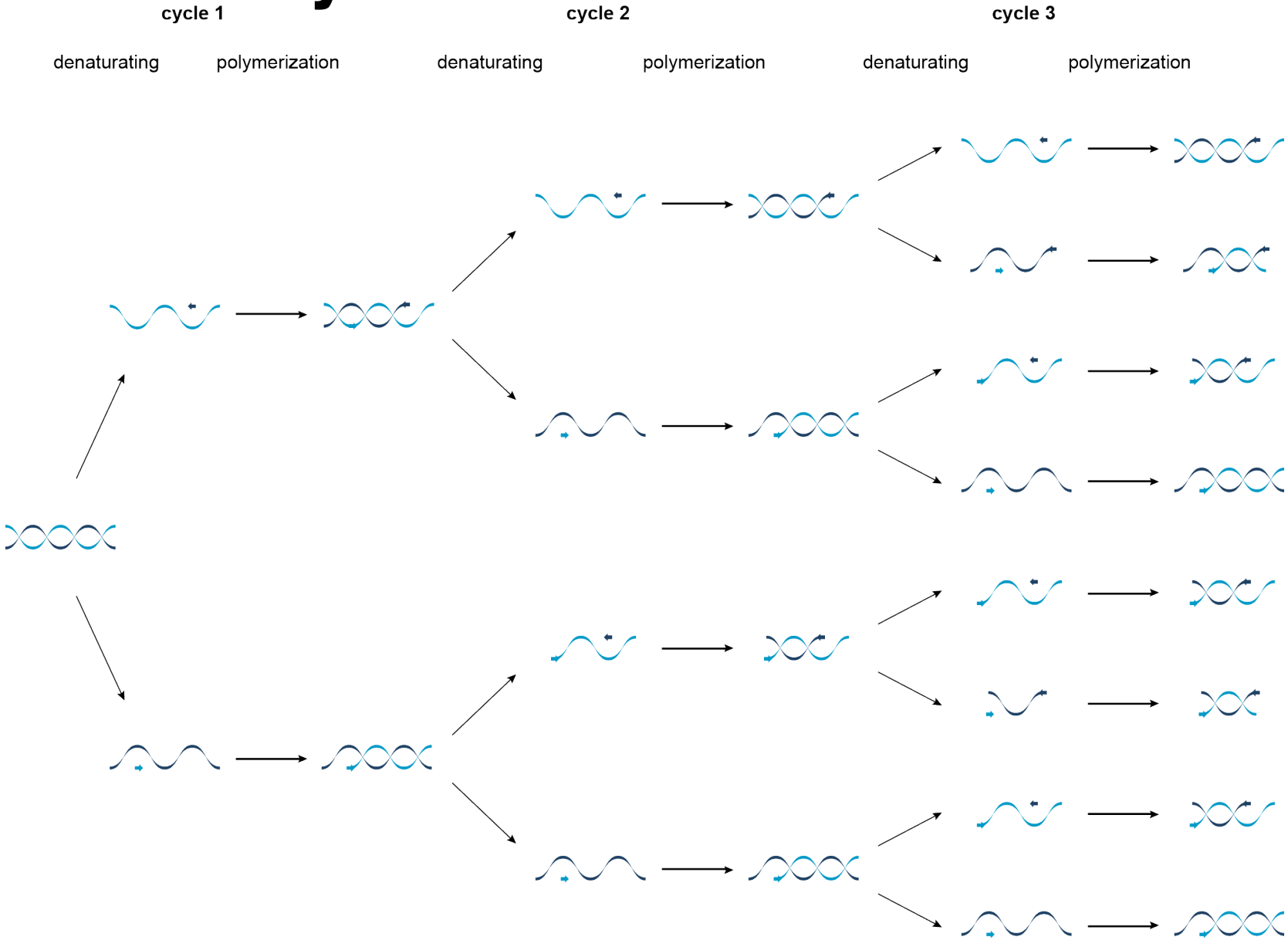
The Polymerase Chain Reaction



DNA sample

- in order to understand a gene and study it or us it for DNA study, more than just a small single sample of DNA is needed. It must be copied or Amplified

Polymerase Chain Reaction (PCR)

- a direct method of making many copies of a DNA sequences in the lab.
- DNA is copied repeatedly for thirty cycles… each cycle doubles the number of DNA molecules (exponential increase)
    - 1,2,4,8,16,32,64…..billions
- useful in forensics, medical diagnosis and genetic research because a small amount of DNA can be amplified

PCR - *3 Steps Involved:*

1. **Denaturing** (95°C)

