

The SynBio Sleuths

A Treasure Hunt for the ever curious

Walking through the woods, one isn't expected to notice it. It has hidden in the best way possible - in plain sight. The angle at which the parchment is held against a tree with a knife, it's meant to evade a commoners glance. You however are not a commoner, and being more perceptive, notice it. A strange piece of parchment in the middle of the woods. As you proceed towards the tree you notice there are many sheets, containing strange statements and questions. The one at the top, the one that first visible reads:

So you noticed my presence, well done.

Do you think you have what it takes?

Solve the "The Sacrum Myriad Trial"

and history shall not forgot your triumph

You have 75 minutes to solve the 10 questions
that follow.

Beware of a sudden death trap.

It is time to test your wits. Proceed with
caution.

We will be watching, we are always watching

An ode to... umm to....

Let's gather around and let's sit down
 Have a talk about X, how does that sound
 Technology used to multiple nucleotides like
 rabbits
 You've become one of a molecular biologists most
 oldest habits

A template, a primer, to bind to the other side,
 dNTPs, enzyme & buffer to make sure everything
 sits tight
 A handful of ingredients and a few easy steps
 Cleave it, and cleave it and hope it extends

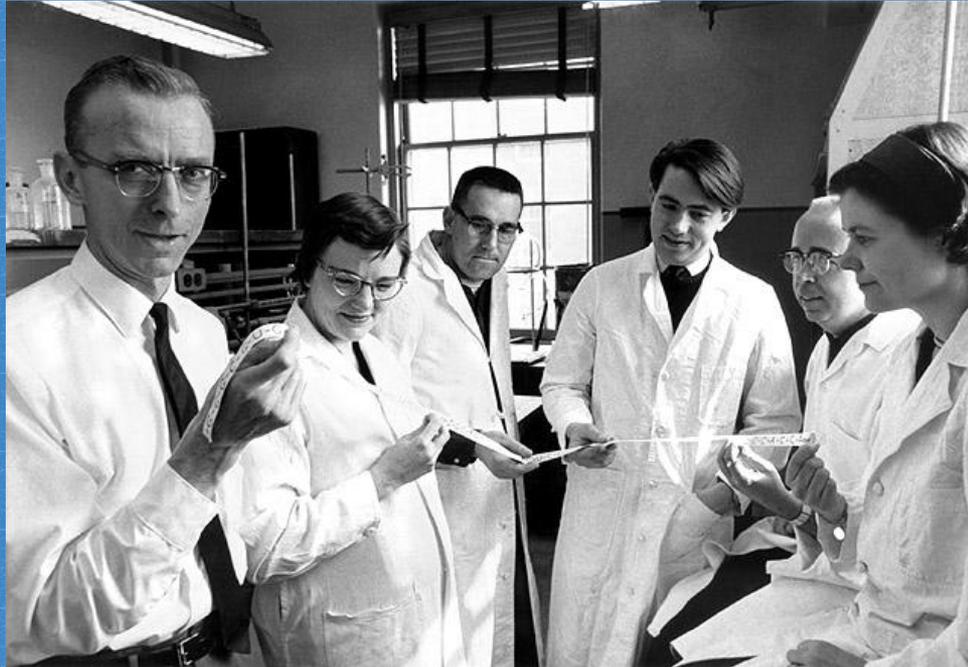
X , oh X what a beautiful technique,
 Gave each and every biologist a new and awesome
 feat
 You can use it to amplify, magnify, detect and
 identify
 If you want something more maybe go for a
 mutation

A medical tool doing wonders beyond you've seen
 All started with a few water baths which ever so
 keen
 As Y, tweaked his setup to make sure it all
 worked fine
 Little did he know he was creating something so
 divine

As your friend on stage recites his poem, an ode to his beloved, he decided to change the name of his muse. However you are far too clever for all that.
 You've figured out what the poem is dedicated to havent you? Give me X and Y

Q2

- > One of the persons in the image below shared a Nobel Prize in Physiology/Medicine with an Indian-American for a discovery that has now become textbook material.
- > What does reading the 'concept' section of this Indian-American's search result on website-x tell you about 'stop signals' (exact sentence).
- > Find website-x hidden on this slide



Q3

What is Lisa talking about? What is she saying you think to yourself. You seem confused and look around. All your fellow humans are confused.

