

如何把中小學生都能明白的 簡易生物科技帶進課室？



晉色園生物科技流動實驗室計劃
Sik Sik Yuen Biotechnology MobileLab Program

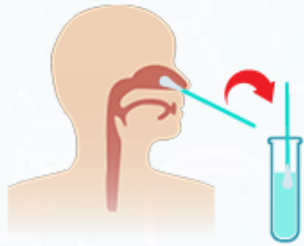


晉色園主辦可譽中學暨可譽小學
Ho Yu College and Primary School (Sponsored by Sik Sik Yuen)



Comparison of COVID-19 Molecular Tests using Nasopharyngeal (NP) specimen collection and SalivaDirect collection

Molecular Tests (Nucleic Acid Detection)



1. Obtain Specimen:
NP swab



2. Extract RNA
from specimen
and convert to
DNA.



3. Amplify by PCR
with SARS-CoV-2
specific primers.



4. Interpret results:
presence of viral
RNA indicates
active SARS-CoV-2
infection.

SalivaDirect Test



1. Obtain Specimen:
SalivaDirect



2. RNA-extraction free
process. Convert RNA from
specimen to DNA and
amplify by PCR with SARS-
CoV-2 specific primers.



3. Interpret results:
presence of viral
RNA indicates
active SARS-CoV-2
infection.

mRNA?
DNA?
PCR?

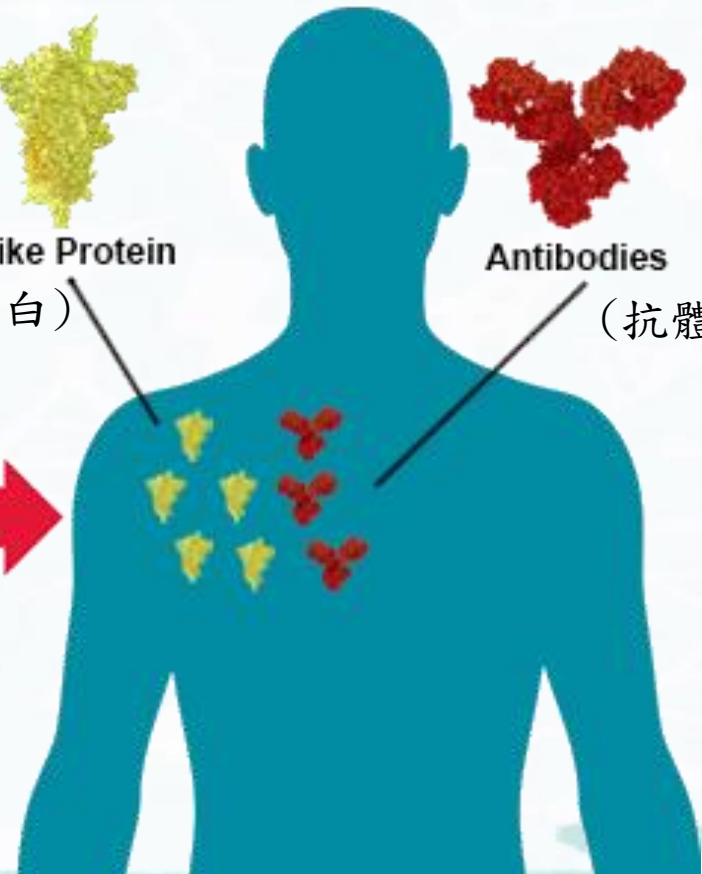
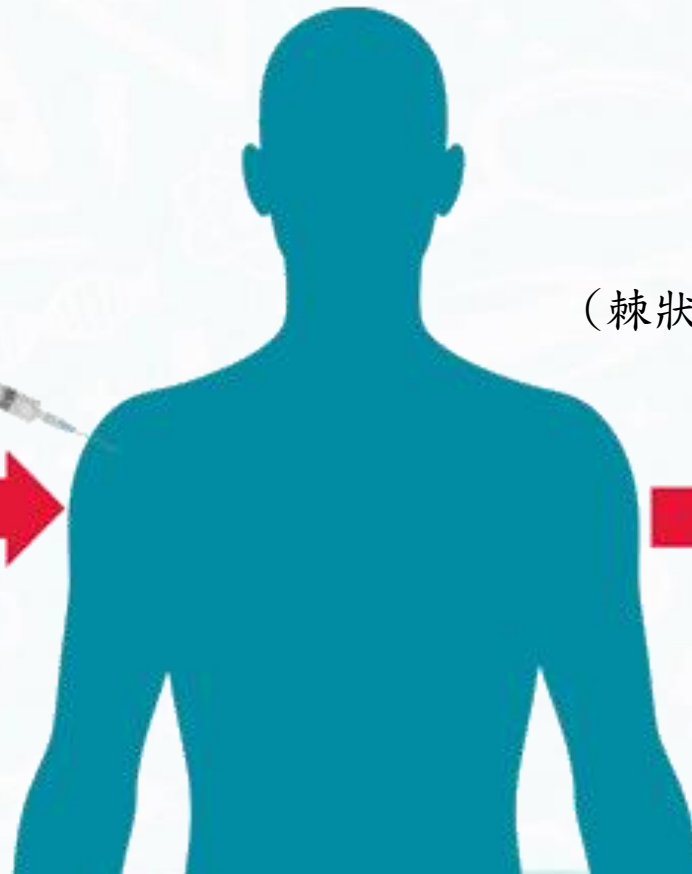
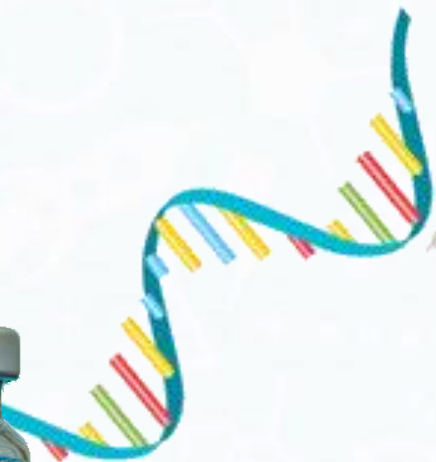
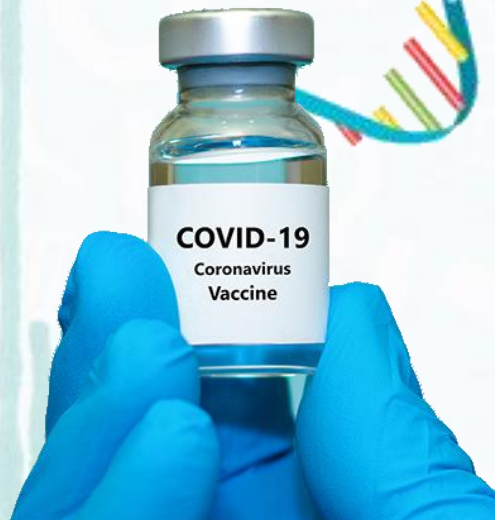




mRNA for spike protein of coronavirus

mRNA is injected into muscle

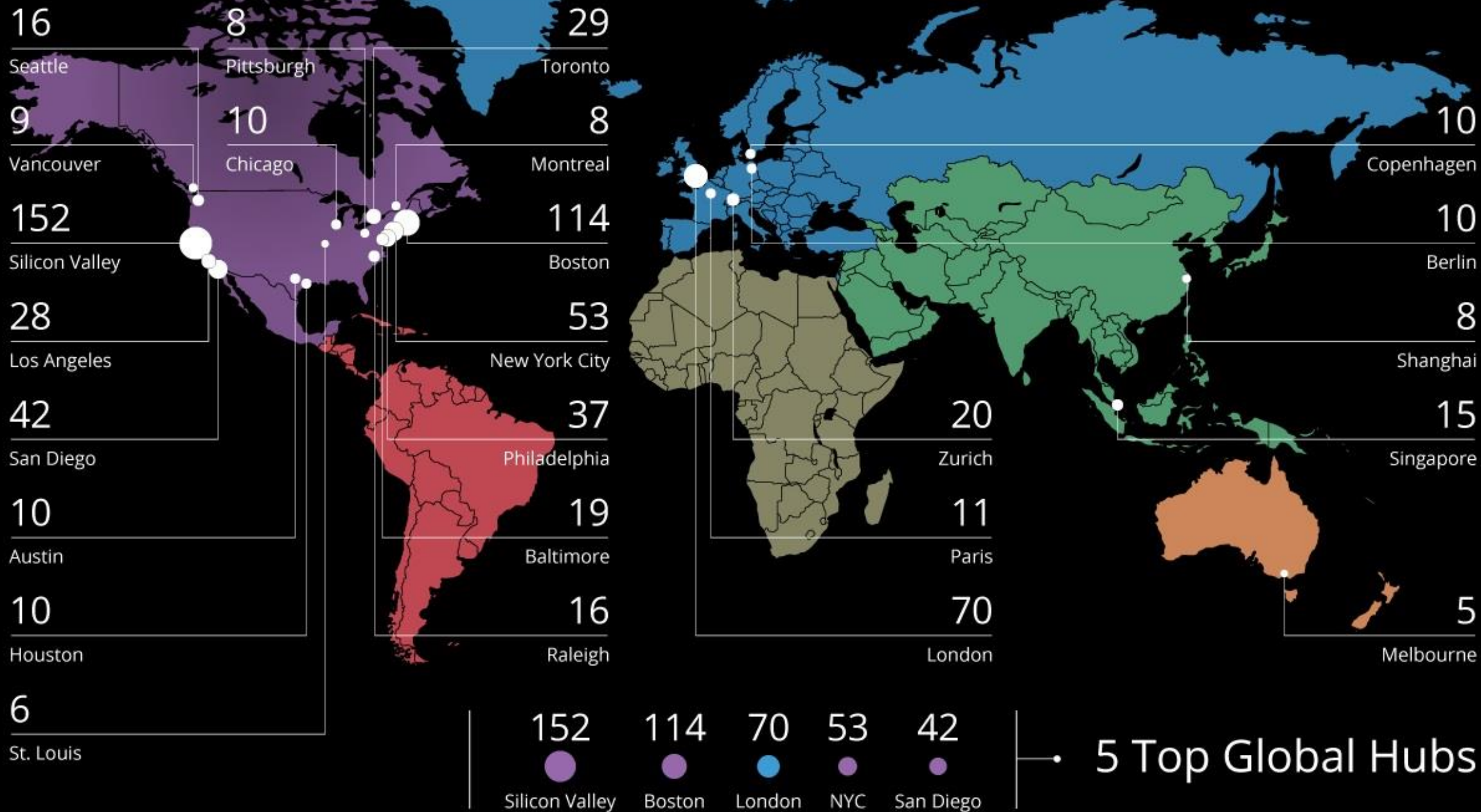
The vaccine triggers production of the spike protein and antibodies specific to it



