

What is the PCR Technique?

Worksheet

PCR is a technique that exponentially copies a target DNA sequence through repeated cycles of denaturation, annealing, and extension, using a heat-stable DNA polymerase such as Taq.

Questions

1. What does PCR stand for?
 - A) Protein Chain Reaction
 - B) Polymerase Chain Reaction
 - C) Plasmid Cloning Reaction
 - D) Peptide Chain Replication
2. Which step of a PCR cycle separates the DNA double helix?
 - A) Annealing
 - B) Extension
 - C) Denaturation
 - D) Ligation
3. Starting with 2 copies of DNA, how many copies exist after 10 cycles (100% efficiency)?
 - A) 1024
 - B) 2048
 - C) 4096
 - D) 10240
4. Which enzyme is essential to PCR because of its heat stability?
 - A) DNA ligase
 - B) Taq polymerase
 - C) Restriction enzyme
 - D) RNA polymerase
5. Starting with 5 copies of target DNA, how many copies exist after 25 cycles of PCR (assuming 100% efficiency)?
6. A sample starts with 1 copy of DNA and undergoes 30 cycles. How many copies result?
7. A PCR reaction reaches 4,096 copies after 12 cycles. How many starting copies (N) were there?
8. Define: What does PCR stand for?
9. Define: What are the three steps of a PCR cycle?
10. Define: What enzyme is used in PCR?

Answer Key

1. B) Polymerase Chain Reaction - PCR stands for Polymerase Chain Reaction.
2. C) Denaturation - High heat (~95C) during denaturation splits the double strand into two single strands.
3. B) $2048 - N = 2^2 = 2^{1024} = 2048$.
4. B) Taq polymerase - Taq polymerase survives the repeated ~95C denaturation steps without breaking down.
5. $N = N \cdot 2^N = 5 \cdot 2^N = 5 \cdot 33,554,432 = 167,772,160$ copies
6. $N = N \cdot 2^N = 1 \cdot 2^N = 1,073,741,824$ copies (about 1 billion)
7. $N = N \cdot 2^{4096} = N \cdot 2^{4096} = N \cdot 4096^N = 1$ copy
8. Polymerase Chain Reaction.
9. Denaturation, annealing, and extension.
10. Taq polymerase, a heat-stable DNA polymerase from *Thermus aquaticus*.

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