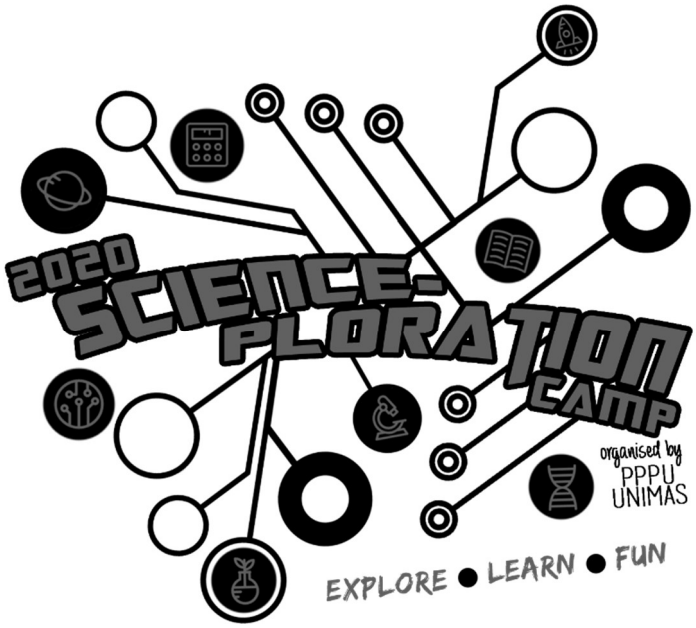

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Foreword

The Scienceploration Camp is an initiative of the Centre for Pre-University Studies, UNIMAS, aimed to increase the interest in science among secondary school students and SPM leavers. The camp has two main objectives; to inspire and nurture future generations of experts in science, technology, engineering and mathematics (STEM) area and to increase the visibility of the Centre for Pre-University Studies as one of the best option for post-secondary education.

The activities are designed to provide hands-on experiences to the participants, combining learning with fun-filled experiments.

It is hoped that the activities would deepen the participants' interest in science, particularly after they have completed their secondary school education and in preparation to embark onto their tertiary education.

Associate Professor Dr. Muna binti Sabri
Director
Centre for Pre-University Studies
UNIMAS

Note for Participants

The activities outlined for this Camp are to be carried out with close supervision from the experts, within the allocated venues. Engage your interests, ask questions, and relate what you have learned to your experiences.

Learning can be both fun and rewarding.

Contents

UNIMAS

Scienceploration Camp

Activity 1: Inspector Maggot

OBJECTIVES:

1. To observe the physical characteristics of maggots
2. To characterize different genus/species of flies

INTRODUCTION:

Maggots are often considered disgusting as their presence are associated with household waste or dead organic matter. Little do we know that they are doing us a big favour by decomposing our wastes. These maggots can be found feeding on decaying organic matter and are responsible for cycling nutrients back into the soil.

One of the well-known species is *Musca domestica*, or the common housefly, whose larvae can develop in a large range of decomposing organic matter, animal or plant. Another species, *Chrysomya megacephala,* is commonly called the oriental latrine fly because of its habit of breeding in faeces as well as on carrion and other decomposing organic matter. It may also become a nuisance in slaughterhouses and open-air meat and fish markets.

Maggots feed on decaying matter for several days before moving away from the food source and pupating. During the pupal stage, the insect does not feed. The entire length of this life cycle depends on the ambient temperature. House flies progress from egg to adult much more quickly in warmer temperatures than they do when exposed to colder temperatures.

This knowledge can be applied in various field such as agriculture and forensic. In animal husbandry, some of the fly species can cause myiasis in livestock, which also carry diseases and parasites. In criminal cases involving decomposed bodies, the maggot or its pupa can be used to determine the time and location of death.

APPARATUS:

1. forceps
2. petri dish
3. stereo microscope
4. pin
5. gloves

MATERIALS:

- ethanol
- maggot

METHOD:

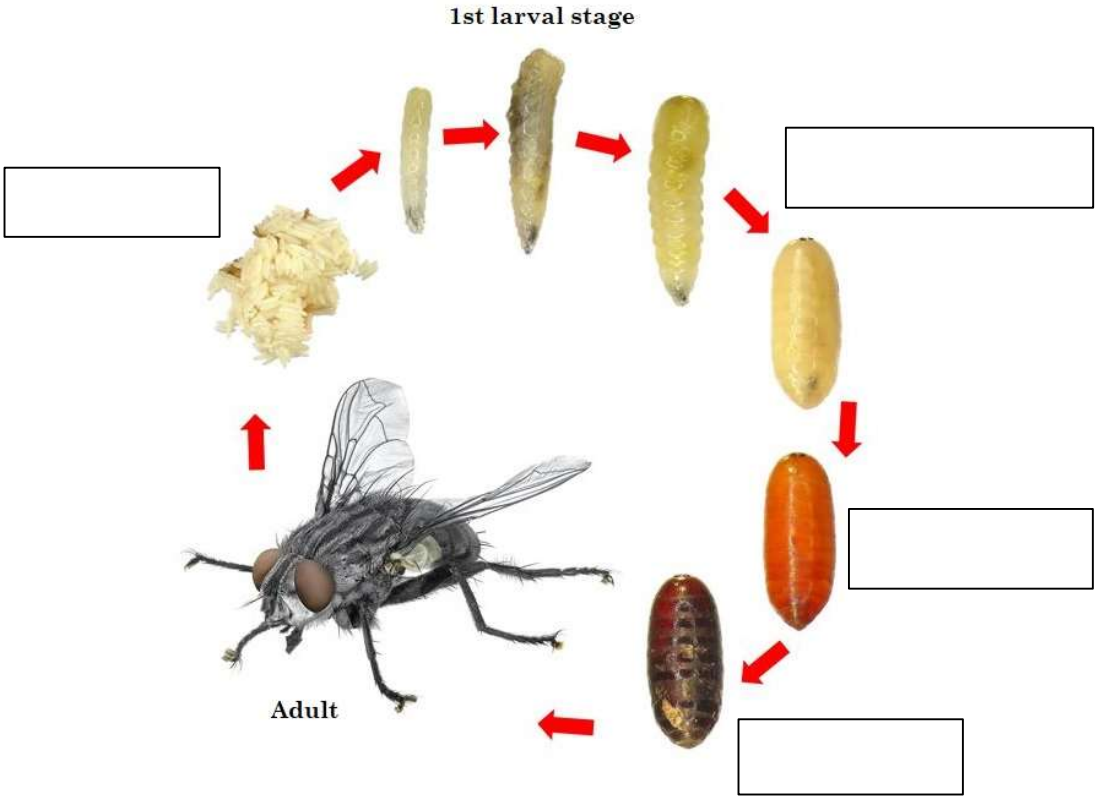
1. Put on a pair of gloves, choose a maggot by using a pair of forceps and place it in a petri dish.
2. Carefully observe the physical characteristic under a stereo microscope.
3. Using the identification diagram provided, observe the following characteristics; body texture, peritreme, spiracle slits and posterior spiracles cavity.
4. Determine the genus or species of the maggots based on your observation.
5. Record your observations.

RESULTS:

Genus / Species	Characteristics

DISCUSSION:

1. Complete the life cycle of a house fly in the diagram below.



(Source: https://www.carolina.com)

2. What type of metamorphosis have you learned today?

3. Which scientific application listed below is related to this activity?

   a. Human genetics ☐
   b. Oncology ☐
   c. Forensic entomology ☐
   d. Maggot therapy ☐

REFERENCES:

- *https://shire.science.uq.edu.au/bb/parasitology/maggots/maggot.html*
- *https://www.carolina.com*

Activity 2: ElectroKeyMystery

OBJECTIVES:

1. To observe a redox reaction in an electroplating process.
2. To electroplate a key using copper.

INTRODUCTION:

Electrochemistry is a process in which very thin layers of a selected metal are bonded to the surface of another metal at a molecular level. The process involves the use of an electrolytic cell, a device that uses electricity to deliver molecules to a particular location. Electroplating is one of the applications of electrolytic cells in which a thin layer of metal is deposited onto an electrically conductive surface. In this experiment, copper(II) ions, Cu^{2+} from the electrolyte will be attracted to the key carrying the negative charge. When the Cu^{2+} ions reach the key, they are reduced to form solid copper, Cu. The Cu^{2+} ions removed from the electrolyte are replenished by the copper plate when it undergoes oxidation at the positive terminal.

APPARATUS:

1. Beaker
2. Glass rod
3. Copper strip
4. Power source
5. Key
6. Alligator clip
7. Measuring cylinder

MATERIALS:

1. 1.0 M Copper Nitrate solution

METHOD:

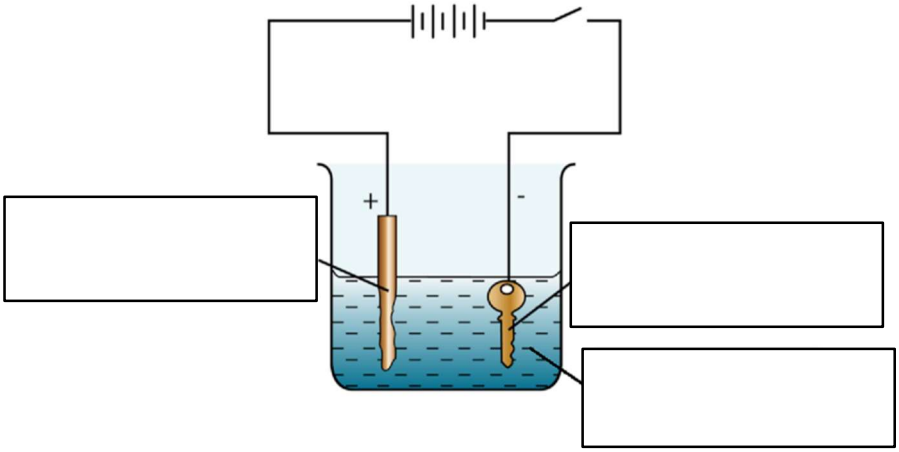
1. Pour copper nitrate solution into a beaker using a measuring cylinder.
2. Use a red alligator clip to attach the copper strip to the positive terminal of the power source and the black alligator clip to attach the key to the negative terminal.
3. Partially suspend the key in the solution by wrapping the wire lead loosely around a glass rod and placing it across the mouth of the beaker. The alligator clip should not touch the solution.
4. Place the copper strip into the solution, making sure it does not touch the key and the alligator clip does not touch the solution. An electrical circuit has now been completed and a current is flowing.
5. Leave the circuit for 15 minutes.
6. Turn off the power source and take out the key from beaker.
7. Wipe the key using tissue and let it dry.
8. Record your observation in the table provided.