You start to notice that your epithelial cells and the bacteria (maybe others too but it's difficult to tell) almost replying to Lisa. They seemed to have figured it out.

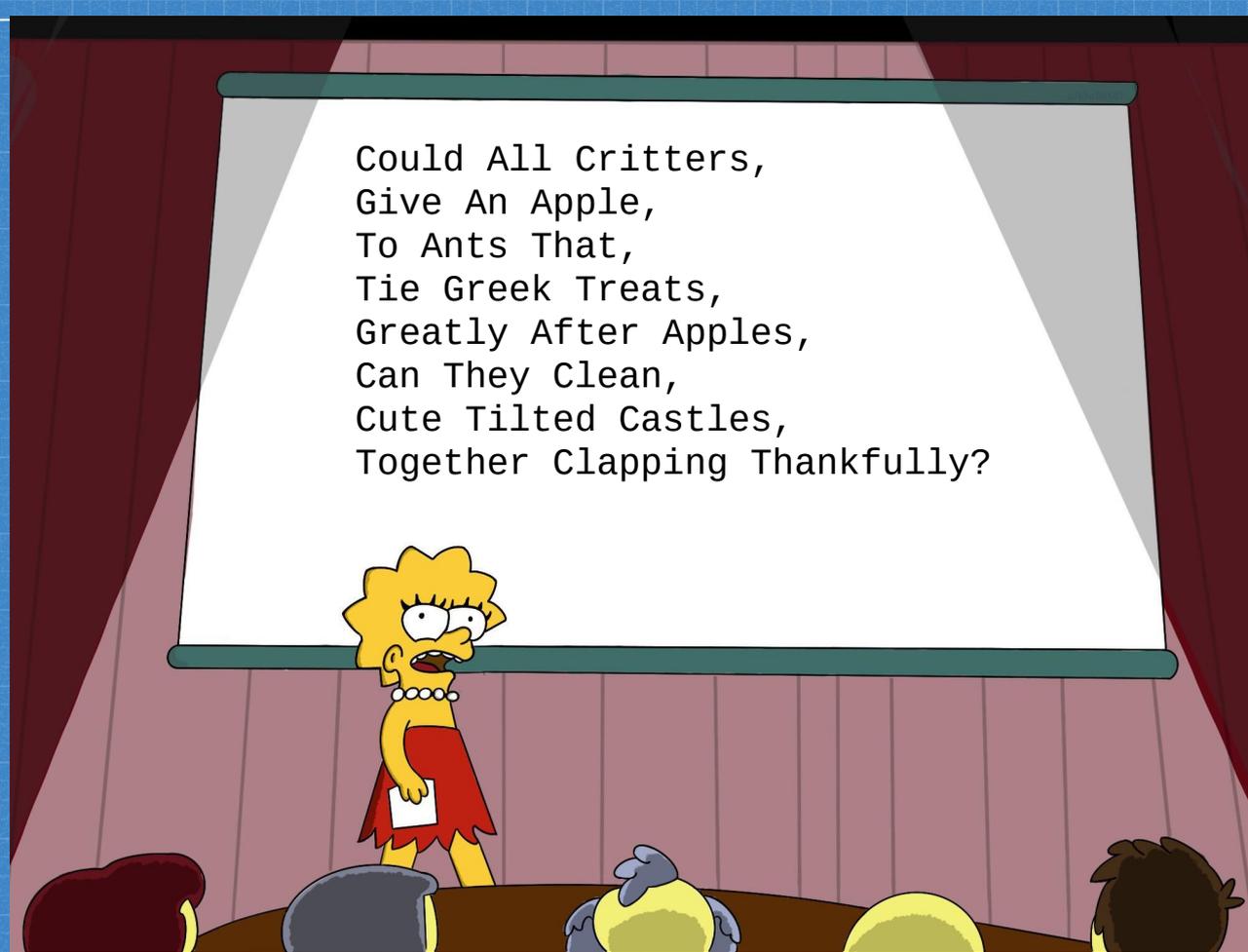
Can you?

