

5. Explain how you would find an antibiotic-resistant mutant by direct selection and how you would find an antibiotic-sensitive mutant by indirect selection.
6. Match the following examples of mutagens.
 

____ A mutagen that is incorporated into DNA in place of a normal base ____ A mutagen that causes the formation of highly reactive ions ____ A mutagen that alters adenine so that it base-pairs with cytosine ____ A mutagen that causes insertions ____ A mutagen that causes the formation of pyrimidine dimers	a. Frameshift mutagen b. Nucleoside analog c. Base-pair mutagen d. Ionizing radiation e. Nonionizing radiation
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7. Describe the principle of the Ames test for identifying chemical carcinogens.
8. Define plasmids, and explain the relationship between F factors and conjugation.
9. Use the following metabolic pathway to answer the questions that follow it.
 

enzyme *a*                      enzyme *b*  
 Substrate *A* → Intermediate *B* → End-product *C*

  - a. If enzyme *a* is inducible and is not being synthesized at present, a \_\_\_\_\_ protein must be bound tightly to the \_\_\_\_\_ site. When the inducer is present, it will bind to the \_\_\_\_\_ so that \_\_\_\_\_ can occur.
  - b. If enzyme *a* is repressible, end-product *C*, called a \_\_\_\_\_, causes the \_\_\_\_\_ to bind to the \_\_\_\_\_. What causes derepression?
  - c. If enzyme *a* is constitutive, what effect, if any, will the presence of *A* or *C* have on it?
10. Identify three ways of preventing mistakes in DNA.
11. Define the following terms:
  - a. genotype
  - b. phenotype
  - c. recombination
12. Which sequence is the best target for damage by UV radiation: AGGCAA, CTTTGA, or GUAAAU? Why aren't all bacteria killed when they are exposed to sunlight?
13. You are provided with cultures with the following characteristics:
 

Culture 1:  $F^+$ , genotype  $A^+ B^+ C^+$   
 Culture 2:  $F^-$ , genotype  $A^- B^- C^-$

  - a. Indicate the possible genotypes of a recombinant cell resulting from the conjugation of cultures 1 and 2.
  - b. Indicate the possible genotypes of a recombinant cell resulting from conjugation of the two cultures after the  $F^+$  has become an Hfr-cell.
14. Why are semiconservative replication and degeneracy of the genetic code advantageous to the survival of species?
15. Why are mutation and recombination important in the process of natural selection and the evolution of organisms?

## MULTIPLE CHOICE

Match the following terms to the definitions in questions 1 and 2.

- |                  |                   |
|------------------|-------------------|
| a. conjugation   | d. transformation |
| b. transcription | e. translation    |
| c. transduction  |                   |
1. The transfer of DNA from a donor to a recipient cell by a bacteriophage.
  2. The transfer of DNA from a donor to a recipient as naked DNA in solution.
  3. Feedback inhibition differs from repression because feedback inhibition
 

a. is less precise.	d. stops the synthesis of new enzymes.
b. is slower acting.	e. all of the above
c. stops the action of preexisting enzymes.	

4. Bacteria can acquire antibiotic resistance by
 

a. mutation.	d. all of the above
b. insertion of transposons.	e. none of the above
c. acquiring plasmids.	
5. Suppose you inoculate three flasks of minimal salts broth with *E. coli*. Flask A contains glucose. Flask B contains glucose and lactose. Flask C contains lactose. After a few hours of incubation, you test the flasks for the presence of  $\beta$ -galactosidase. Which flask(s) do you predict will have this enzyme?
 

a. A	d. A and B
b. B	e. B and C
c. C	
6. Plasmids differ from transposons because plasmids
  - a. become inserted into chromosomes.
  - b. are self-replicated outside the chromosome.
  - c. move from chromosome to chromosome.
  - d. carry genes for antibiotic resistance.
  - e. none of the above

Use the following choices to answer questions 7 and 8.

- |                         |                |
|-------------------------|----------------|
| a. catabolic repression | d. repression  |
| b. DNA polymerase       | e. translation |
| c. induction            |                |
7. The mechanism by which the presence of glucose inhibits the *lac* operon.
  8. The mechanism by which lactose controls the *lac* operon.
  9. Two daughter cells are most likely to inherit which one of the following from the parent cell?
    - a. a change in a nucleotide in mRNA
    - b. a change in a nucleotide in tRNA
    - c. a change in a nucleotide in rRNA
    - d. a change in a nucleotide in DNA
    - e. a change in a protein
  10. Which of the following is *not* a method of horizontal gene transfer?
    - a. binary fission
    - b. conjugation
    - c. integration of a transposon
    - d. transduction
    - e. transformation