RESULTS:

	Observation
Key	
Copper strip	
Colour of electrolyte	

DISCUSSION:

1. Label the diagram below



2. Write the half equations that occur at the anode and cathode.

Anode:	
Cathode:	

3. State the reactions that occur at the anode and cathode.

Anode:	
Cathode:	

4. Which of the following is the most important benefit of electroplating a key?
   A. Low cost
   B. Strengthen the key
   C. Making the key shinier
   D. Increasing the key's corrosion resistance

REFERENCES:

- Silberberg, M 2013, Chemistry The Molecular Nature of Matter and Change, McGraw-Hill Companies, New York
- Mark Miodownik, M (2015) 'Stainless steel revolutionised eating after centuries of a bad taste in the mouth', *The Guardian*, 29 April

Activity 3: Sweet Salty Rainbow

OBJECTIVES:

1. To observe the relationship between temperature and the density of water.
2. To observe the difference in densities of sugar and salt solutions.
3. To identify the factors that cause the difference in densities of various solutions.

INTRODUCTION:

One of the physical characteristics of a substance is density. Density is the mass of any material per unit volume. The density of liquid water is approximately 1000 kg m^{-3}. In liquid state, the particles in liquid vibrate, rotate and move in randomly with respect to each other. The distance between particles in liquids is similar to the distances in solids, and so liquids have definite volumes. However, the shape of a liquid changes depending on the shape of its container. Different type of liquids has their own characteristic density which determine the liquid ability to float on or sink in another liquid. As the temperature of liquid increases, the particles gain kinetic energy thus causes them to vibrate and move faster.

APPARATUS:

1. Beaker
2. Pipette
3. Jar
4. Aluminium foil

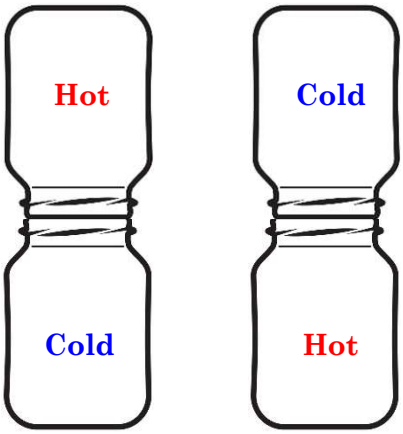
MATERIALS:

1. Salt water
2. Sugar water
3. Artificial colours

METHOD:

Part 1:

1. Fill two jars with hot and cold water, separately.
2. Using a pipette, put several drops of blue artificial colour in the cold water and red artificial colour in the hot water.
3. Cover one of the jar with an aluminium foil.
4. Turn the hot water jar upside down and place it on top of the cold water jar.
5. Carefully take off the aluminium foil and observe any change.
6. Repeat step 4 with the hot water jar at the bottom.



Expected Results: _____

Part 2:

1. Add several drops of sugar solution into a test tube using a pipette.
2. Slowly add several drops of salt solution into the same test tube using a pipette.
3. Observe the sugar and salt solutions mixture.

Expected Result: _____

Part 3:

1. Add several drops of green solution into a test tube using a pipette.
2. Slowly add several drops of red solution, followed by blue solution and yellow solution, using a pipette.
3. Observe any changes.

Expected Result: _____

RESULTS:

Part 1:

1. Are the layers maintained with the cold water jar at the bottom?

   ☐ Yes ☐ No

2. Are the layers maintained with the hot water jar at the bottom?

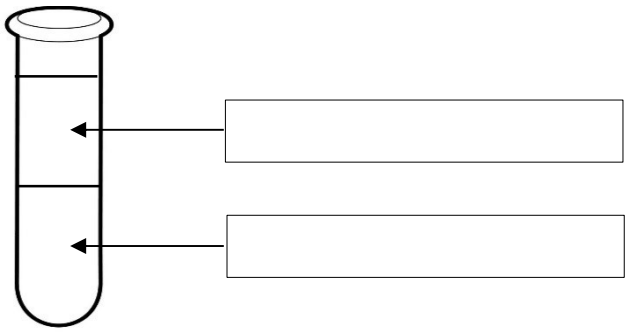
   ☐ Yes ☐ No

Part 2:

1. Are the layers maintained once the solutions are added?

   ☐ Yes ☐ No

2. If yes, based on your observation, which solutions appeared at the top and at the bottom of the test tube?



3. If no, what is the colour observed in the test tube?

   _____

Part 3:

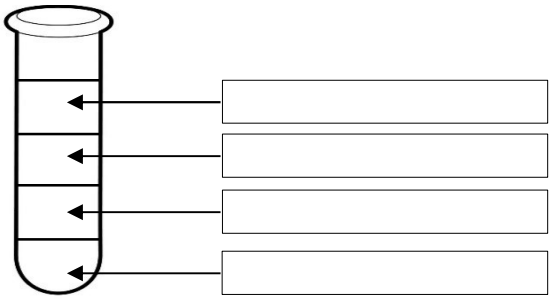
1. Did the four solutions mix completely?

   ☐ Yes ☐ No

2. If yes, what happened to the four solutions?

   _____

3. If no, label the layers according to the options provided.



10 g Sugar	**10 g Salt**
1 g Sugar	**1 g Salt**

DISCUSSION:

Part 1:

1. Based on your observation, which water is denser?

   ☐ Cold Water ☐ Hot Water

2. What would happen if you leave the jars with the hot water at the top for 1 hour?

   ☐ Remain in layers ☐ Layers mix

Part 2:

1. Based on your observation, which solution is denser?

   ☐ Sugar solution ☐ Salt solution

   Explain your answer: _____

Part 3:

1. What do you think is the factor that causes the observations in Part 3.

   ☐ Material of solutions

   ☐ Concentration of the solutions

   ☐ Weight of the solutions

   ☐ Colour of the solutions

2. Explain your results in Part 3.

   _____

Activity 4: Equatorial Sundial

OBJECTIVES:

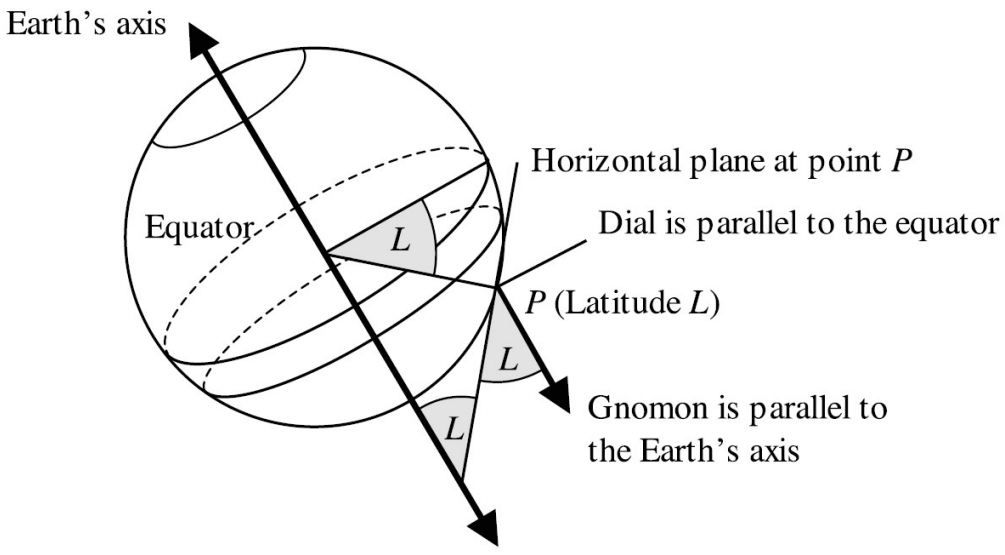
1. Construct an equatorial sundial.
2. Apply mathematical concept in constructing an equatorial sundial.
3. Appreciate the Earth's rotation in the application of a sundial.

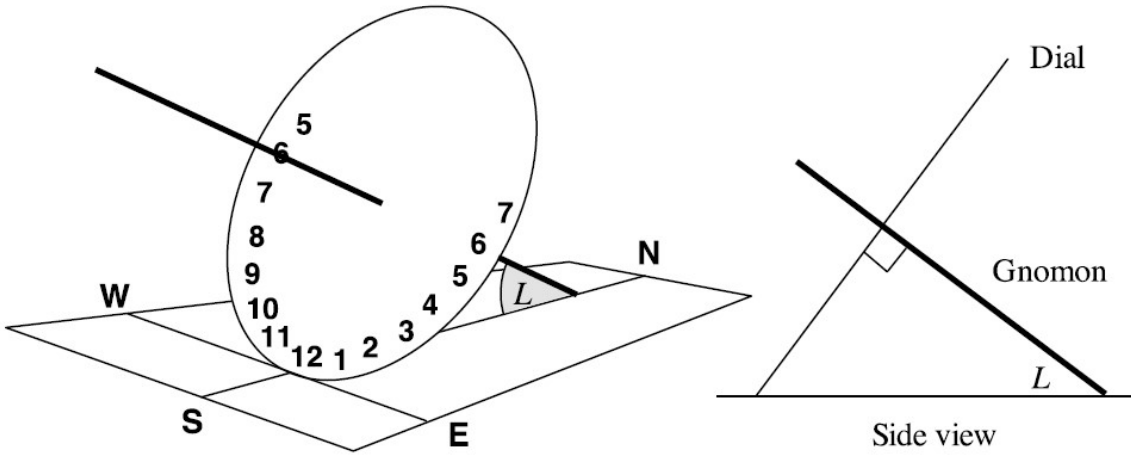
INTRODUCTION:

A sundial is a device that tells the time of the day when there is sunlight by the apparent position of the Sun in the sky. Generally, it consists of a flat plate (the dial) and a gnomon, which casts a shadow onto the dial. As the Sun moves across the sky, the shadow aligns with different hour-lines, which are marked on the dial to indicate the time of the day.