Answer: 8 characters long

All hints are on these webpages, no need to click any links on the webpages.

[Hint 1](#)

[Hint 2](#)



Q4

As your teacher was explaining how restriction enzymes cut at DNA, you seemed to have decided to take an afternoon siesta. You wake up just in time as your teacher calls out your name and says, "Now it's your turn to solve the problem". The question written on the blackboard reads:

How many combinations of completely paired double stranded DNA do you have when you add EcoRI to sequences 1 and 2 and mix them together?

Sequence 1:

```
AGAAAGCAATAGGAATTCGCCACTTCTTTATGAGATCGAATTCCTTTCATTAGGAGCCCCGC  
TCTTCGTTATCCTTAAGCGGTGAAGAAATACTCTAGCTTAAGGAAAGTAATCCTCGGGGCG
```

Sequence 2:

```
GAATTCCTTATGTCGTGAATTC  
CTTAAGGAATACAGCACTTAAG
```

Luckily enough, you managed to scribble something down before your untimely nap:

1. A restriction enzyme is an enzyme that cleaves DNA into fragments at or near specific recognition sites within molecules known as restriction sites.
Ex: EcoRI, BamHI, etc.
2. Remembering that in nucleic acids, Adenine and Thymine always pair up and Cytosine and Guanine always pair up, answer the following question.
You also remember that, single strands of DNA are always desperately in search of their partners and will go for the closest match
3. EcoRI Cuts at the recognition site "GAATTC" in the following pattern

```
GAATTC  
CTTAAG
```

Hint 1: Main image

Q5

You come across a sheet of paper that looks like it has been ripped out of a newspaper. It reads as below.
What is the question? What is the answer?

Best Environmental iGEM Project 2018 - NCKU Tainan

2018 NCKU Tainan team strives to reduce the concentration of carbon dioxide (CO₂) with the approach of synthetic biology.

We constructed a carbon fixing E coli by cloning enzymes from Calvin cycle into it.

We measured the function of each enzyme in the pathway and proved that the engineered pathway can utilize carbon.

Our team has also designed a bioreactor. The bioreactor contains an air valve in which we can pump the CO₂.

The bioreactor is also monitored by sensors that will send the data to a cloud database.

Combining IoT and synthetic biology, we believe that our device can be applied to industrial settings.

Q6

The Wiki Game, also known as the Wikipedia race, is a hypertextual game designed to work specifically with Wikipedia. Players start on the same randomly selected article, and must navigate to another pre-selected target article, solely by clicking links within each article. The goal is to arrive at the target article in the fewest clicks (articles), or the least time.

What is the shortest path from site A to site B mentioned below:



Answer should be the path, from A to B.

Q7

Identify the speaker if the toast that the speaker raises also happens to be the title of their quite famous speech.



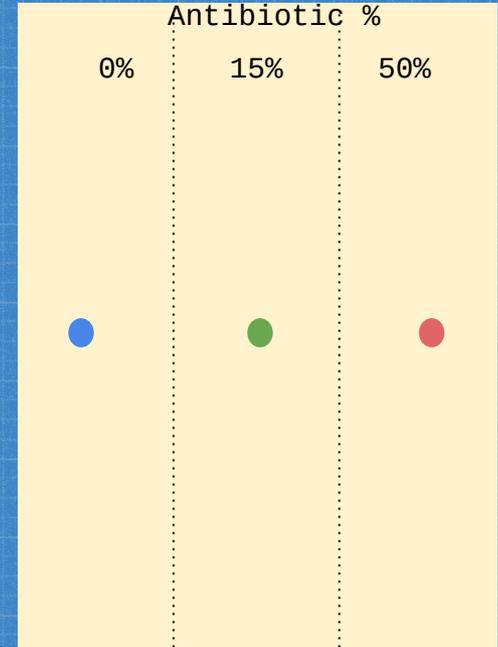
Link for the audio is the image
Hint for the question is the image

Q8

An organism's main goal is to increase the population of the species to propagate it's DNA. Given a limited space, it keeps on reproducing, until it has taken over all space and exhausted all resources. Since it doesn't wish to die, it will try to adapt to survive off of new resources. Once it is able to do that, it has evolved (naturally selected) to survive in places where it couldn't before.