Spike Protein
(棘狀蛋白)

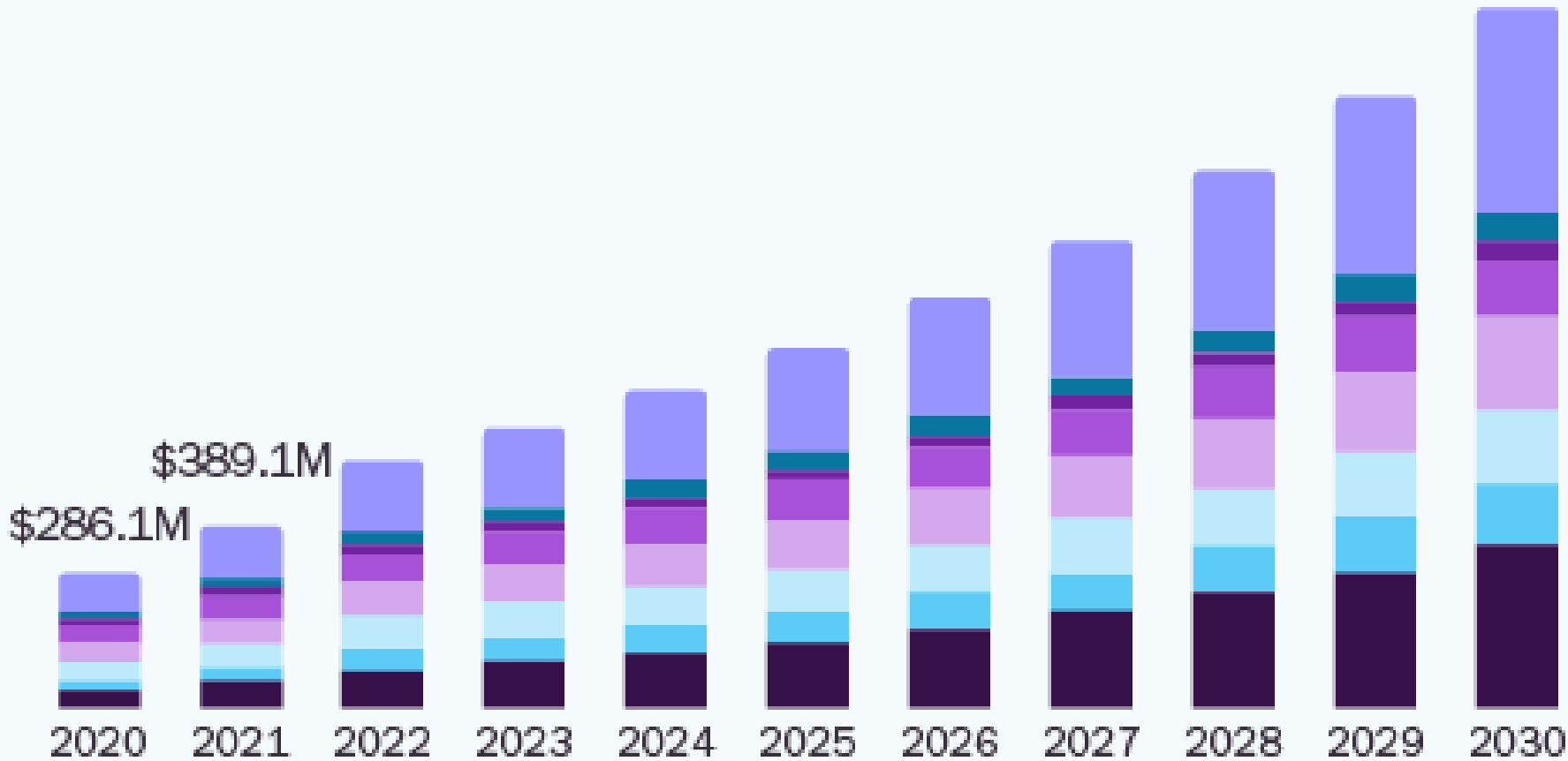
Antibodies
(抗體)

Biotechnology

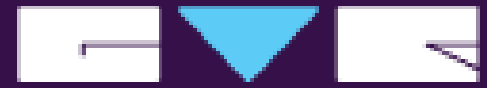


U.S. Biotechnology Market

size, by technology, 2020 - 2030 (USD Million)



- DNA Sequencing
- Nanobiotechnology
- Tissue Engineering & Regeneration
- Fermentation
- Cell-based Assays
- PCR Technology
- Chromatography
- Others



GRAND VIEW RESEARCH

13.9%

U.S. Market CAGR,
2022 - 2028

Source:
www.grandviewresearch.com





**Hands-on Biotech: The Lawrence Hall of Science
(University of California, Berkeley)**



Science Adventure Lab (2009 Launched)



North Carolina's BioNetwork Mobile Laboratory (2006 Launched)





Sik Sik Yuen Biotechnology Mobile Laboratory (BML) Program (2009 Launched)



校本生物科技教育

- 2004年
 - ✓ 於中學部五樓建立達大學研究水平的**生物科技教研室**
- 2009年
 - ✓ 建成了全亞洲首台**生物科技流動實驗室**
 - ✓ 成立**科學團隊**
- 2016年-現在
 - ✓ 被教育局邀請作學界**專業發展學校**為全港中小學校建立**專業學習網絡**以推動STEM及生物科技教育課程





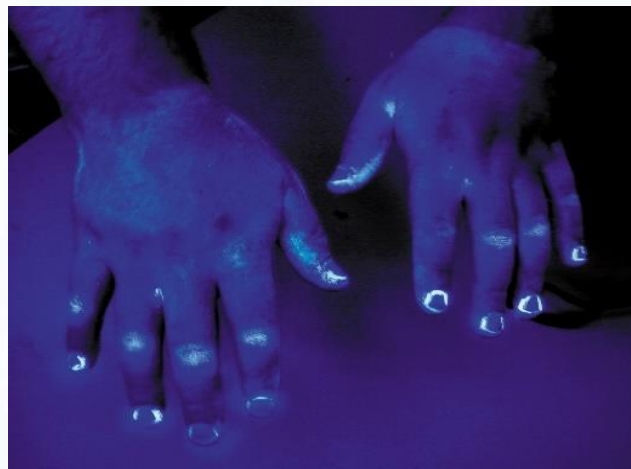
• 生物科技課程框架 (自2004年起)

| 小學 | | 中學 | |
|----|----------------|----|----------------|
| | | 中一 | 探索微生物世界—何處覓細菌? |
| | | 中二 | 家居化學物質對細菌生長的影响 |
| 小三 | 「螢」之手 | 中三 | 抗生素對細菌生長的影响 |
| 小四 | 探索微生物世界—何處覓細菌? | 中四 | 利用光譜儀量度微生物生長 |
| 小五 | DNA與遺傳—抽取細菌DNA | 中五 | DNA 重組技術 |
| 小六 | 遺傳疾病—美食DNA | 中六 | DNA 指紋分析 |