The Earth's axis is tilted at an angle of 23.5° to the plane of its orbit around the Sun. As the Earth rotates on its axis, the shadow of a vertical stick at the pole would form a circle on the surface of the Earth parallel to the equator. If the circle is divided into 24 equal hour marks, the position of the shadow around the circle would give the time. Sundials based on this principle are called equatorial sundials.

For an equatorial sundial, the gnomon must be parallel to the Earth's axis. The diagram shows why the angle that the gnomon makes with the horizontal is equal to the latitude. The dial with the hour marks must be perpendicular to the gnomon. In the southern hemisphere the gnomon will point to the south celestial pole (in the northern hemisphere, it points towards the pole star).



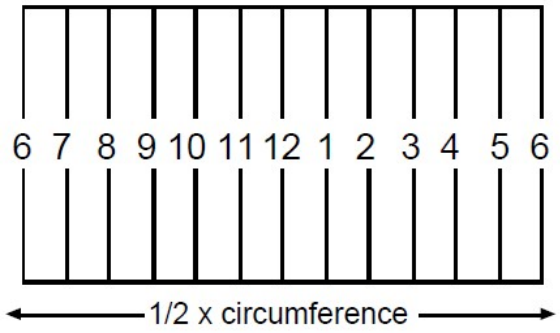


APPARATUS:

1. Drinking bottle
2. Wire coat hanger
3. Plain paper
4. Ruler
5. Tape
6. Protractor
7. Compass

METHOD:

1. Measure the circumference of the bottle.
2. Mark out a piece of paper as shown below with equal spacing between the hour lines.



3. Make a hole in the bottom of the bottle (and in the top if necessary) with a hot piece of wire the same diameter as the wire coat hanger.
4. Stick this piece of paper inside or outside the bottle.
5. Straighten out the coat hanger and insert it through the holes at the top and bottom of the bottle. The piece inside the bottle is now called the gnomon.
6. Bend the wire so that the gnomon is inclined at an angle equal to the latitude of your place.
7. Place the sundial so that the gnomon lies in the north – south direction. The shadow of the gnomon will fall on the hour lines to show the local solar time.

RESULTS:

Category	Observation
Circumference of the bottle	
Your location's latitude	
Your location's longitude	
Equatorial sundial time	
Actual clock time	

DISCUSSION:

1. Is there a difference from equatorial sundial time with the actual clock time?

   ☐ Yes ☐ No

2. If you want to use the same sundial to read time at Venice, what modification that you should make?

   ☐ Use a different kind of bottle

   ☐ Adjust the angle to Venice's latitude

   ☐ Place the sundial on an east – west direction

REFERENCES:

- Vincent, J. (2008). The mathematics of sundials. *Australian Senior Mathematics Journal*, 22(1), 13-23.
- https://www.stem.org.uk/resources/elibrary/resource/34709/sundials

Activity 5: AR Battleship

OBJECTIVES:

1. Develop an understanding on how computers perform search algorithm.
2. Work in a group to solve practical problems related to ICT.
3. Appreciate the practicality of technology in IR 4.0.

INTRODUCTION:

Digital devices like computers, smartphones and many more are often required to find information in large collections of data. The set of instructions to complete a task such as this, is called algorithm. Over the years, various algorithm has been created so that computers may perform tasks faster. In this activity, participants will be able to experience how the digital devices of today perform distinct search algorithm within their storage, by playing a battleship game modernized with augmented reality.

APPARATUS:

1. Android phone
2. Battleship cards

MATERIALS:

1. Sweets

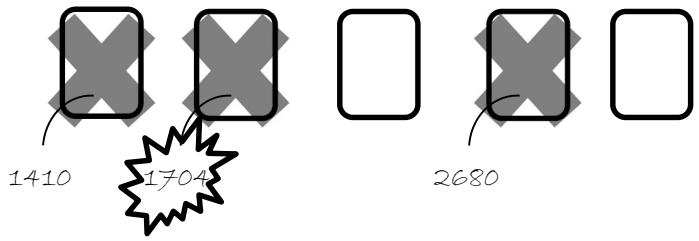
METHOD:

1. Divide yourselves into four groups. The activity will be played as a match between two groups. There will be two matches that will be conducted.
2. Each group will take equal amount of battleship cards and sweets.
3. Arrange the cards in ascending order according to the numbers without revealing it to the opposing groups.
4. Select a number as your group's battleship from the cards.
5. Announce to the opposing group your battleship number.
6. In the first match, group's turn will be decided with a coin toss.
7. Take turn to select a card from opposing group by guess and scan it to reveal its hidden number. Remember, the cards are arranged in an ascending order. One sweet is used for each turn taken in the match.
8. The match ends when either team's battleship is located and destroyed. The remaining number of sweets will be the winning group rewards.
9. In the second match, the cards will be arranged in columns, where the column number is obtained by adding all the numbers of a card, for example the card with the number 2345 will be 2+3+4+5 = 14 and be put in column number 4, following the last digit of the sum of the numbers.
10. After arrangement is made, decide the turn again with coin toss, then begin the match following the rules done in previous match. The remaining number of sweets will be rewarded to the winning group.

RESULTS:

Draw a rectangle representing the opposing team cards. Cross the rectangle and jot down the number when the card is destroyed. Draw an explosion mark when opposing team's battleship is located successfully.

Example:



Your space:

DISCUSSION:

Answer the following question by selecting the right answer.

1. In the first game, what is the name of search algorithm used?

☐ Linear search ☐ Binary search ☐ Hashing search

2. In the second game, what is the name of search algorithm used?

☐ Linear search ☐ Binary search ☐ Hashing search

3. For a linear search, what would be the minimum and maximum numbers of sweet used?

Minimum : _____
Maximum : _____

REFERENCE:

- Bell, T., Witten, I.H., Fellows, M. (2015) *CS Unplugged*. 2015 Computer Science Unplugged (csunplugged.org), licensed under creative commons.

Activity 6: MedicZania

OBJECTIVES:

1. To perform basic CardioPulmonary Resuscitation (CPR).
2. To observe on the process on how to save life or critically ill patient.
3. To experience Medic ambulance ride.
4. To describe normal and diseased lung.
5. To perform Carbon Monoxide Smokerlyser test.
6. To practice personal hygiene in surgical gowning.

INTRODUCTION:

MedicZania is an immersive career role-play as a Healthcare provider (doctor, assistant medical officer and staff nurse).

APPARATUS:

1. CPR Manikin
2. Ambulance
3. Lung anatomy model
4. Bronchopneumonia pot specimen
5. CO smokerlyser
6. Surgical gown

MATERIALS:

1. CO mouthpiece
2. Gloves
3. Mask
4. Face shields
5. Hand sanitiser

METHOD:

1. CardioPulmonary Resuscitation:
    a. The students will have briefed on how to save life or critically ill patient.
    b. They will be briefed and shown on the steps on how to perform CPR.
    c. The students perform CPR using the CPR manikin.
2. Medic Ambulance Ride
    a. The students are briefed on the equipment and procedures available in an ambulance service.
    b. They will experience a short ambulance ride within UNIMAS campus.
3. Lung anatomy and pathology
    a. Students are given a short instruction and scenario about the lung.
    b. They will assemble the lung anatomy model and observe the lungh with bronchopneumonia.
    c. Students will perform CO smokerlyser test to and measure their own CO content.
4. Surgical gowning
    a. Students will be briefed on the importance of hygiene when doing a surgery.
    b. Students are shown the steps of surgical gowning
    c. Student will perform surgical gowning.

RESULTS:

CO content: 

DISCUSSION:

1. List the steps for CPR.

2. Describe the ambulance service.

3. Describe the normal and diseased lung.

4. State the significance of CO content.

5. Describe the importance of surgical gowning.

6. State the significance of surgical gowning.

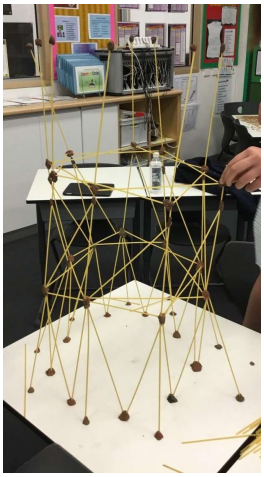
Activity 7: Spaghetti Tower

OBJECTIVES:

1. Discover basic principles of design and engineering by working together to build a tall and stable tower.
2. Discover strategies that enhance group participation.

INTRODUCTION:

Each group is given a task to build a tower model using only uncooked spaghetti and plasticine within 10 minutes. The group that gets to build the tallest and most stable tower model will win. Below is an example of a spaghetti tower model:



Example of a tower model

Source: (S.T.E.M Activity - Spaghetti Structures | Tintern Aspectus, 2017)

APPARATUS:

- A measuring tape
- A scissor
- A stopwatch

MATERIALS:

- 10 uncooked spaghetti sticks
- Plasticine

Use the provided materials **ONLY.**

METHOD:

1. 10 uncooked spaghetti sticks and plasticine are given to each group.
2. Cut the spaghetti sticks into desired length using the provided scissor.
3. Bind the spaghetti sticks using given plasticine to build a tower model in 10 minutes.
4. The design of tower model depends on the group's creativity and understanding in designing a structure using engineering knowledge.
5. The height of tower model from each group is measured using measuring tape.
6. The stability of tower model is observed.

