

Aim of the game

To make as many DNA segments as you can during three PCR cycles.

You will amplify a segment of DNA, using 'paper PCR' tools provided. PCR is carried out inside a thermocycler, a machine that heats and cools DNA repeatedly, amplifying DNA.

There are three stages in PCR:

- denaturation
- annealing
- elongation

Each stage occurs at a specific temperature within the thermocycler. In this activity you'll recreate each stage.

Tools

To play, form pairs.

Each pair receives a PCR kit containing:

- 1 double-stranded DNA template
- 10 forward primers – pink DNA segments
- 10 reverse primers – green DNA segments
- 1 bag nucleotides
- 1 roll of sticky tape
- 1 pair of scissors
- 1 *Taq* polymerase badge

How to play

Cycle 1

1. Denaturation (temperature: 95 °C)

Take the double-stranded DNA template and cut lengthwise into two strands. Each person in your pair takes one single-stranded DNA template.

2. Annealing (temperature: 60 °C)

Choose the correct primer for your single-stranded DNA template. (Hint: it's either forward or reverse.) Remember primers always anneal at the 3' end of a DNA segment and follow rules of complementary base pairing.

Use tape to stick the correct primer to each single-stranded DNA template.

3. Elongation (temperature: 72 °C)

Put on your *Taq* polymerase badge and elongate the DNA template by adding nucleotides to the primers. Follow the rules of complementary base pairing.

Use tape to stick each nucleotide in place.

You've completed one PCR cycle and created a new double-stranded DNA segment, an exact copy of the DNA template.

Cycle 2

In this cycle, each PCR stage is time-restricted. Temperature and PCR stage prompts will guide you.

1. Use your copy of the original double-stranded DNA template to begin.
2. Label the 3' and 5' ends of each strand.
3. Follow temperature and PCR stage prompts that appear on screen and recreate the relevant stage of PCR.
4. Watch and listen for the timer. When time is up move onto the next step regardless of where you're up to.

Cycle 3

In this cycle, each PCR stage is time-restricted, and temperature and PCR stage prompts will guide you.

1. Use the double-stranded DNA template created in cycle two to begin the third PCR cycle.
2. Label the 3' and 5' ends of each strand.
3. Follow temperature and PCR stage prompts that appear on screen and recreate the relevant stage of PCR.
4. Watch and listen for the timer. When time is up move onto the next step regardless of where you're up to.

Compare the DNA segments you made with the original double-stranded DNA template. How many correct copies did you and your partner make?