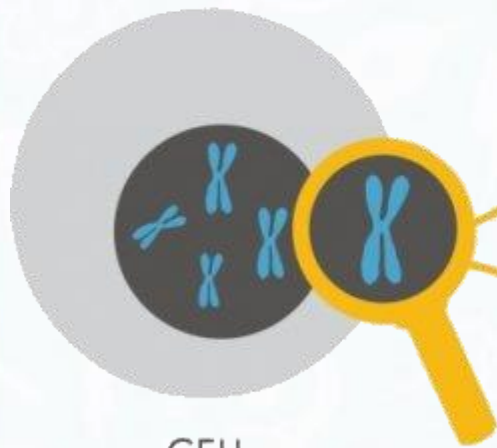
課程範疇

- 遺傳學
- 生物工程
- 微生物學
- 趣味科學





化深為趣，化繁為簡



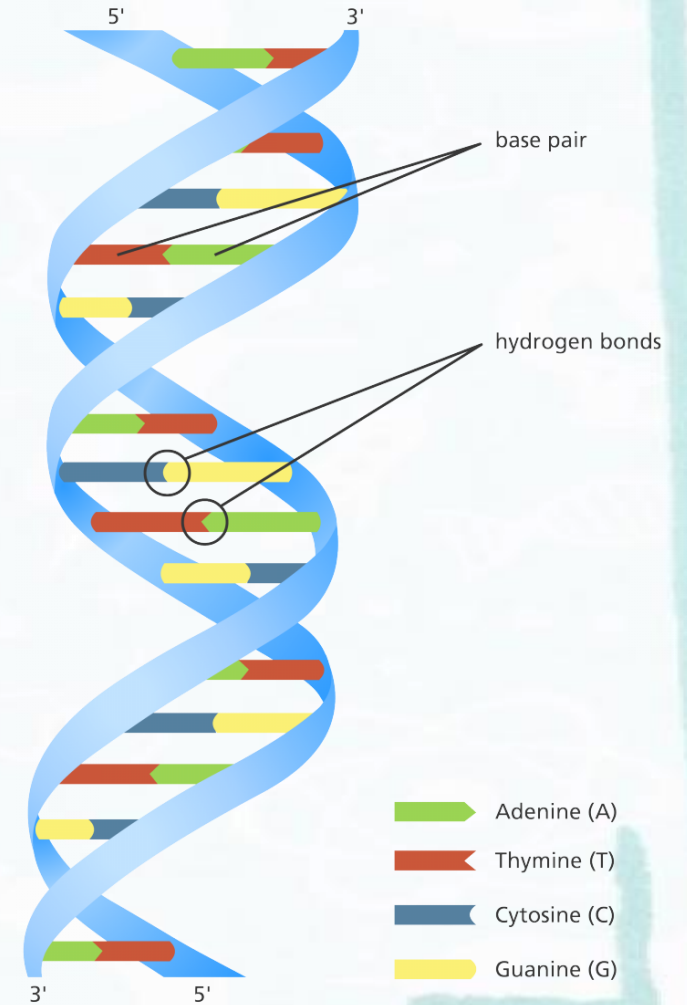
CELL



CHROMOSOME

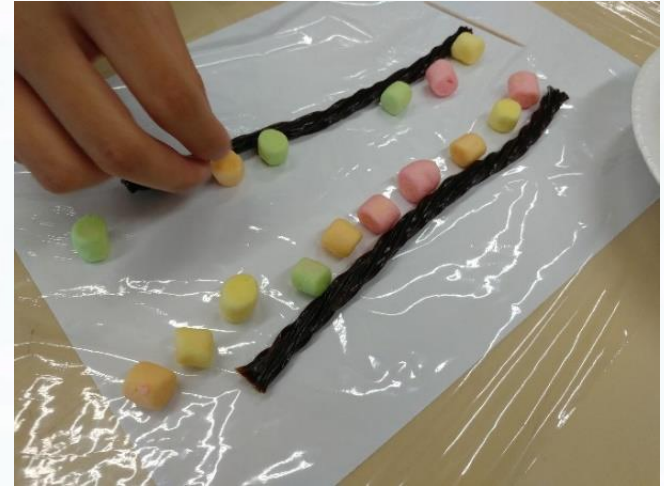


DNA





糖果DNA活動





觸摸 DNA

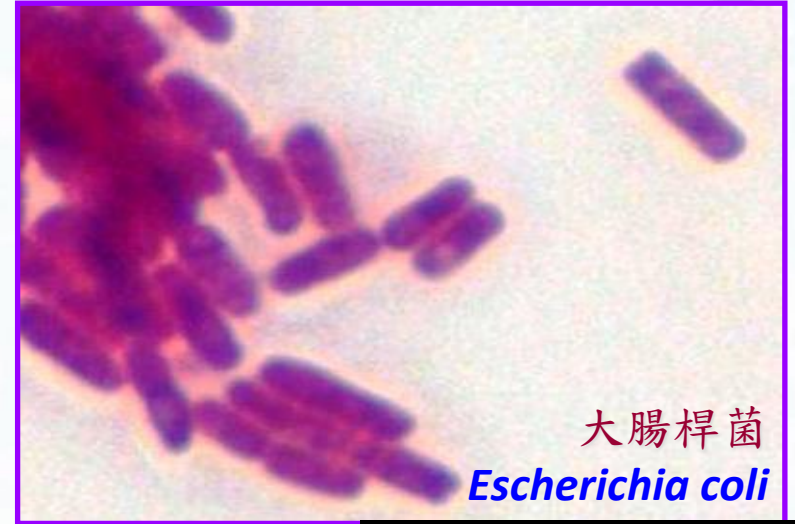
1



2



3

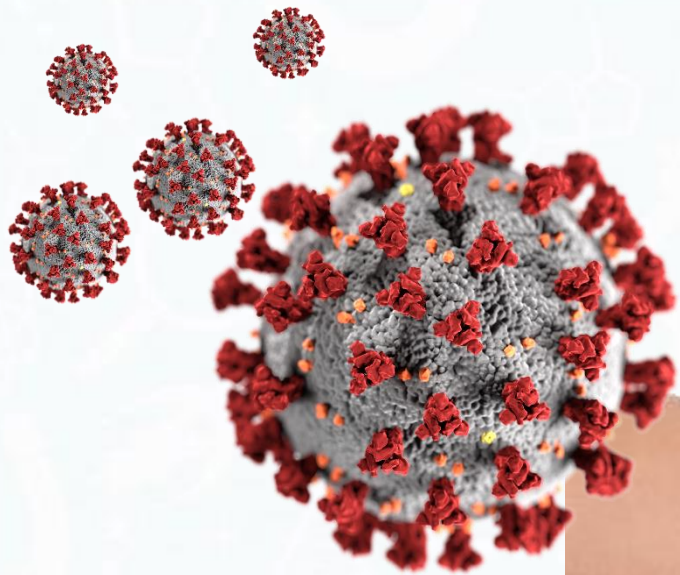


大腸桿菌
Escherichia coli



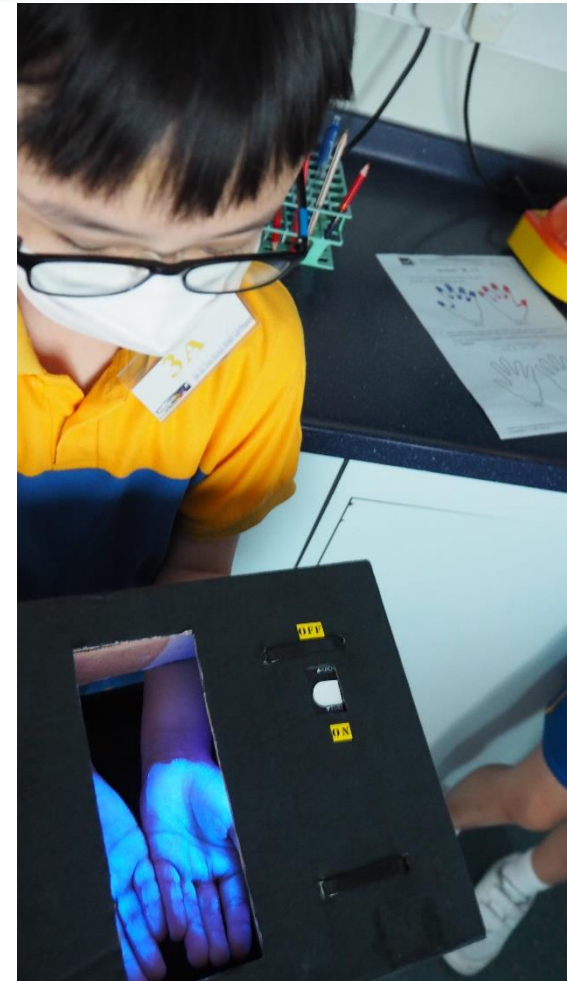


受感染？



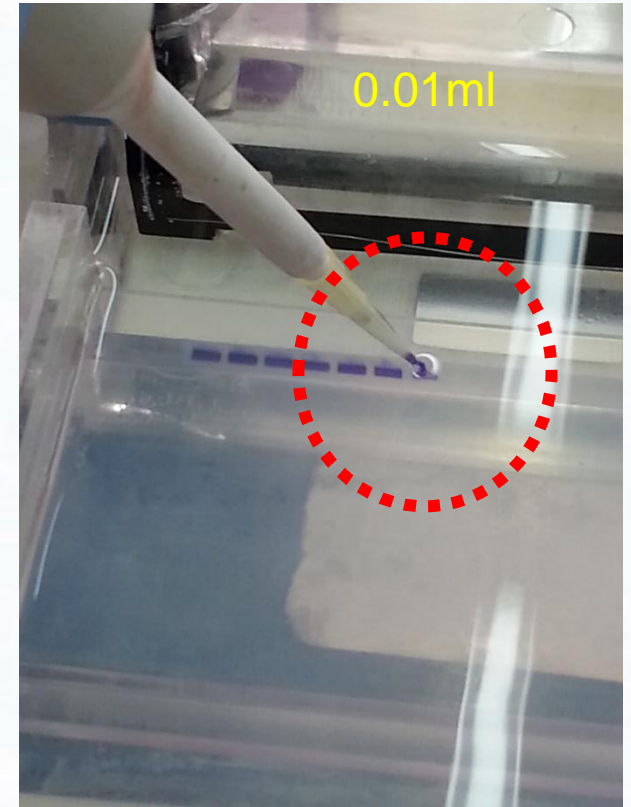


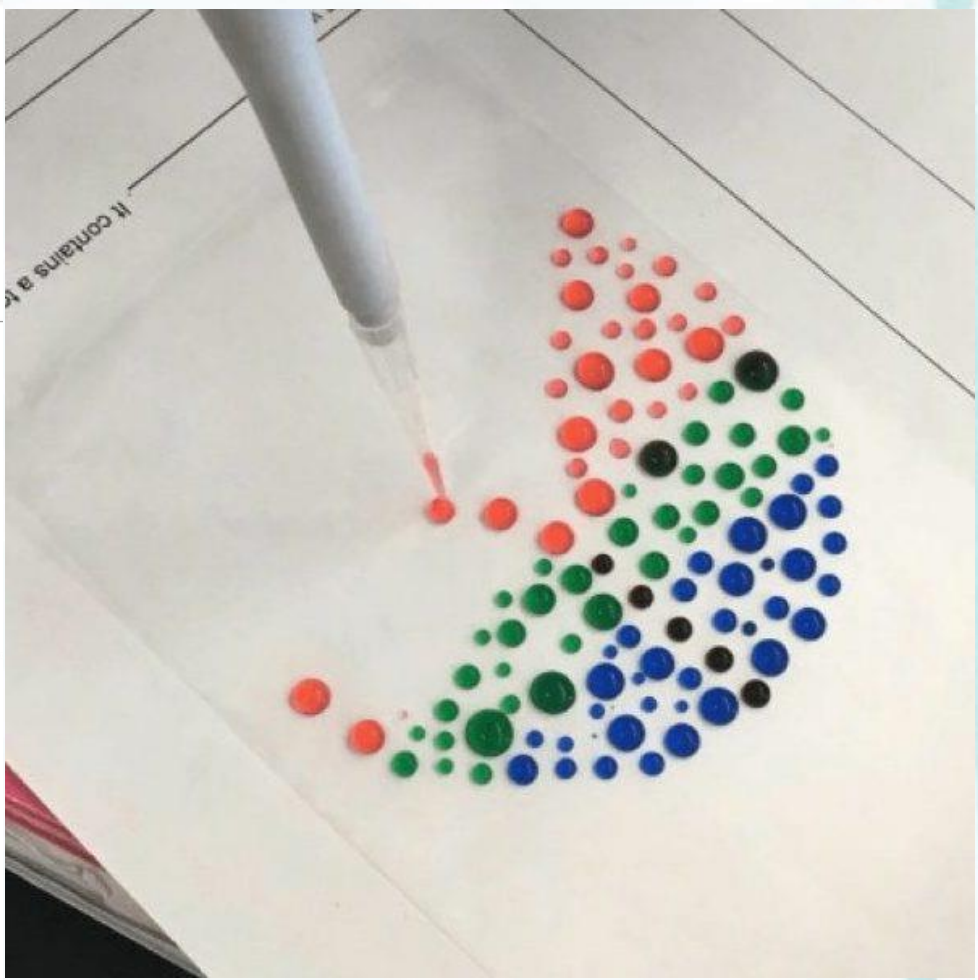
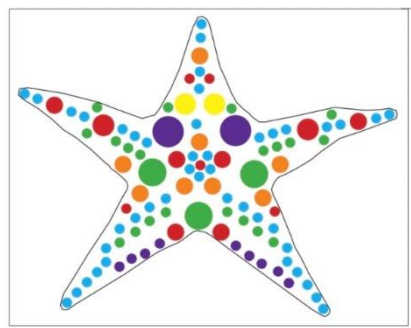
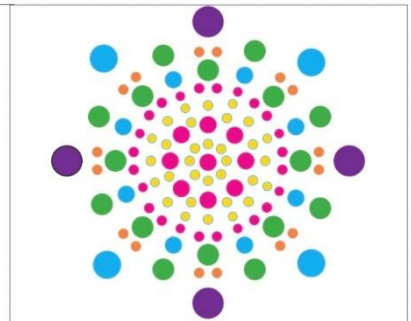
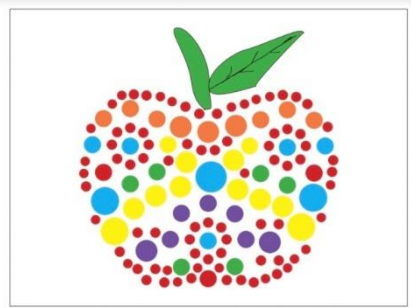
