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Pollard: Cell Biology, 3rd Edition

Test Bank

Chapter 2: Evolution of life on Earth

1. What is the best estimate of the number of genes in the first cell, the universal common ancestor?
   a. 6
   b. 60
   c. 600
   d. 6000

   Ans: C
   About 600 genes is the minimum to carry out the biochemistry that we would today count as being a viable self-renewing cell.

2. Other than carrying genetic information, what other property does RNA have that makes it likely to have been the "spark" that kindled life?
   a. It may have catalytic activity.
   b. It is very stable in water.
   c. It can form membranes in water.
   d. It contains all the essential elements for life.

   Ans: A
   The catalytic activity of some RNAs allows it to self-replicate, self-cleave, and catalyse formation of peptide bonds. Other catalytic activities may have contributed to the essence of early life.

3. Which other material likely worked with RNA in the prebiotic world?
   a. Silica
   b. Biotite mica
   c. Calcium carbonate
   d. Montmorillonite clay

   Ans: D
   Interaction with clay allows RNA to fully unfold so that it can act as a template for replication.

4. What is the name given to genes that occur in the same cell that have resulted from duplication and mutation?
   a. Homologs
   b. Paralogs
   c. Captinslogs
   d. Orthologs

   Ans: B

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Paralogous genes are separated by a gene duplication event. Orthologous genes are separated by a speciation event.

5. Genes are normally inherited from a parent cell. What is the process by which a cell may obtain a gene from an unrelated organism?
   a. Vertical transgression
   b. Vertical take-up
   c. Horizontal transgression
   d. Lateral transfer

   Ans: D
   This is also known as horizontal gene transfer and is considered to be an important part in evolution that is still occurring today.

6. The simple bacteria *Mycoplasma genitalium* has lost many genes. How is this cell able to grow in a reduced state?

   a. It is a pathogen that obtains many nutrients from the host and so can function with reduced synthetic ability.
   b. It grows extremely slowly and does not need enzymatic catalysis.
   c. It grow in hot springs where the heat substitutes for many enzymes.
   d. It is not known how this organism grows in this state.

   Ans: A
   The animal host provides many of the nutrients that it can no longer make for itself.

7. Which of the following statements concerning Bacteria and Archaea is FALSE?

   a. Some Bacteria and Archaea are human pathogens.
   b. Bacteria and Archaea are similar in structure.
   c. Bacteria and Archaea are prokaryotes.
   d. Bacteria and Archaea can use energy sources such as hydrogen, sulfate, or methane.

   Ans: A
   Remarkably, no Archaea has yet been found to cause pathology in humans.

8. It is widely accepted that the eukaryotic mitochondrion is actually a very much altered bacterium, but which sort of bacterium was its ancestor?

   a. A relative of *E. coli*
   b. An α-proteobacterium
   c. An unknown gram-negative bacterium
   d. A cyanobacterium

   Ans: B
   Phylogenetic analysis reveals that the bacterium was an α-proteobacterium related to the *Rickettsia* bacterium, which causes typhus in humans.

9. When did the last eukaryotic common ancestor (LECA) exist?

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a. 2.1 to 0.9 billion years ago
b. 21 to 9 billion years ago
c. 210 to 900 million years ago
d. 21 to 9 million years ago

Ans: A
All traces of the LECA were presumably obliterated by their more successful offspring.

10. Sponges (porifera) may be the earliest multicellular animals; which group of extant protozoans do they most closely resemble?
a. Amoebae
b. Choanoflagellates
c. Euglenoids
d. Excavata

Ans: B
Some species of choanoflagellates form simple colonies consistent with their being ancestors of the sponges, an idea first proposed by Dujardin in 1841.

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