aerobic atmosphere

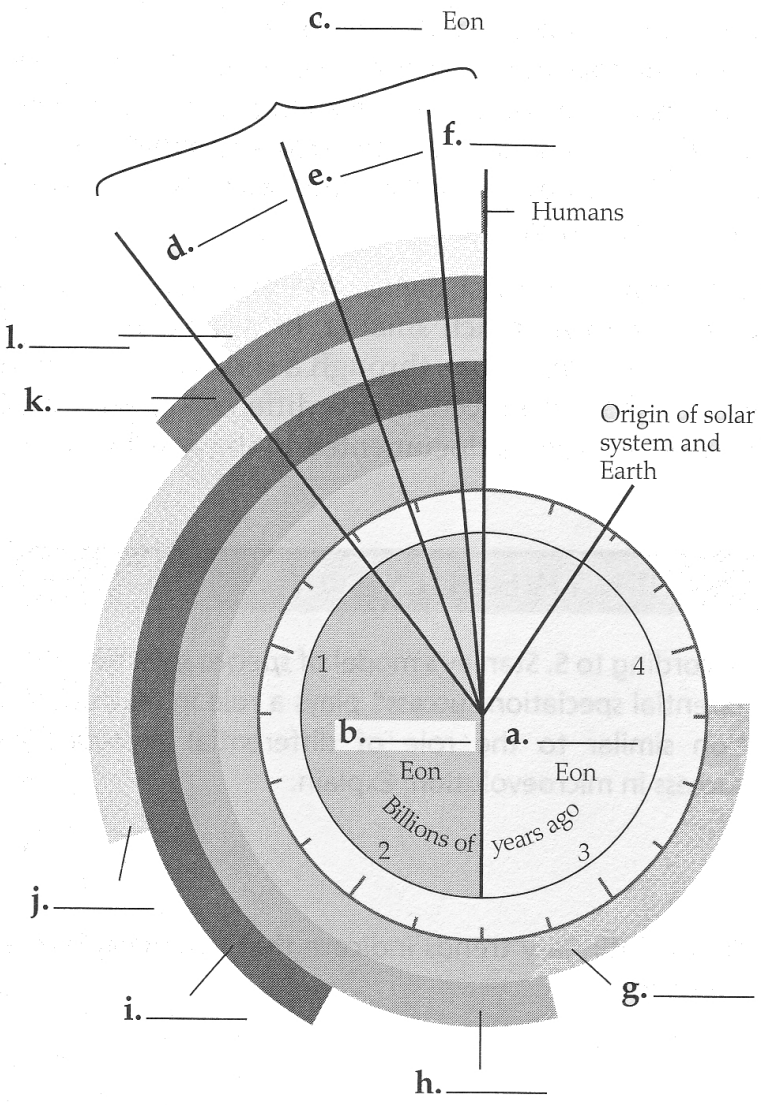
_____ H. Origin of eukaryotes

_____ I. Volcanoes belch out atmosphere of H_20, CO, CO_2, N_2, CH_4, NH_3

_____ J. Origin of life-first prokaryotes

_____ K. Oldest known animals

2. Label the eons, eras, and the key events shown on this clock analogy of Earth's history.



3. Fill in the following table with a brief description of the characteristics of prokaryotic cells.

Property	Description
Cell shape	a.
Cell size	b.
Cell surface	c.
Motility	d.
Internal membranes	e.
Genome	f.
Reproduction and growth	g.