- separates the double stranded DNA apart

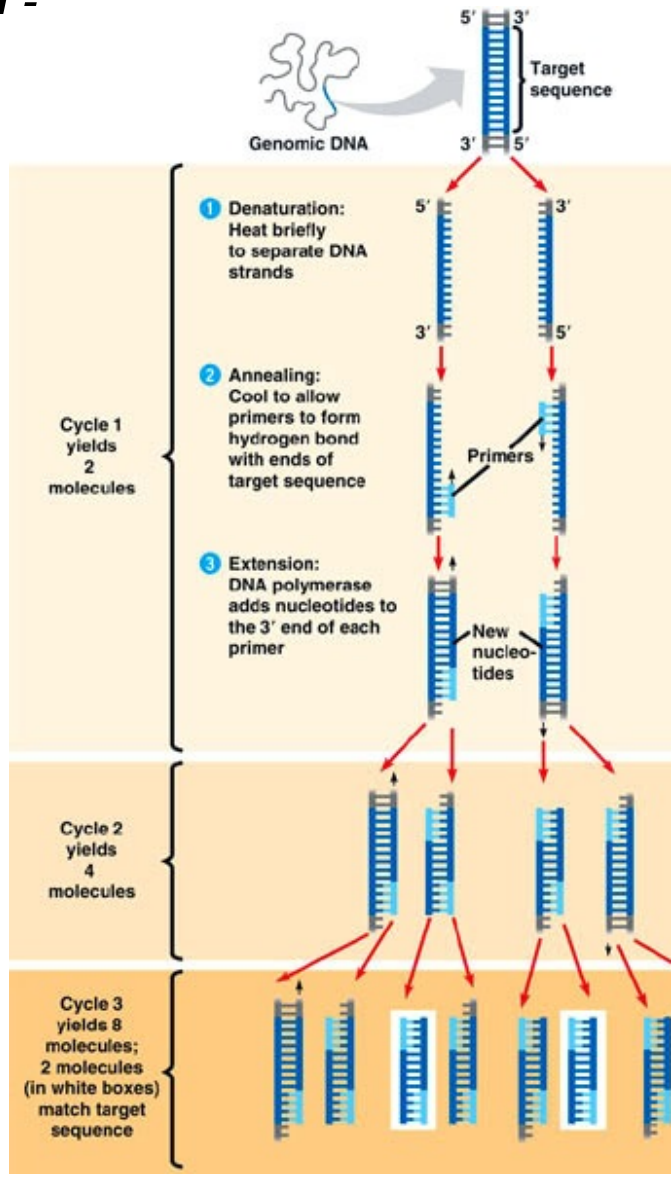
2. **Annealing** (55°C)

- adding artifically synthesized DNA primers added to each 3' ends

3. **Elongation** (72°C)

- both strands act as template

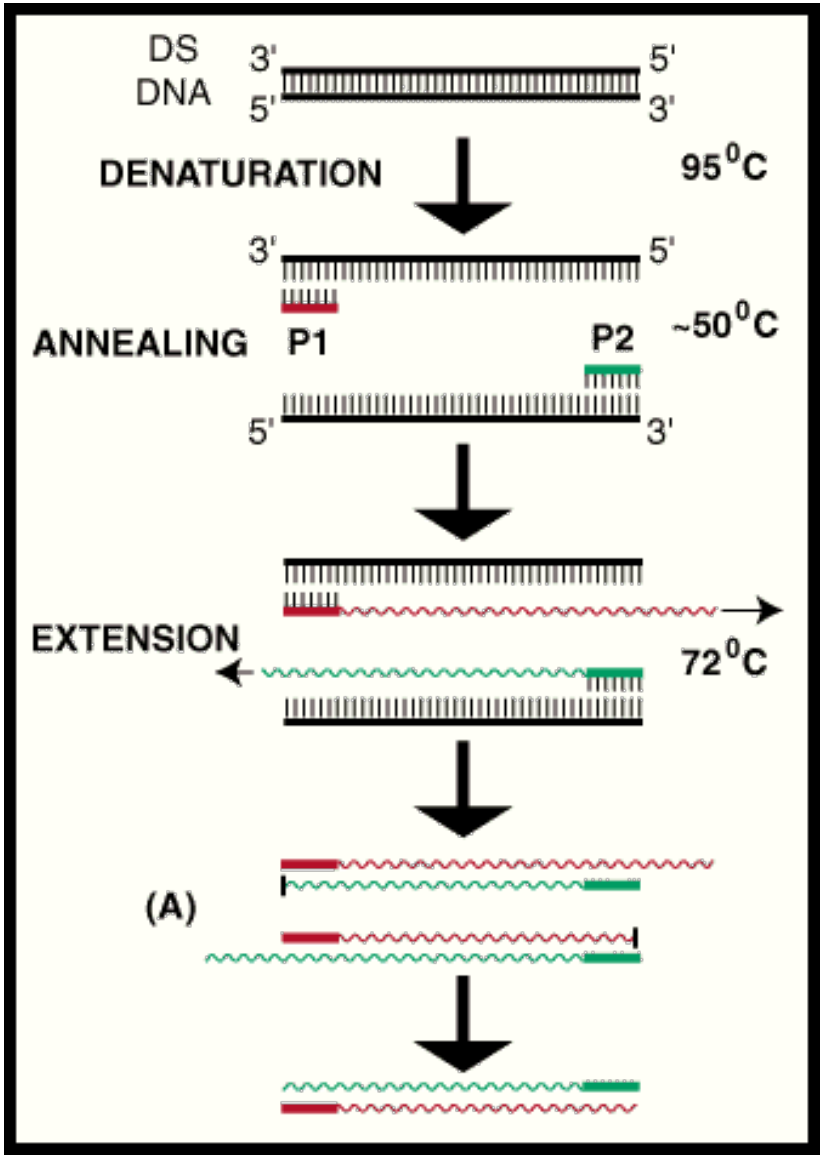
- catalyzed by a DNA polymerase enzyme called ***Taq polymerase***



Taq polymerase - the enzyme used

- from *Thermus aquaticus* (a prokaryote that lives in hot springs)
- benefit: it does not denatured at the high temperatures needed in PCR
- works optimally at 72°C

Explain why human polymerase cannot be used in the PCR process to add nucleotides to the synthesized DNA.


DS
DNA
3'
5'
5'
3'
DENATURATION
95⁰C
3'
5'
ANNEALING
P1
P2
~50⁰C
5'
3'
EXTENSION
72⁰C
(A)

PCR Animations

Look at step-by-step animation of PCR process in this excellent interactive "virtual lab":

https://dnalc.cshl.edu/resources/animations/pcr.html