

AP Biology CH 24 QUIZ **THIS IS OPEN BOOK BUT NO COLLABORATION**

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- ____ 1. Which of the following is a defining characteristic that all protobionts had in common?
 - a. the ability to synthesize enzymes
 - b. a surrounding membrane or membrane-like structure
 - c. RNA genes
 - d. the ability to replicate RNA

- ____ 2. The first genes on Earth were probably
 - a. DNA produced by reverse transcriptase from abiotically produced RNA.
 - b. DNA molecules whose information was transcribed to RNA and later translated in polypeptides.
 - c. auto-catalytic RNA molecules.
 - d. oligopeptides located within protobionts.

- ____ 3. Approximately how far back in time does the fossil record extend?
 - a. 3.5 million years
 - b. 5.0 million years
 - c. 3.5 billion years
 - d. 5.0 billion years

- ____ 4. Prokaryotic ribosomes differ from those present in eukaryotic cytosol. Because of this, which of the following is correct?
 - a. Some antibiotics can block protein synthesis in bacteria without effects in the eukaryotic host.
 - b. Eukaryotes did not evolve from prokaryotes.
 - c. Translation can occur at the same time as transcription in eukaryotes but not in prokaryotes.
 - d. Some antibiotics can block the synthesis of peptidoglycan in the walls of bacteria.
 - e. Prokaryotes are unable to use a greater variety of molecules as food sources than can eukaryotes.

- ____ 5. Which statement about the genomes of prokaryotes is correct?
 - a. Prokaryotic genomes are diploid throughout most of the cell cycle.
 - b. Prokaryotic chromosomes are sometimes called plasmids.
 - c. Prokaryotic cells have multiple chromosomes, "packed" with a relatively large amount of protein.
 - d. The prokaryotic chromosome is not contained within a nucleus but, rather, is found at the nucleolus.
 - e. Prokaryotic genomes are composed of circular DNA.

- ____ 6. In a hypothetical situation, the genes for sex pilus construction and for tetracycline resistance are located together on the same plasmid within a particular bacterium. If this bacterium readily performs conjugation involving a copy of this plasmid, then the result should be
 - a. a bacterium that has undergone transduction.

- b. the rapid spread of tetracycline resistance to other bacteria in that habitat.
- c. the subsequent loss of tetracycline resistance from this bacterium.
- d. the production of endospores among the bacterium's progeny.
- e. the temporary possession by this bacterium of a completely diploid genome.

_____ 7. Regarding prokaryotic genetics, which statement is correct?

- a. Crossing over during prophase I introduces some genetic variation.
- b. Prokaryotes feature the union of haploid gametes, as do eukaryotes.
- c. Prokaryotes exchange some of their genes by conjugation, the union of haploid gametes, and transduction.
- d. Mutation is a primary source of variation in prokaryote populations.
- e. Prokaryotes skip sexual life cycles because their life cycle is too short.

_____ 8. Which of these statements about prokaryotes is correct?

- a. Bacterial cells conjugate to mutually exchange genetic material.
- b. Their genetic material is confined within vesicles known as plasmids.
- c. They divide by binary fission, without mitosis or meiosis.
- d. The persistence of bacteria throughout evolutionary time is due to their genetic homogeneity (in other words, sameness).
- e. Genetic variation in bacteria is not known to occur, because of their asexual mode of reproduction.

_____ 9. Which of the following traits do archaeans and bacteria share?

- 1. composition of the cell wall
 - 2. presence of plasma membrane
 - 3. lack of a nuclear envelope
 - 4. identical rRNA sequences
- a. 1 only
 - b. 3 only
 - c. 1 and 3
 - d. 2 and 3
 - e. 2 and 4

_____ 10. Assuming that each of these possesses a cell wall, which prokaryotes should be expected to be most strongly resistant to plasmolysis in hypertonic environments?