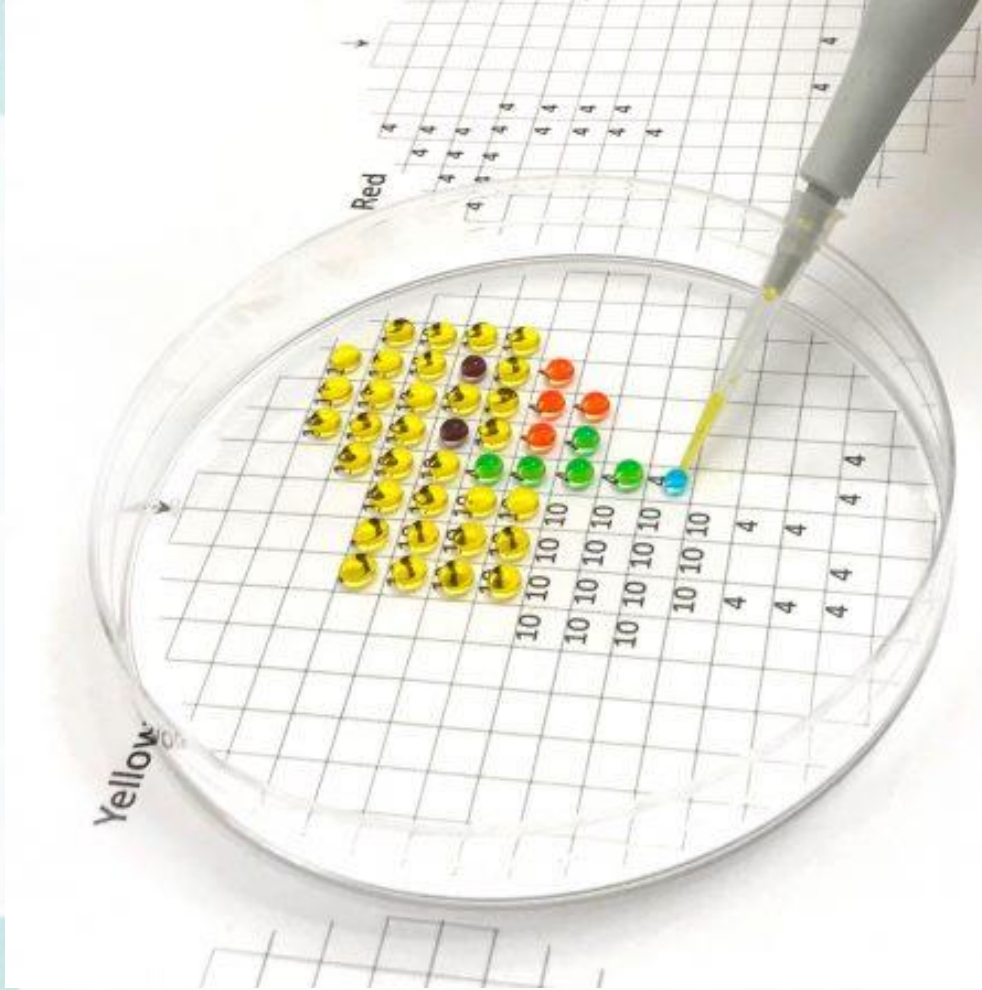
螢之手





運用微量移液管







Pipet P20 (2-20 μL)

| Min. | | Max. |
|-----------------|--------------------|------------------|
| 0 | 1 | 2 |
| 2 | 2 | 0 |
| 0 | 5 | 0 |
| 2 μL | 12.5 μL | 20 μL |



Pipet P100 (10-100 μL)

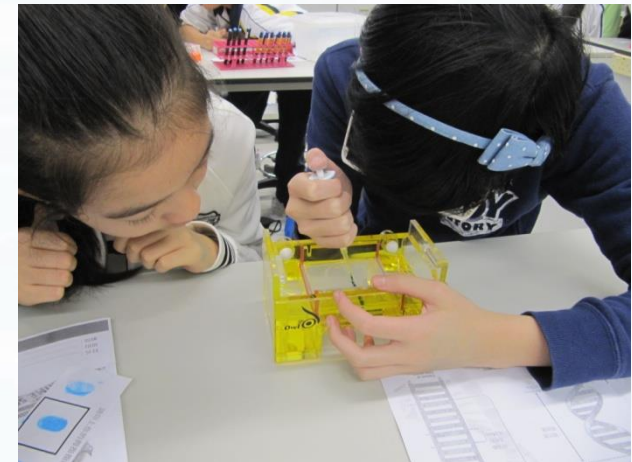
| Min. | | Max. |
|------------------|------------------|-------------------|
| 0 | 0 | 1 |
| 1 | 7 | 0 |
| 0 | 5 | 0 |
| 10 μL | 75 μL | 100 μL |

Pipet P200 (20-200 μL)

| Min. | | Max. |
|------------------|-------------------|-------------------|
| 0 | 1 | 2 |
| 2 | 2 | 0 |
| 0 | 5 | 0 |
| 20 μL | 125 μL | 200 μL |

