

**1) 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) 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) 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<sub>2</sub>.

**4) 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) 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) 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) 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?**

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

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

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

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