Synthetic Biology

What is it?

- Synthetic biology is the design and construction of new biological entities or the redesign of biological systems.
- This allows us to alter or completely create new pathways to change the purpose of an organism.
- It is a combination of Biology, Physics, Chemistry, Mathematics, Engineering and Computer science.

Why is it important?

- Synthetic biology is a new frontier in science with lots of applications such as: biofuels, medicine production, food security and waste removal etc.

How To Play

Rule set one:

1. Separate cards into four decks: Promoters, Ribosome Binding Sites (RBS), Protein Coding Region (PCR) and Terminators. Shuffle each deck.

PCR Promoter Terminator RBS

Biology" and wants to give it a go. Using your newly bought portable synthetic biology lab, produce a unique strain of *E. coli* to make the party unforgettable.

Space walk:

You are the first synthetic biologist on the International Space Station. Currently space walks are costly and difficult to plan. Using the on-board synthetic biology laboratory produce your own colony of *E. coli* to make space walks a more comfortable experience.

Orange:

Mountain top:

After a 7 day hike you find yourself at the highest base camp on Mount Everest. Due to popular demand, you find the camp has been equipped with a high tech synthetic biology laboratory. Using synthetic biology it is up to you to construct a plasmid to insert into *E. coli* that will help make the treck to the peak more comfortable.

Under water:

You are relaxing in the Caribbean when you decide that you want to establish your own underwater base. Using your synthetic biology lab, prepare a colony of *E. coli* to take with you under water that will allow you to live in your base all year round.

Mars:

You were selected to be a part of the first Martian colony. The new Mars rover can only be used for day excursions due to the small rover battery. The colony has an up-to-date synthetic biology lab. Use this to kit out the rover so people can take it out for weeks at a time.

BioMech

The scenario-based board game introducing synthetic biology.

Developed by Exeter iGEM

BBSRC
bioscience for the future

EMBG
Exeter Microbial Biofuels Group

SEB

Supported by
wellcome trust

University of Exeter

New England BioLabs Inc.

Ocean Optics

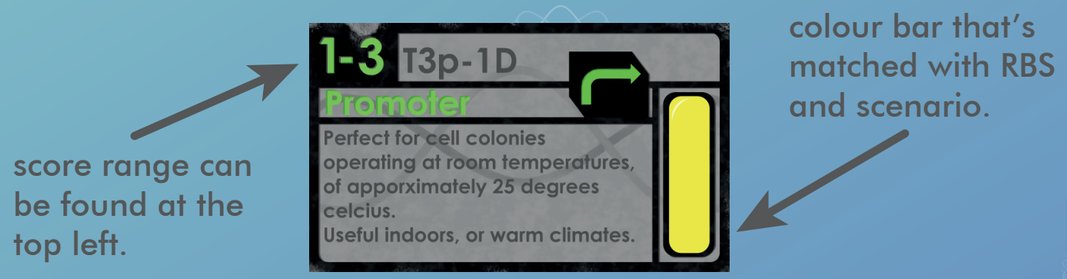
iGEM

- Terminator: The score on the top left of the card is awarded.

- Bonus points: One bonus point is awarded for each colour bar that matches the scenario colour.

6. After scoring, the active team must roll a die. If they roll under the number displayed on the terminator card, the cell mutates and the team score zero.

7. Repeat previous steps with all teams. The highest score wins the round. First team to win three rounds wins the game.



Rule set 2:

Ignore step 3 on 'Rules set 1'. Teams will play as normal but then before the discussion, they will describe in what scenario their plasmid will be useful. Scoring will then commence with other players basing scores on how well the cards fit the chosen scenario.

Scenarios

Pick your scenario from the list below

Purple:

Mine:

You have managed to secure a job at a mine, but only because you told the boss you would "revolutionise" the business; he has high expectations. Using the biology laboratory at the local university you will develop a strain of *E. coli* to allow miners to more comfortably work those long shifts.

Radioactive:

Radiation leaks can cause areas to become contaminated for thousands of years. Currently there is no safe way for people to stay in such places for extended amounts of time; this is where you come in. Using your synthetic biology knowledge you will insert your plasmid into *E. coli* with an aim of protecting humans, or helping to combat any negative effects of irradiation.

Disease:

Thankfully, epidemics are not too common these days, but we can always be prepared. You have been asked to research how synthetic biology can be used to better prevent or fight infectious diseases. You have all the equipment you need, what will you make?

Blue:

Beach:

You and some colleagues have taken a trip to a remote beach but you have forgotten to pack food. Being keen scientists, you have a portable synthetic biology lab to hand - it is up to you to produce a colony of *E. coli* to make your trip more enjoyable.

Volcano:

You were working in your high altitude laboratory when a volcano erupted; you were a safe distance from the initial blast but the lab is covered by a thick layer of dust and ash. After waiting a while, you decide it is time to leave. Produce a plasmid to insert into *E. coli* that will make the journey home slightly more pleasurable.

Remote Island:

Your ship capsized in the night and you wake up with what's left of your ship on the shore of a remote island. The island has a thick jungle in the center with sandy beaches around the edge. Thankfully your portable synthetic biology lab survived the night; produce a plasmid to insert into *E. coli* to help you survive until help arrives.

Yellow:

Lack of food:

Due to an unfortunate heat wave, rivers have dried up and crops have begun to die. Your university has employed you to develop a strain of *E. coli* to help protect or restart the growth of crops. You need to act quickly, the whole city is relying on you!

Party:

It's your friend's birthday, to celebrate he is hosting a party. Like you, your friend is a keen biologist and has just heard about a field of science called "Synthetic

2. To each team deal 4 PCRs, 2 Terminators, 2 RBSs and 2 Promotors (as seen on the right).

3. Choose a scenario from the list provided on page 4 or create your own!

4. Each team rolls a die, the highest scoring team will go first and the game will continue clockwise. Re-roll in case of a draw.

5. The first team places five cards on the game board, filling each slot. The other teams will then score the first teams plasmid:

- Promoter: The other players award a score depending on how well they feel it fits the scenario. The score given must be within the values indicated on the top left of the card.

- RBS: Points are awarded for the number of coloured bars in the plasmid matching that of the RBS. As indicated on the card.

- PCR: Points are awarded in the same manner as the promoter.