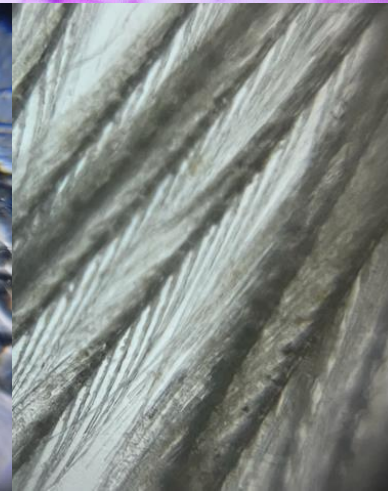
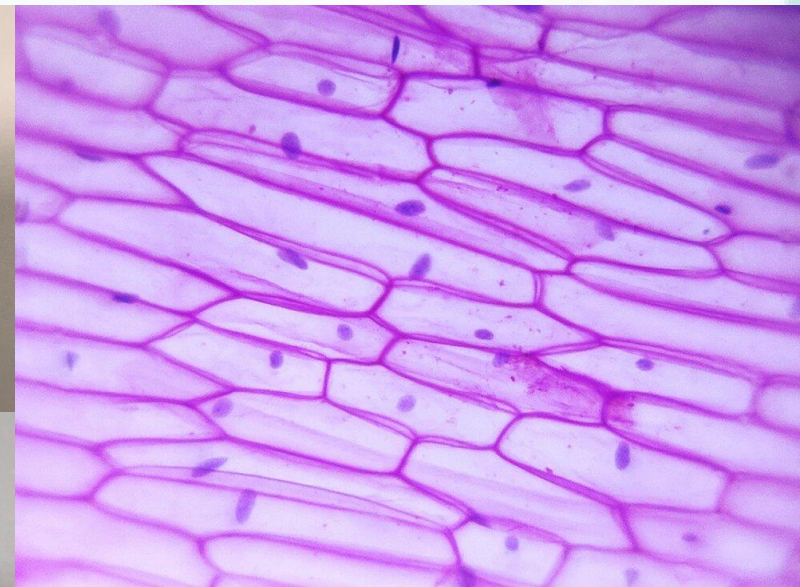
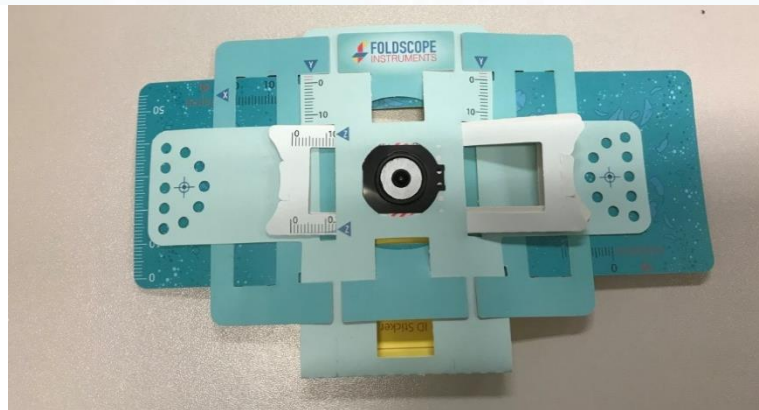
Pipet P1000 (100-2000 μL)

| Min. | | Max. |
|-------------------|-------------------|--------------------|
| 0 | 0 | 1 |
| 1 | 7 | 0 |
| 0 | 5 | 0 |
| 100 μL | 750 μL | 1000 μL |





Foldscope 顯微鏡



SCIENCE

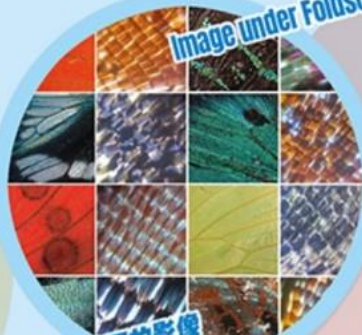
Science@Home Competition 2021 親子也科研比賽 2021

A Special Paper Microscope



用紙製的顯微鏡

Image under Foldscope



在顯微鏡下的影像

Assemble and Learn with Fun



動手做 動腦學

日期：2021年6月26日(六)
地點：香港太空館演講廳 語言：廣東話

專題講座
漫遊科學與科技的世界

齋色園 100 周年紀念

Hong Kong Student Forensic Science Competition 2021

全港學生鑑證科學大賽 2021

精彩花絮及比賽結果 Event Highlights & Competition Results





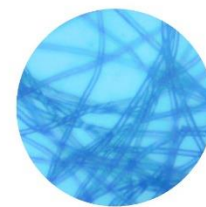
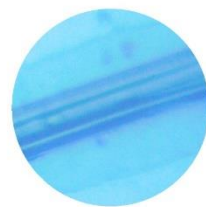
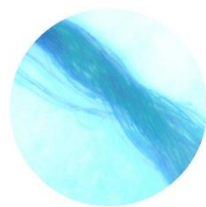
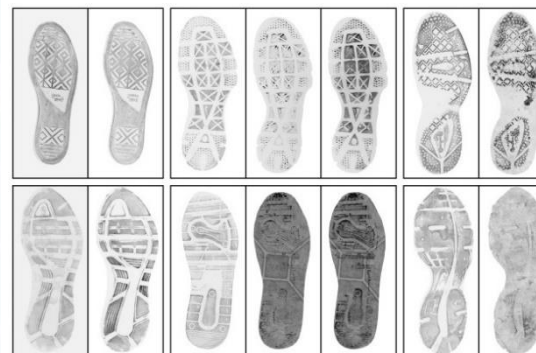
鑑證科學





鑑證的內容

- ① 衣物纖維鑑定
- ② DNA指紋分析
- ③ 指紋分析
- ④ 鞋印鑑定
- ⑤ 血型分析
- ⑥ 血濺分析



疑犯1
Suspect 1

疑犯2
Suspect 2

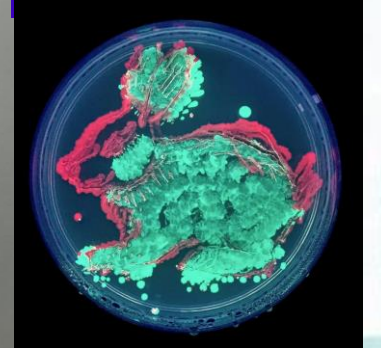
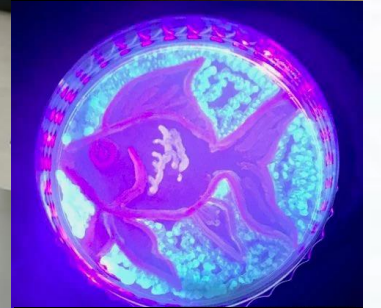
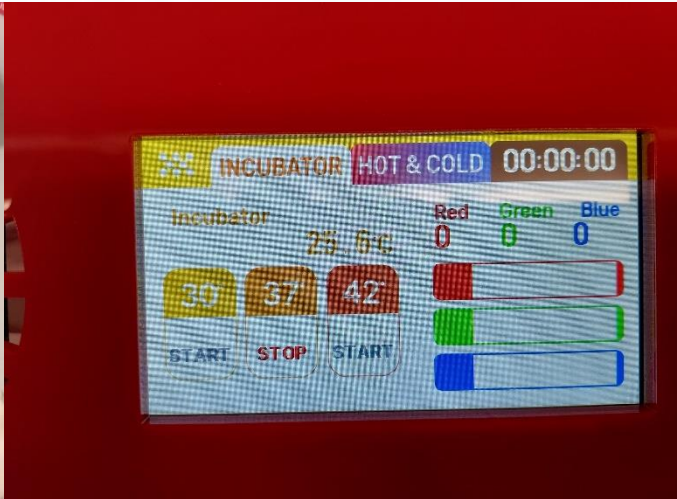
疑犯3
Suspect 3