- a. extreme halophiles
- b. extreme thermophiles
- c. methanogens
- d. cyanobacteria
- e. nitrogen-fixing bacteria that live in root nodules

_____ 11. In general, what is the primary ecological role of prokaryotes?

- a. parasitizing eukaryotes, thus causing diseases
- b. breaking down organic matter
- c. metabolizing materials in extreme environments
- d. adding methane to the atmosphere
- e. serving as primary producers in terrestrial environments

The following questions refer to Figure 24.1.

In this eight-year experiment, 12 populations of *E. coli*, each begun from a single cell, were grown in low-glucose conditions for 20,000 generations. Each culture was introduced to fresh growth medium every 24 hours. Occasionally, samples were removed from the populations, and their fitness in low-glucose conditions was tested against that of members sampled from the ancestral (common ancestor) *E. coli* population.

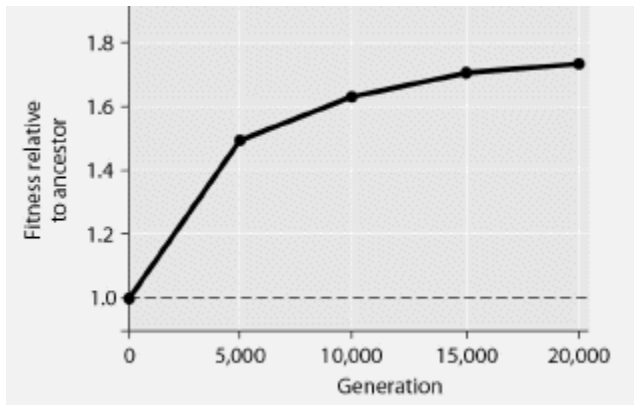


Figure 24.1

12. If the experimental population of *E. coli* lacks an F factor or F plasmid, and if bacteriophages are excluded from the bacterial cultures, then which of these is (are) means by which beneficial mutations might be transmitted horizontally to other *E. coli* cells?
- via sex pili
 - via transduction
 - via conjugation
 - via transformation
 - Two of the responses above are correct.

The following questions are based on the observation that several dozen different proteins comprise the prokaryotic flagellum and its attachment to the prokaryotic cell, producing a highly complex structure.

13. Certain proteins of the complex motor that drives bacterial flagella are modified versions of proteins that had previously belonged to plasma membrane pumps. This evidence supports the claim that
- some structures are so complex that natural selection cannot, and will not, explain their origins.
 - the power of natural selection allows it to act in an almost predictive fashion, producing organs that will be needed in future environments.
 - the motors of bacterial flagella were originally synthesized abiotically.
 - natural selection can produce new structures by coupling together parts of other structures.
 - bacteria that possess flagella must have lost the ability to pump certain chemicals across their plasma membranes.

Nitrogenase, the enzyme that catalyzes nitrogen fixation, is inhibited whenever free O₂ reaches a critical concentration. Consequently, nitrogen fixation cannot occur in cells wherein photosynthesis produces free O₂. Consider the colonial aquatic cyanobacterium *Anabaena*, whose heterocytes are described as having "...a thickened cell wall that restricts entry of O₂ produced by neighboring cells. Intracellular connections allow heterocysts to transport fixed nitrogen to neighboring cells in exchange for carbohydrates."

- ____ 14. Given that the enzymes that catalyze nitrogen fixation are inhibited by oxygen, what are *two* "strategies" that nitrogen-fixing prokaryotes might use to protect these enzymes from oxygen?
1. couple them with photosystem II (the photosystem that splits water molecules)
 2. package them in membranes that are impermeable to all gases
 3. be obligate anaerobes
 4. be strict aerobes
 5. package these enzymes in specialized cells or compartments that inhibit oxygen entry
- a. 1 and 4
 - b. 2 and 4
 - c. 2 and 5
 - d. 3 and 4
 - e. 3 and 5

End-of-Chapter Questions

- ____ 15. Genetic variation in bacterial populations cannot result from
- a. transduction.
 - b. transformation.
 - c. conjugation.
 - d. mutation.
 - e. meiosis.

