

1) Pages: 307-308 Ans: B

The biological role of restriction enzymes is to:

- A) aid recombinant DNA research.
- B) degrade foreign DNA that enters a bacterium.**
- C) make bacteria resistant to antibiotics.
- D) restrict the damage to DNA by ultraviolet light.
- E) restrict the size of DNA in certain bacteria.

2) Page: 308 Ans: C

Certain restriction enzymes produce cohesive (sticky) ends. This means that they:

- A) cut both DNA strands at the same base pair.
- B) cut in regions of high GC content, leaving ends that can form more hydrogen bonds than ends of high AT content.
- C) make a staggered double-strand cut, leaving ends with a few nucleotides of single-stranded DNA protruding.**
- D) make ends that can anneal to cohesive ends generated by any other restriction enzyme.
- E) stick tightly to the ends of the DNA they have cut.

3) Page: 311 Ans: E

In the laboratory, recombinant plasmids are commonly introduced into bacterial cells by:

- A) electrophoresis – a gentle low-voltage gradient draws the DNA into the cell.
- B) infection with a bacteriophage that carries the plasmid.
- C) microinjection.
- D) mixing plasmids with an extract of broken cells.
- E) transformation – heat shock of the cells incubated with plasmid DNA in the presence of CaCl_2 .**

4) Page: 311 Ans: C

A convenient cloning vector with which to introduce foreign DNA into *E. coli* is a(n):

- A) *E. coli* chromosome.
- B) messenger RNA.
- C) plasmid.**
- D) yeast "ARS" sequence.
- E) yeast transposable element.

5) Pages: 319-321 Ans: B

Which of the following statements about the polymerase chain reaction (PCR) is *false*?

- A) DNA amplified by PCR can be cloned.
- B) DNA is amplified at many points within a cellular genome.**
- C) Newly synthesized DNA must be heat-denatured before the next round of DNA synthesis begins.
- D) The boundaries of the amplified DNA segment are determined by the synthetic oligonucleotides used to prime DNA synthesis.
- E) The technique is sufficiently sensitive that DNA sequences can be amplified from a single animal or human hair.

6) Pages: 326-330 Ans: C

Which one of the following analytical techniques does *not* help illuminate a gene's cellular function?

- A) DNA microarray analysis
- B) Protein chip analysis
- C) Southern blotting**
- D) Two-dimensional gel electrophoresis
- E) Two-hybrid analysis

7) Pages: 310-312

A plasmid that encodes resistance to ampicillin and tetracycline is digested with the restriction enzyme *Pst*I, which cuts the plasmid at a single site in the ampicillin-resistance gene. The DNA is then annealed with a *Pst*I digest of human DNA, ligated, and used to transform *E. coli* cells. (a) What antibiotic would you put in an agar plate to ensure that the cells of a bacterial colony contain the plasmid? (b) What antibiotic-resistance phenotypes will be found on the plate? (c) Which phenotype will indicate the presence of plasmids that contain human DNA fragments?

Ans: (a) tetracycline; (b) $tet^R amp^R$ and $tet^R amp^S$; (c) The $tet^R amp^S$ phenotype indicates that the gene for ampicillin resistance has been interrupted by the insertion of a human DNA fragment.

8) Pages: 311-312

Explain how each of the following is used in cloning in a plasmid: (a) antibiotic resistance genes; (b) origin of replication; (c) polylinker region.

Ans: (a) Antibiotic resistance allows a researcher to select for a bacterial cell clone that carries the plasmid; loss of an antibiotic marker in a strain known to contain the plasmid can be used to infer the presence of a cloned DNA segment that interrupts the antibiotic resistance gene. (b) An origin of replication assures that the plasmid will replicate autonomously in the bacterium. (c) Polylinkers have cut sites for a variety of restriction enzymes, allowing insertion of DNA fragments produced with any of them.

9) Page: 320

Why must the DNA polymerase used in the polymerase chain reaction (PCR) be heat stable?

Ans: The PCR involves repeated heating of the reaction mixture (to denature the double-stranded DNA) and cooling (to allow hybridization of DNA with oligonucleotide primers). A heat-sensitive enzyme would be denatured by this procedure.

10) Page: 322

What are RFLPs and how are they used in forensic DNA fingerprinting technology?

Ans: RFLPs (restriction fragment length polymorphisms) are minor variations among individuals in DNA base sequence that can be detected by variation in the patterns of fragments that are produced upon cleavage with restriction endonucleases. When several DNA regions are examined, these patterns are distinctive for an individual and can be used to determine the identity (or nonidentity) of two samples of DNA. One of these samples can be from a crime scene, the other from a known individual.

11) Pages: 326-327

What is a DNA microarray? How does it resemble and how does it differ from a DNA library?

Ans: A DNA microarray is a solid surface upon which are placed DNA fragments from many thousands of genes. It is in essence a form of DNA library that is arranged physically to allow rapid simultaneous screening of many thousands of genes.