

DNA Technology Chapter 20

1. Describe the term “DNA sequencing.”
2. The restriction enzyme Hind III recognizes the sequence 5'-AAGCTT-3', cutting between the two A's. Draw the double-stranded sequence before and after the enzyme cuts it.
3. The restriction site for an enzyme called *PvuI* is the sequence 5'-CGATCG-3'. The enzyme cuts between the T and C. One strand of a DNA molecule has the sequence 5'-CTTGACGATCGTTACCG-3'. Write the sequence of the other strand. Predict whether *PvuI* will cut this molecule. If you think it will cut the molecule, draw the fragments produced.
4. Identify some reasons a researcher might clone a gene.
5. Describe how bacterial plasmids can be used to clone genes.
6. Describe the use of a restriction enzyme to create a recombinant DNA plasmid.
7.
 - a) Describe the problem posed by introns in using bacteria to clone eukaryotic genes.
 - b) Explain how yeast can be used to avoid the incompatibility of eukaryotic genes in cloning using bacteria.
8.
 - a) Identify the characteristic of DNA that causes it to move during gel electrophoresis.
 - b) Identify the basis on which gel electrophoresis separates fragments of DNA.
9. Describe how PCR can be used to produce many copies of a desired gene.
10. When using PCR to amplify a sample of DNA, the primers used are made of DNA, rather than RNA as in living cells. Suggest a reason for this.
11. If a researcher has genomic DNA, explain how a specific segment can be amplified using PCR.
12.
 - a) We know that DNA polymerase has an inherent error rate. Considering this, propose a reason that PCR cannot be used to produce an unlimited number of copies of a DNA molecule.
 - b) Explain how living cells can be used to circumvent the limitations of PCR.
13.
 - a) When trying to determine which embryonic cells express a particular gene, researchers look for the corresponding mRNA in the cell. Propose a reason they would do so.
 - b) Describe how a nucleic acid probe can be used to detect the presence of a particular mRNA in a cell.
 - c) Describe how you could determine which genes are expressed in a particular embryonic tissue compared to the same tissue in the fetus and the adult.
14. A patient presents with COVID-19 symptoms, but no viral proteins can be detected by the nasopharyngeal swab (rapid test) and no antibodies can be detected in the serological test. Knowing that SARS-CoV-2 is an RNA virus, describe how a PCR test can be used to detect the virus in a sample taken from a patient. Describe the results that constitute a positive test.