疑犯4
Suspect 4





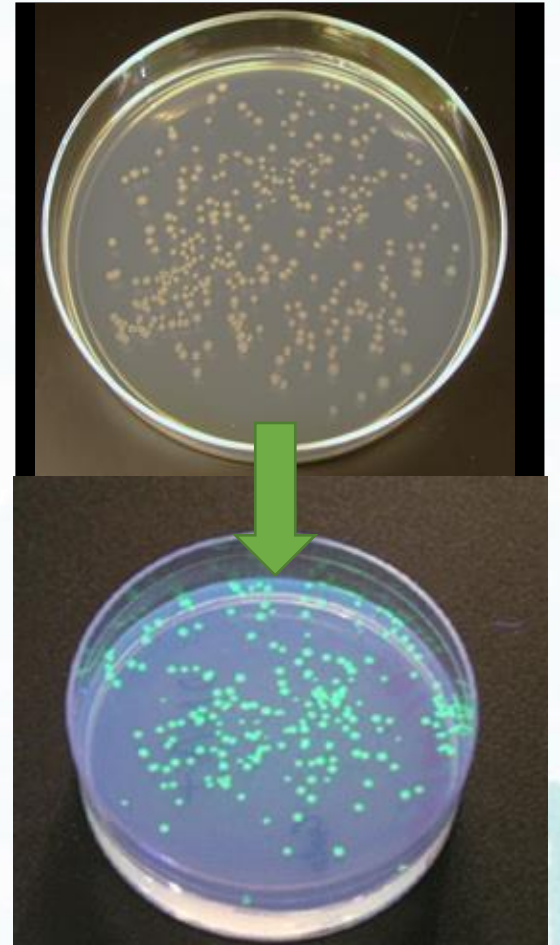
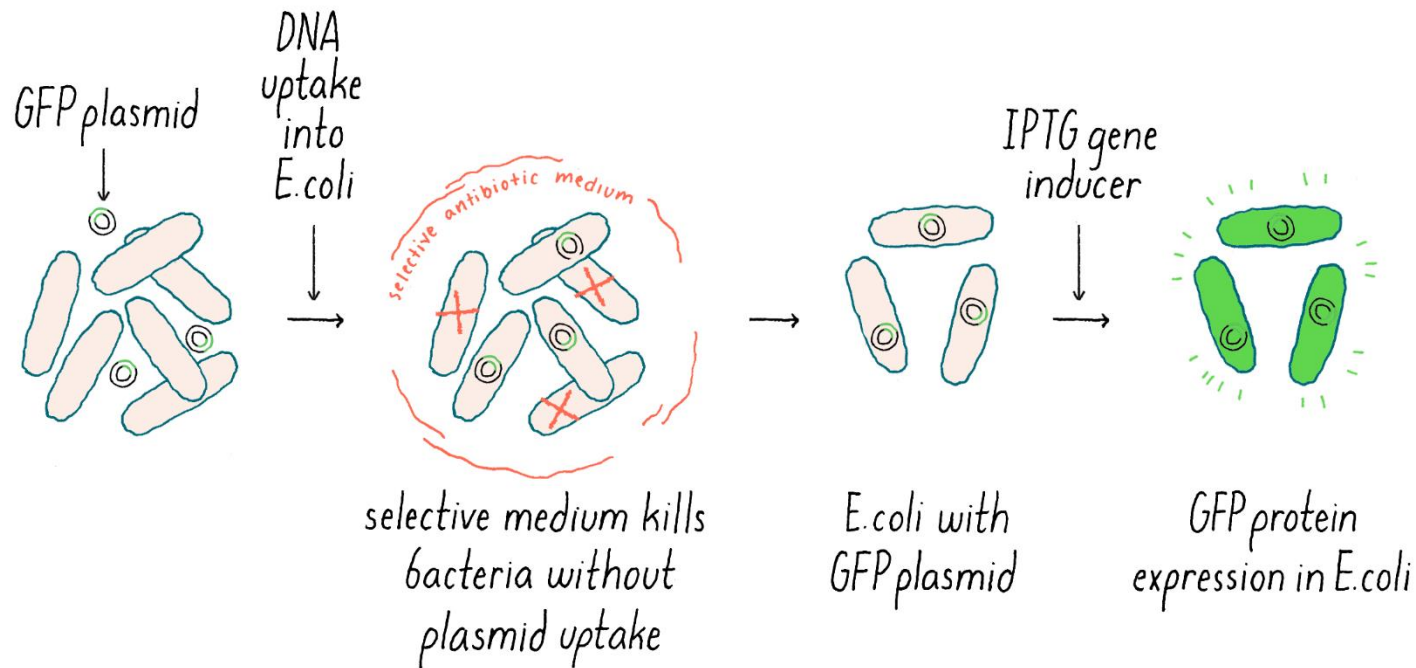
微生物彩繪





生物工程：轉化 (Transformation)

TRANSFORMATION AND EXPRESSION OF GFP IN BACTERIA



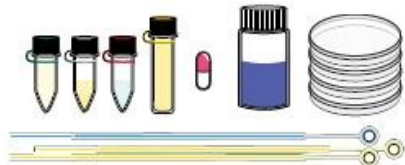
《中學實驗》



Pre-labs

Pre-lab(s)

Use the Virtual Bioengineer to prepare for the hands-on experience with theory and procedures (30 minutes)



Engineer-it Kit

Day 1

Create petri dishes, LB agar, streak blank bacteria and incubate (45 minutes)

Day 2

Make cells chemically competent & transform with DNA plasmid. Start recovery (45 minutes)

Day 3

Plate transformed cells and incubate (45 minutes)

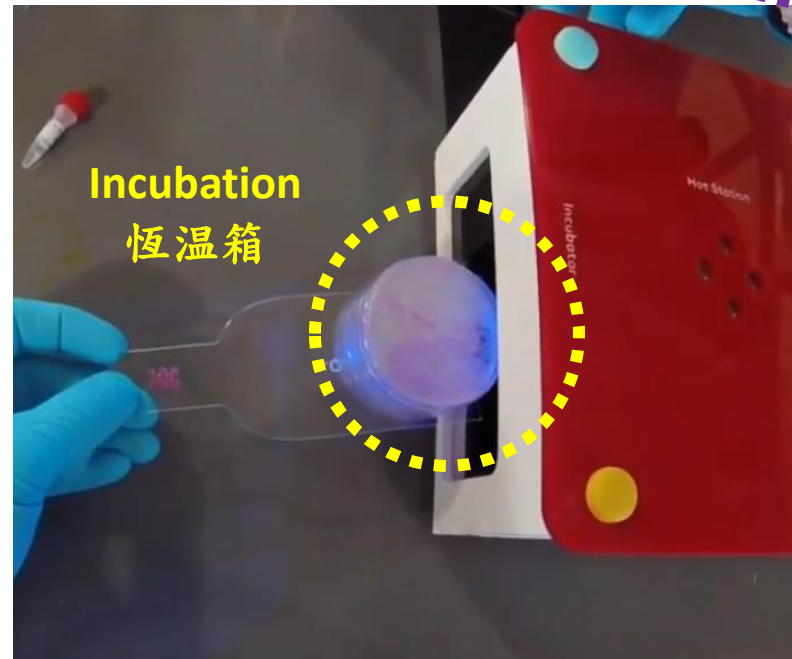
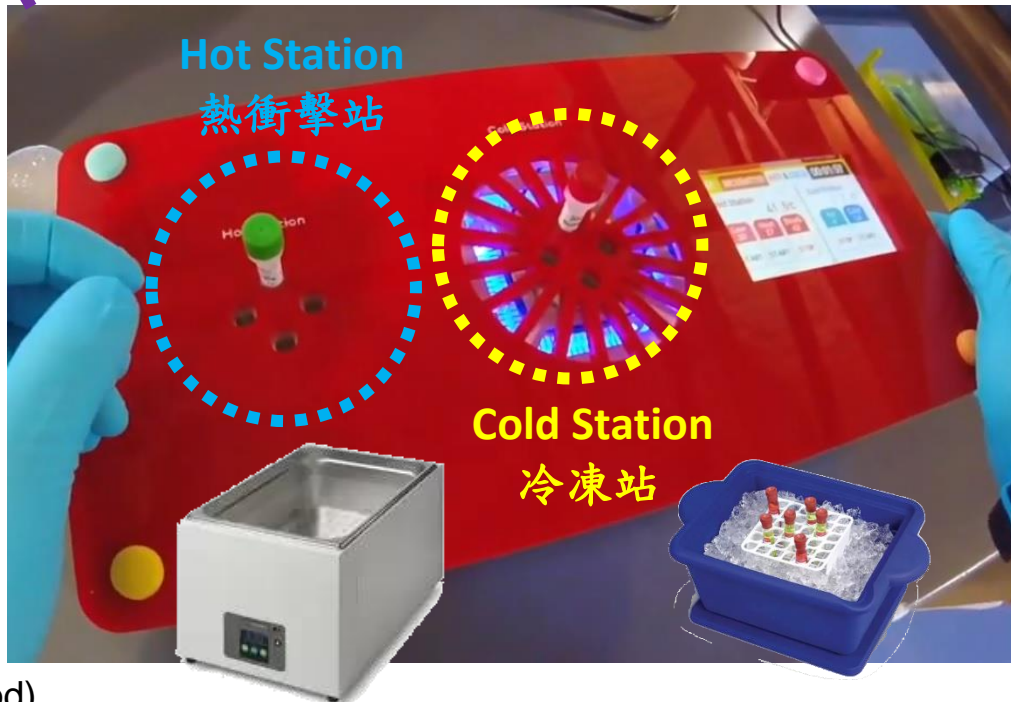
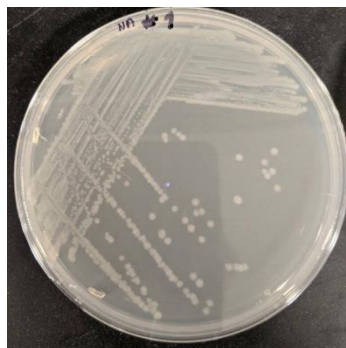
Day 4

View colonies and analyze results. (10-45 minutes)

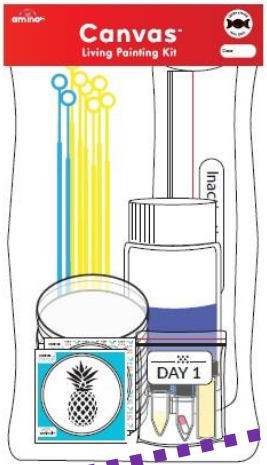
Incubation
12-24 hours

Recovery
12-24 hours

Incubation
24-48 hours



劃線法 (streak-plate method)



Canvas Kit

Day 1

Create painting palette(s)
 Each student group or individual makes LB agar plates with antibiotics (selective plates) and streaks each of the colored bacteria paints from the tubes included in the kit onto one of these selective plates. This amplifies the colorful bacteria so there is enough to paint with. Incubate it so that it becomes the painting palette. **(60 minutes)**