RESULTS:

The spaghetti tower model should be freestanding on a plate surface, tall and stable. The tower model should not collapse within a few minutes after it is completed. Marks given will depend on the height and stability of tower model. The design of tower model will also be judged.

DISCUSSION:

Participants will briefly explain the design of their spaghetti tower model and relate it to basic engineering principles.

REFERENCE:

- S.T.E.M Activity - Spaghetti Structures | Tintern Aspectus. (2017, September 12). Retrieved from https://newsletter.tintern.vic.edu.au/article/s-t-e-m-activity-spaghetti-structures/

Activity 8: Chemical Unit Operations

OBJECTIVES:

1. To introduce equipment commonly used in chemical engineering industries.
2. To demonstrate the operations of lab-scale equipment.
3. To operate some of the equipment.

INTRODUCTION:

Chemical unit operations are technologies used in the industry to convert a raw material into valuable products. Students will be shown lab-scale equipment available in the Chemical Engineering laboratories and some of the faculty's undergraduate students will demonstrate the operations of these equipment. Students will also be allowed to operate some parts of the machines to experience the working processes in the industry.

APPARATUS:

- Multi-effects evaporator
- Distillation column
- Absorption column
- Sedimentation tank
- Membrane separation

MATERIALS:

- Syrup
- Methanol
- Compressed air
- Wastewater
- Salt

METHOD:

1. Students will be shown all equipment with their applications explained.
2. A lab facilitator will demonstrate the operation of a selected equipment.
3. Students will be guided to handle some part of the machine by a lab facilitator.
4. Students will be given a short quiz to determine their understanding of the technologies.

RESULTS:

1. State your observation on the changes in the fluid from one evaporator to another.

   _____

   _____

   _____

2. State your observation on the changes in the fluid from the inlet to the outlet of the distillation column.

   _____

   _____

   _____

3. State your observation on the changes in the fluid from the inlet to the outlet of the absorption column.

_____

_____

_____

4. State your observation on the changes in the fluid from one sedimentation tank to another.

_____

_____

_____

5. State your observation on the changes in the fluid from the inlet to the outlet of the membrane separation column.

_____

_____

_____

DISCUSSION:

1. Name one equipment that you have learned and state one of its applications.

_____

_____

_____

2. Was there any problem during your experiment? What happened and what will happen if the problem persists?

_____

_____

_____

REFERENCE:

- Don W. Green and Robert H. Perry (2008). Perry's Chemical Engineer's Handbook, 8th Ed. McGraw-hill, New York.

Activity 9: Introduction to Robotics

OBJECTIVE(S):

1. Understand the robotics mechanism and concept
2. Assemble the robot using LEGO teaching set
3. Apply the robotics control for selected case studies

INTRODUCTION:

This activity will introduce the students to the basic mechanism and concept of robotics. Besides discussing the theory of robotics, the students will have an opportunity to use the robot for selected case studies. In this activity, LEGO robot teaching set will be used as the platform for teaching and learning. Students will be divided into several groups to encourage the communication between them in order to solve the problem.

APPARATUS:

- LEGO robot teaching set
- Line tracking set

METHOD:

1. Interactive lecture will be given to the students using power point and selected video in order to give them basic understanding about robotics.
2. Students will be divided into several groups. Each group will be given one set of LEGO robot teaching set. Students need to follow the step by step manual instruction in order to assemble the robot. Each group will have their own robot.
3. Students need to apply the step by step control using graphical user interface software provided by LEGO. The control system (software) will help the student to navigate (move around) the robot.
4. Line tracking set will be given to the students in order to test their own control.
5. Other selected activities such as 'robot sumo' will be given upon completion the line tracking activity.

RESULTS:

1. State the main reason for human to apply the robot in their daily life.

   _____

   _____

   _____

2. State the components that enable the robot to move and sense the environment around them.

   _____

   _____

   _____

3. State the importance of control system for the robot.

   _____

   _____

   _____

DISCUSSION:

1. Name one type of sensor and discuss the role of the sensor in your robot.

   _____

   _____

   _____

2. Was there any difficulties to control the sensor during the line tracking activity? What was happened and how your group solved the problem?

   _____

   _____

   _____

REFERENCE:

- Saeed B. Niku, "Introduction to Robotics, Analysis, System and Applications," Prentice Hall, 2010

Activity 10: Murder Mystery Investigation

OBJECTIVES:

1. To encourage students' reasoning and creative thinking skills.
2. To engage students' participation in hands-on inquiry and lessons application.

INTRODUCTION:

Your role as Inspector Morse is to investigate a murder mystery at local beauty health spa. You and your team of police were called to a crime scene.

As you and your team arrived at the crime scene;

The murdered guest was found lying on the floor in one of the rooms. Your team began to search thoroughly for clues at the spa, and they found five (5) important clues as written down by the witnesses. The clues were then delivered to you to further decipher along with the list of guests and staff present at the crime scene when the murder was committed.

