

I. Game Components

1. DNA Bell

2. Cards (Component Cards + Function Cards)

① Biological Component Cards

Including the following biological components (a single card may contain different types and quantities of components):

- Promoters (including promoters with broad response to low pH, promoters activated under anaerobic conditions, and promoters induced by high temperatures; distinguished between eukaryotic and prokaryotic types)
- Prokaryotic RBS/Eukaryotic Cap Structure
- Target Genes (including fluorescent protein genes, antibiotic resistance genes, and protease genes; distinguished between eukaryotic and prokaryotic types)
- Terminators (distinguished between eukaryotic and prokaryotic types)

② Function Cards

Tool Cards:

- CRISPR-Cas9 Scissors: Gene scissors
- DNA Ligase: Links DNA fragments

Contamination Cards:

- Bacteriophage Outbreak: Bacteriophages extensively infect bacteria and cause their death
- Medium Contamination: The culture medium is contaminated by other bacteria
- Mutation Accumulation: Accumulation of mutations in engineered bacteria leads to experimental failure

II. Game Rules

1. Core Rule: Gene Circuit Assembly

Each round, the flipped cards contain different types and quantities of components. Players need to use the cards in the central area to construct a complete gene circuit (Promoter → Prokaryotic

RBS/Eukaryotic Cap Structure → Target Gene → Terminator) while preventing experimental failure caused by contamination or other reasons.

Trigger Conditions: Players must compete for the DNA Bell when the following situations occur in the central area:

① Standard Circuit: Form a complete expression unit (e.g., Eukaryotic Promoter + Eukaryotic RBS + Eukaryotic Target Gene + Eukaryotic Terminator).

② Out-of-Control System: A Contamination Card appears, and the experiment must be terminated immediately.

③ Special Tools:

- When CRISPR-Cas9 Scissors appear, the first player to ring the bell can remove components from other players' hands (all other players place one card under the bell, which can be obtained by the player who rings the bell for the standard circuit or out-of-control system in the next round);
- When DNA Ligase appears, the first player to ring the bell can take components from other players' hands (all other players give one card to this player).

2. Rewards and Penalties (for Trigger Conditions ① and ②):

- Correct Bell Ringing (for Trigger Condition ①, the player must also correctly state the function of the pathway on the table): Win all cards on the table and add them face-down to their own deck.
- Incorrect Bell Ringing: Give one of your own cards to each other player (resource consumption due to experimental failure). All cards on the table are placed under the bell, which can be obtained by the player who rings the bell for the standard circuit or out-of-control system in the next round.

3. Victory and Elimination Criteria

Elimination Condition: A player is eliminated when they run out of cards.

Victory Condition: The last surviving player wins.

III. Friendly Reminders

① Please remove sharp objects such as rings and watches before the game to avoid injury when ringing the bell!

② It is recommended to place a cloth or blanket under the bell to prevent scratching the tabletop.