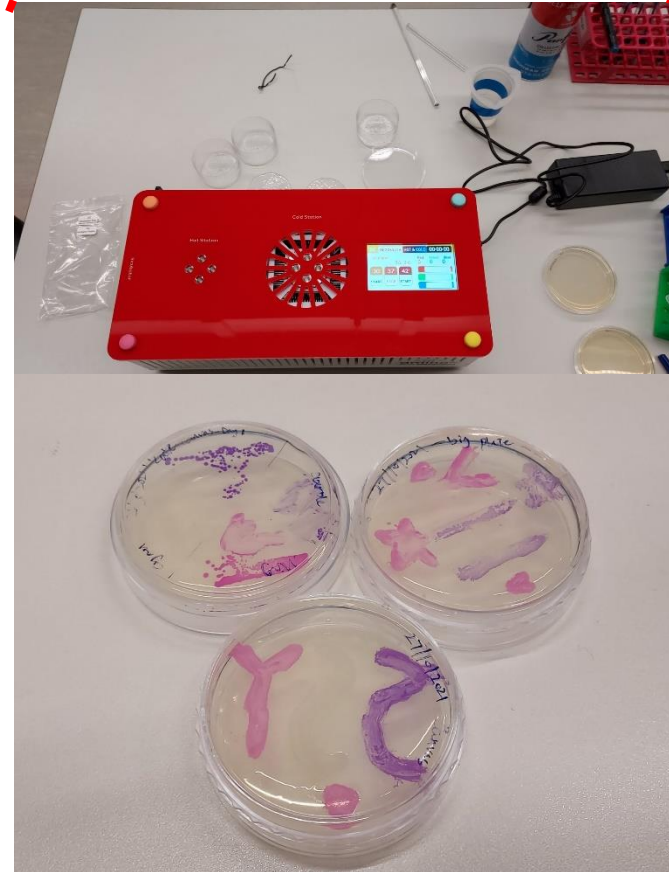
Day 2

Paint your bioart
 Each student or individual can use a blank stencil to draw their picture that will become the bioart. Set the stencil under the petri dish in order to trace it using the bacteria paintbrushes and the painting palette. Incubate the petri dish(es). **(30+ minutes)**

Day 3

See your bioart
 View the living art grow and change color over the next 24-72 hours. Use natural and UV light to see the different colors and photographs! **(10+ minutes)**

《中小學實驗》





Living art by Flowery Branch High School





Bio-Rad Laboratories
 @BioRadLaboratoriesCorp
 6.27萬位訂閱者

訂閱

首頁 影片 播放清單 社群 頻道 簡介



Introducing the QX600™ Droplet Digital™ PCR System
 觀看次數：22,016次 · 2個月前

This video showcases the QX600™ Droplet Digital™ PCR System which enables advanced six-color multiplexing, allowing clear discrimination of multiple targets. The QX600 System is designed for researchers who need to quantify multiple targets with high accuracy, reproducibility, and sensitivity.

Learn more about QX600™ Droplet Digital™ PCR System at ...

Digital PCR ▶ 全部播放

Bio-Rad's Droplet Digital PCR™ (ddPCR™) systems provide absolute quantification of target DNA or RNA molecules with EvaGreen or probe-based digital PCR assays without using a standard curve. ...



The MiniOne Electrophoresis
 @Theminionesystem
 83位訂閱者

訂閱

首頁 影片 SHORTS 播放清單 社群 頻道 簡介

最新上傳 熱門影片



How to Repack Your MiniOne Electrophoresis Carrying Case
 觀看次數：221次 · 1年前



New SpiniOne - MiniOne Mini Centrifuge
 觀看次數：161次 · 2年前



Students Trying the MiniOne System for the First Time!
 觀看次數：277次 · 2年前



How to Use the MiniOne PCR App for iPhone
 觀看次數：711次 · 3年前

Edvotek Inc.
 @EdvotekInc
 6220位訂閱者

訂閱

首頁 影片 直播 播放清單 社群 頻道 簡介



Welcome to the Edvotek Learning Center!
 觀看次數：1,354次 · 2年前

Edvotek was founded in 1987 as the first company focused on translating cutting-edge biotechnology for the teaching classroom. We work with educators all over the world to demystify science and foster the next generation of scientists through hands-on, active learning activities.

Our equipment is tough enough to stand up to daily use in the ...



熱門影片 ▶ 全部播放



Foldscope Instruments
 @FoldscopeInstruments
 8000位訂閱者

訂閱

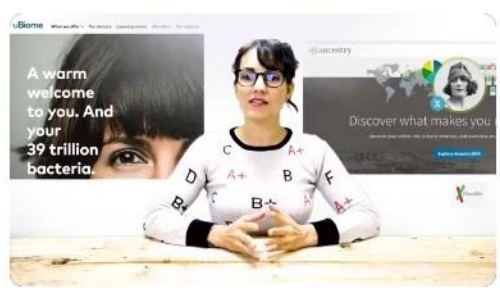
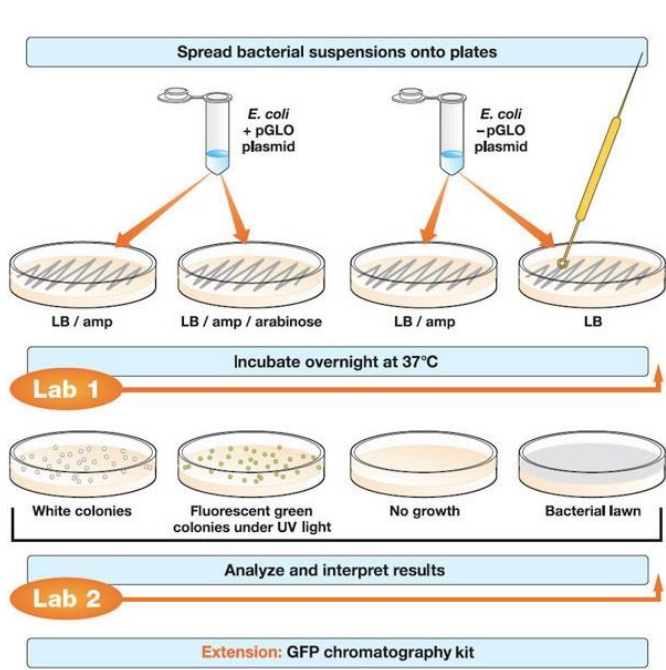
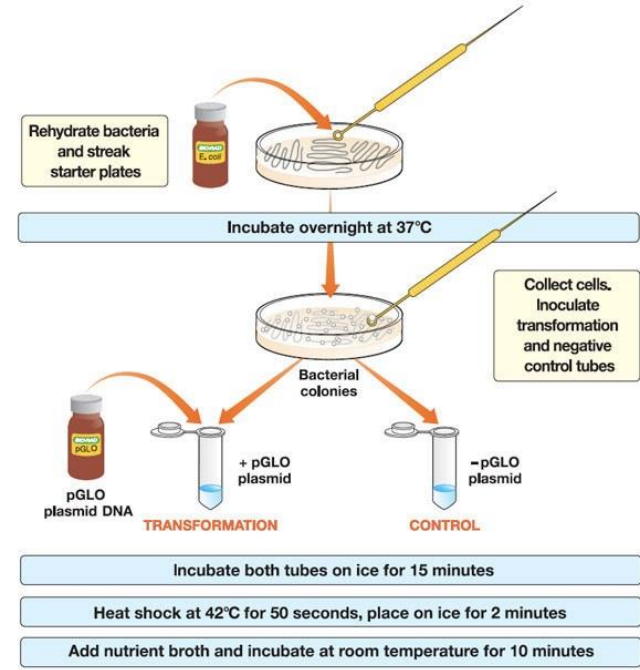
首頁 影片 SHORTS 直播 播放清單 社群 頻道 簡介



Introducing Foldscope: The Paper Microscope
 觀看次數：8,117次 · 2年前

Foldscope magnifies curiosity - the sense of wonder of the world all around us. From your kitchen sink to the water in the creek running in the backyard; from life forms bizarre and wild to the smallest bacteria crawling in your kitchen sink. See and experience science for yourself! All microscopy clips in the video are taken with a Foldscope.

...



Welcome to the Biorevolution

觀看次數：500次 · 4年前


Biology-as-a-Technology (BAAT) is the mindset where biology is not just a natural force, but rather a powerful technology platform. As genetic engineering and BAAT will become widespread over the coming decades, there is not better time to start learning about it than now. Become "bio-literate".

Tutorials ▶ 全部播放

- EXTRACTING DNA FROM A STRAWBERRY (6:54)
- Canvas Kit for living (1:16:44)
- The Engineer-it Kit for (1:40:49)
- Smell-it Kit experiment video: (39:34)
- How to make a DIY incubator (12:5...)

Virtual Bioengineer - Canvas Kit Edition


Remember that for any of the Virtual Bioengineer simulators, **you need to be using a desktop computer** as they are not optimized for touch devices like tablets and phones. Go full screen for the best experience!