Now, let us do a thought experiment.

1. Consider a swimming pool filled with agar (food for bacteria).
2. Each lane of the swimming pool has agar with different percentages of antibiotic (greater the quantity, more dangerous it is) as shown in the diagram.
3. More antibiotic does not mean less agar.
4. Bacteria can move from one lane to another as there is no physical boundary
5. In each lane, you put bacteria from the same culture. This means that they are all considered identical. However the only difference is that they are all differently coloured.
6. Dead bacteria can be considered to vanish (for the sake of the experiment)



For all this hard work, you give yourself a well earned vacation for a couple of weeks. What would happen in your swimming pool over time, as the bacteria try to grow? Imagine and simulate this experiment in your mind and describe what the outcome will be.

Q9

A sequence alignment is basically the process of matching two sequences of DNA/RNA/Protein in order to identify how similar they are to each other.

> When an organism's genome is sequenced for the first time, distinguishing features are identified in the genomes (ex: genes) by comparing it to the known genome of a closely related organism.

> Sequence alignment also tells us how a genome changes over time.

When aligning genomes, an alignment score is generated. Higher the score, better the alignment. [Use this link to understand how to align sequences.](#)

1. What is the best way to align the following new sequence against the reference?
2. What does the XYZ Gene look like in Sequence A?

Reference Sequence: ACTCTTTCGTTCCCTTAAGCGAACCACTCTAGCTTAAAAGG

Gene slop3: GAACCACTCTAGCTTA

New Sequence: ACTCGTTCGCTTAAGCAGAAAGGACCTAGCTTCCCAAGG

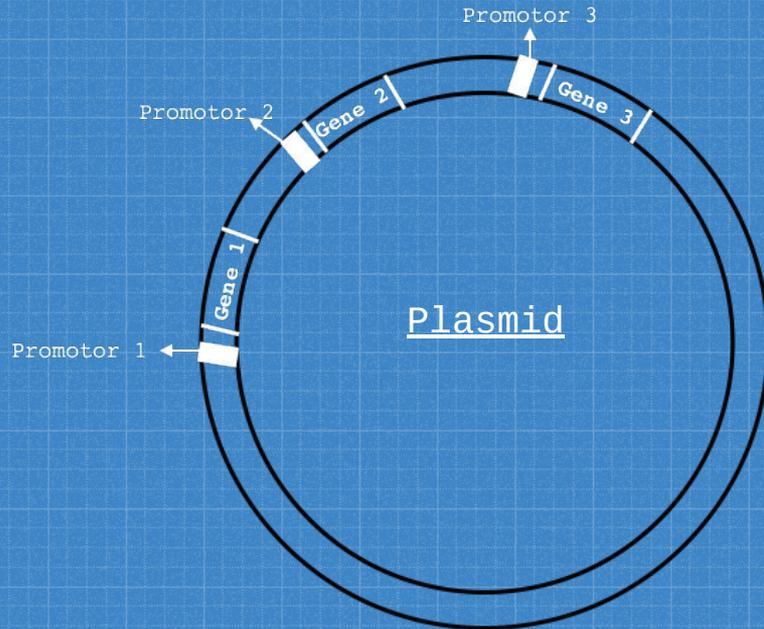
Gene slop3: ??

Q10

A bacteria can be reprogrammed to help you do what you want it to do by giving it some extra instructions. These are given in the form of genes inserted in a plasmid (plasmid:bacteria::cd:computer). One plasmid can have many different genes.

Using the various genes given in the wordpress link below, construct a bacteria that can solve a problem that is affecting our world.

Ex: plastic eating bacteria to clean up our oceans, making bacteria produce biodegradable silk, etc.



Use the link on the Plasmid to see what all parts you can use.

Give us the problem that you want to solve and how your bacteria with its new plasmid, will help solve the problem.

The only thing stopping you is your creativity.

[Help 1](#) ; [Help 2](#)



Thank you for participating, we hope you had a good time!
Results will be communicated shortly.....