4. State whether each of the following describes bacteria (B) or archaea (A).

_____ 1 genes lack introns

_____ 2 many rRNAs match eukaryote rRNAs

_____ 3 cell walls contain peptidoglycan

_____ 4 uninhibited by streptomycin

_____ 5 membrane lipids have branched chains

_____ 6 some genes contain introns

_____ 7 complex RNA polymerases

_____ 8 membrane lipids have unbranched chains

_____ 9 simple RNA polymerases

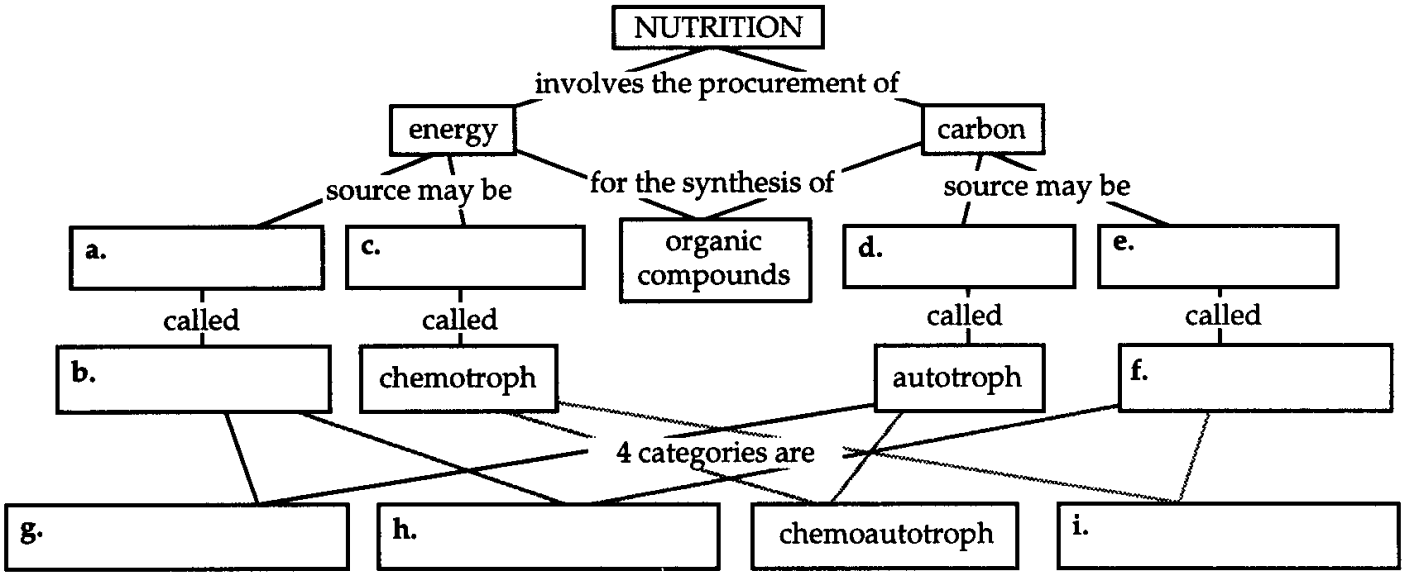
_____ 10 inhibited by streptomycin

_____ 11 cell walls lack peptidoglycan

_____ 12 rRNAs different from eukaryotic rRNAs

_____ 13 more like eukaryotes

5. Complete the following concept map that organizes the various modes of nutrition found in prokaryotes.



5. Fill in the blanks.

1. _____	the name for spherical bacteria
2. _____	region in which the prokaryotic chromosome is found
3. _____	common laboratory technique for identifying bacteria
4. _____	surface appendages of bacteria used for adherence to substrate
5. _____	an oriented movement in response to light or chemical stimuli
6. _____	nutrition type in which organic molecules are used for both energy and carbon source
7. _____	resistant cell that can survive harsh conditions
8. _____	organism that must grow anaerobically
9. _____	organisms that decompose and absorb nutrients from dead organic matter
10. _____	proteins that are secreted by pathogens and are potent poisons
11. _____	thickenings on roots that house nitrogen-fixing bacteria
12. _____	type of bacteria with plantlike photosynthesis

6. Answer the questions below to review how the complex organelles of eukaryotic cells may have arisen.

   Describe the endosymbiotic model.

   Name two organelles that probably arose via endosymbiosis.

   What is the evidence for endosymbiosis?

   How might infolding have occurred?

   Name two cell structures that probably originated via infolding of the plasma membrane of an ancestral prokaryotic cell.

7. List the general characteristics of protists.

8. The diagram below outlines the various groups of protists and the characteristics of each group. Review the protists by writing the missing names or characteristics in the spaces.