Canvas Kit

1. Make LB Agar Plates
2. Grow Paint Palette
3. Incubate
4. Paint Living Canvas
5. Incubate


Materials




Sterile Water




LB Agar Powder




Microwave



Antibiotics



Nitrile Gloves




Petri dishes

Start Making LB Agar Plates

YouTube

DAY 1 ADD AGAR



2:13 / 13:00

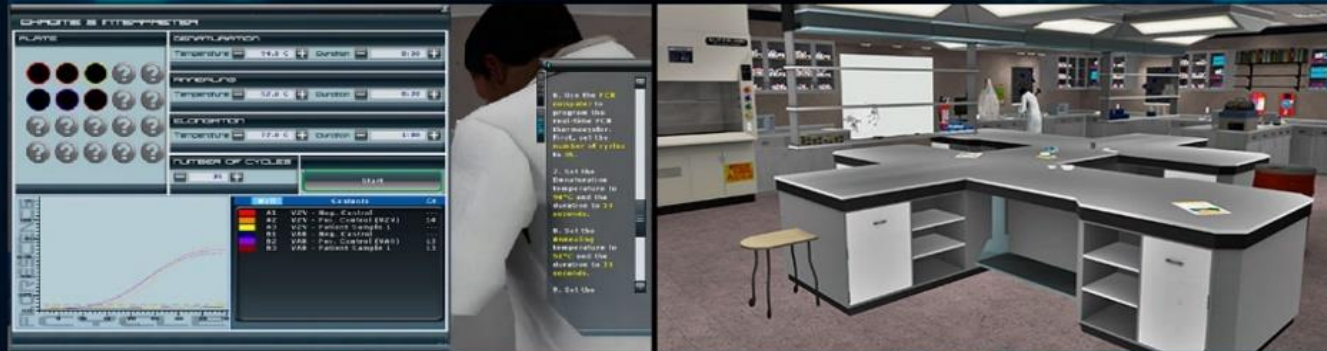
Zero to Genetic Engineering Hero: Create Living Paintings with Canvas Kits

Amino Labs 524 位訂閱者 訂閱

👍 12 🗨 不喜歡 ➦ 分享 📌 儲存 ...

這部首播影片的聊天室功能已停用。

MBT Mission Biotech



Free download. Hours and hours of engaging, immersive, 3D gameplay.

In response to the COVID-19 outbreak, we are making Mission Biotech FREE to the public. This fun, immersive game contains real-world laboratory work in the field of biotechnology, targeted for middle schoolers and above. Includes techniques used by real-world medical workers to test for the currently circulating coronavirus including DNA Extraction and PCR. Funded by NSF, this game encourages everyone to explore careers in biotechnology and work against the clock to identify the threat!

For PC/Windows only

PLAY FOR
FREE



UF UNIVERSITY of FLORIDA

Number of downloads: 1700

Download [Reference Materials](#)

Download [Gameplay Images](#)



Mission Biotech

User Guide



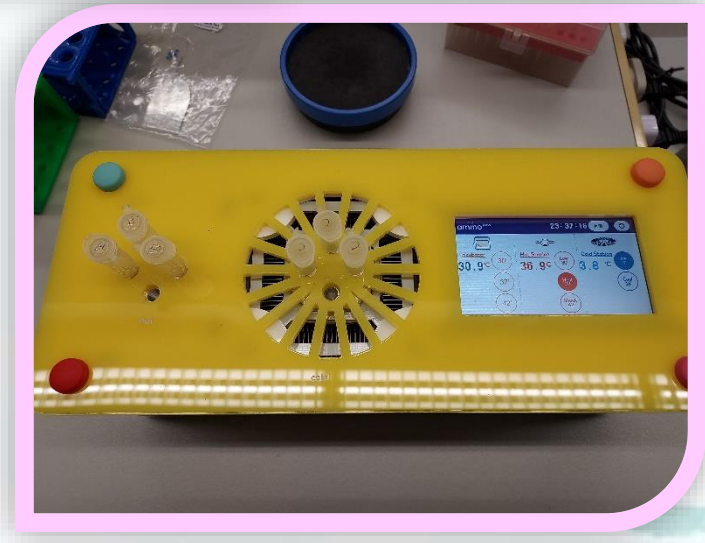
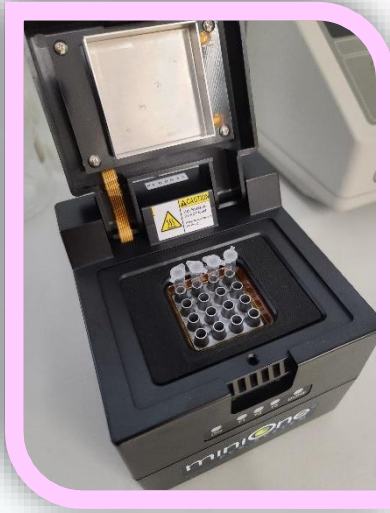
VIRTUALHEROES
A DIVISION OF APPLIED RESEARCH ASSOCIATES, INC.

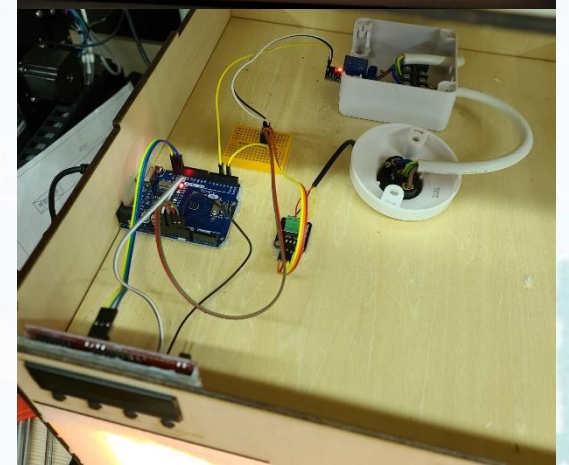
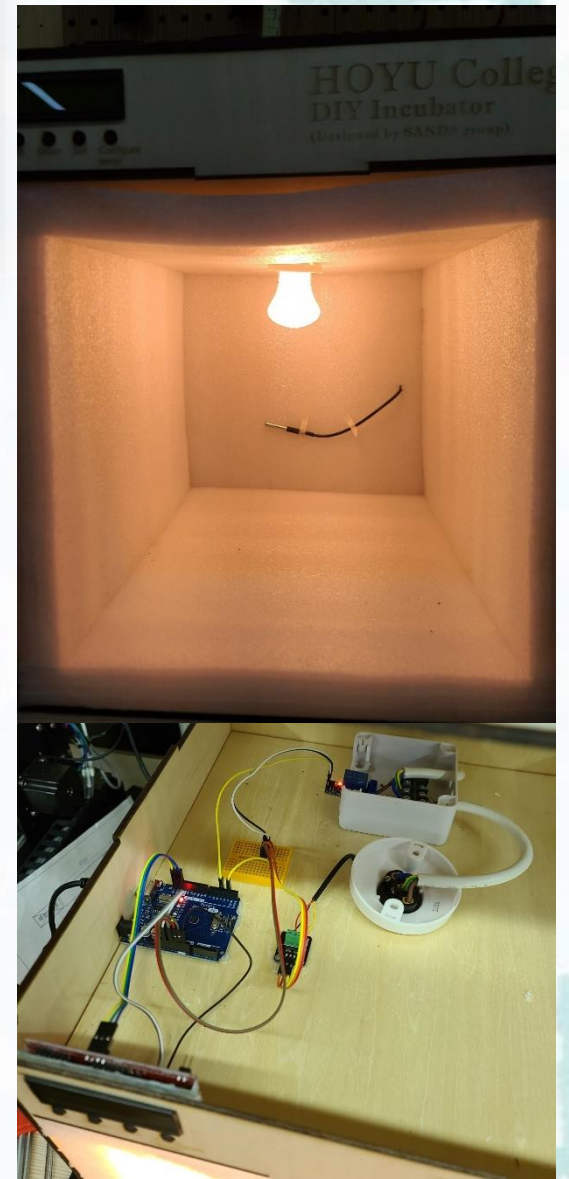
Table of Contents

| | |
|-------------------------------------------|-----------|
| 1. Overview | 4 |
| 1.1 Goals | 4 |
| 1.2 Mode of Play | 4 |
| 1.3 Features | 4 |
| 1.4 Platform | 4 |
| 1.5 Minimum System Requirements | 4 |
| 1.6 Recommended System Requirements | 5 |
| 2. Objective | 5 |
| 3. Launching the Game | 5 |
| 4. Mission Details | 5 |
| 4.1 Mission Progression | 5 |
| 4.2 Adventure Interactions | 6 |
| 4.3 Unlocks | 6 |
| 4.4 Tests | 6 |
| 5. Movement and Control | 6 |
| 6. Character Selection | 7 |
| 7. Badge Creation | 9 |
| 7.1 Name Character | 9 |
| 7.2 Choose Badge Style | 9 |
| 7.2.1 Rank | 9 |
| 7.2.2 Achievements | 9 |
| 8. User Interface | 10 |
| 8.1 User Interface Elements | 10 |
| 8.1.1 Cursor | 10 |
| 8.1.2 Inventory | 11 |
| 8.1.3 Active Item | 11 |
| 8.1.4 Character Badge | 12 |
| 8.1.5 Map | 12 |
| 8.1.6 Protocols Cheat Sheet | 12 |
| 8.2 Software Menus | 12 |
| 8.2.1 Main Screen | 12 |
| 8.2.2 Options Screen | 12 |



科技促進教育







教育局校本支援服務

優質教育基金主題網絡計劃—學校

透過校本科學及生物科技課程
推行 STEM 教育



嗇色園生物科技流動實驗室計劃

SIK SIK YUEN

Biotechnology Mobile Laboratory Program



聯絡



嗇色園主辦可譽中學暨可譽小學



2109 -1001



施瑪恩 smy@hoyu.edu.hk



問卷調查