A total of thirty-two (32) individual were suspected in this case. Each clue will eliminate half of the total number of suspects. When all clues have been solved, the identity of the murderer will be revealed.

METHOD:

1. Students will be divided into 15 groups consisting of 10 members each.
2. Group distributions to each station are based on the respective clue taken.
3. Each group will move from station to station based on numbering system.
   For example, if the group starts with station 1, it will be continued with station 2.
   If the group starts with station 3, it will be followed by station 4.
4. Each task has to be accomplished in order to grab the next clue.
   The time given is only 15 minutes per task.
5. Answers may be written in the attachment provided.

THE SUSPECTS

Name	Surname	Sex	Right / Left	Wears Hat	Hair	Driver?	Guilty
Coutney	Brown	F	Right	Yes	Dark	No	
Sarah	Perkins	F	Right	Yes	Fair	No	
Callum	Rogers	M	Right	Yes	Dark	No	
Simon	Temple	M	Left	No	Dark	Yes	
Greta	Harrup	F	Right	No	Dark	Yes	
Sally	Fisher	F	Left	No	Fair	No	

Frank	Beech	M	Left	Yes	Red	Yes	
Chelsea	Bridges	F	Left	Yes	Red	Yes	
Orla	Smith	F	Right	No	Red	Yes	
Tim	Garner	M	Right	No	Red	Yes	
Ruth	Jameson	F	Left	Yes	Dark	Yes	
Mark	Hitchkins	M	Right	Yes	Dark	Yes	
Carol	Smithkins	F	Left	Yes	Dark	No	
India	Jones	F	Left	No	Dark	No	
Tom	Walker	M	Right	No	Dark	Yes	
Charlotte	Twiddle	F	Left	Yes	Fair	No	
Chardonay	Hogg	F	Right	Yes	Dark	Yes	
Abdirahman	Mustafa	M	Left	Yes	Fair	No	
Becky	Sands	F	Right	No	Fair	No	
James	Wren	M	Left	Yes	Dark	Yes	
Saskia	Riggles	F	Right	No	Dark	No	
Harry	Pitcher	M	Right	No	Fair	No	
Jack	Turnip	M	Right	No	Dark	No	
Jake	Griggle	M	Left	No	Red	Yes	
Fiona	Gibson	F	Left	No	Dark	Yes	
Faisal	Iqbal	M	Right	Yes	Red	Yes	
Sam	Sprat	M	Right	Yes	Fair	No	
Ian	Dent	M	Left	No	Fair	No	
Jim	Begler	M	Left	Yes	Dark	No	
Amina	Khan	F	Left	No	Red	Yes	
Gavin	Redrup	M	Left	No	Dark	No	
Beth	Walters	F	Right	Yes	Red	Yes	

CLUE 1 – *GET INTO SHAPE*

- The answer to each question is a number.
- The number needs to be changed into a letter from the alphabet.
  1 = A, 2 = B etc.

1. Total number of sides of five squares. ***20 = T***
2. An octagon has eight sides. ***8 = H***
3. A square based pyramid has five vertices. ***5 = E***
4. Total number of sides of a triangle, a square and a hexagon. ***13 = M***
5. Total number of sides of an octagon, a heptagon and a hexagon. ***21 = U***
6. Total number of sides of two nonagons. ***18 = R***
7. A rhombus has four sides. ***4 = D***
8. A pentagon has five sides. ***5 = E***
9. Total number of sides of an octagon and a decagon. ***18 = R***
10. Half the number of sides of a decagon. ***5 = E***
11. The number of sides in a triangle multiplies by the number of sides in a hexagon. ***18 = R***
12. A ___ has ___ sides.
13. Total number of sides of ___ hexagons.
14. The number of sides in one equilateral triangle, one right angle triangle, one isosceles triangle and ___ scalene triangles.
15. The number of right angles in ___ squares and ___ rectangles.
16. Total number of sides of four rectangles. ***16 = P***
17. Number of lines of symmetry in a regular pentagon. ***5 = E***
18. Total number of sides of a trapezium. ***4 = D***
19. Number of lines of symmetry in a kite. ***1 = A***
20. A ___ has ___ vertices.
21. Number of sides a ___.
22. Total number of sides of ___ pentagons.

CLUE 2 – *LOOK AT THE MYSTERY FROM A NEW ANGLE!*

- The answer to each question is the number of degree.
- The number of degree needs to be changed into a letter from the alphabet. 10° = a, 20° = b, etc.

Answer 1:	Answer 2:	Answer 3:	Answer 4:	Answer 5:	Answer 6:	Answer 7:	Answer 8:
130° = M	210° = U	180° = R	40° = D	50° = E	180° = R	50° = E	180° = R

Answer 1:	Answer 2:	Answer 3:
80° = H	10° = A	190° = S

Answer 1:	Answer 2:	Answer 3:	Answer 4:

Answer 1:	Answer 2:	Answer 3:	Answer 4:

CLUE 3 – *WHERE DO THE COMPASS POINTS LEAD?*

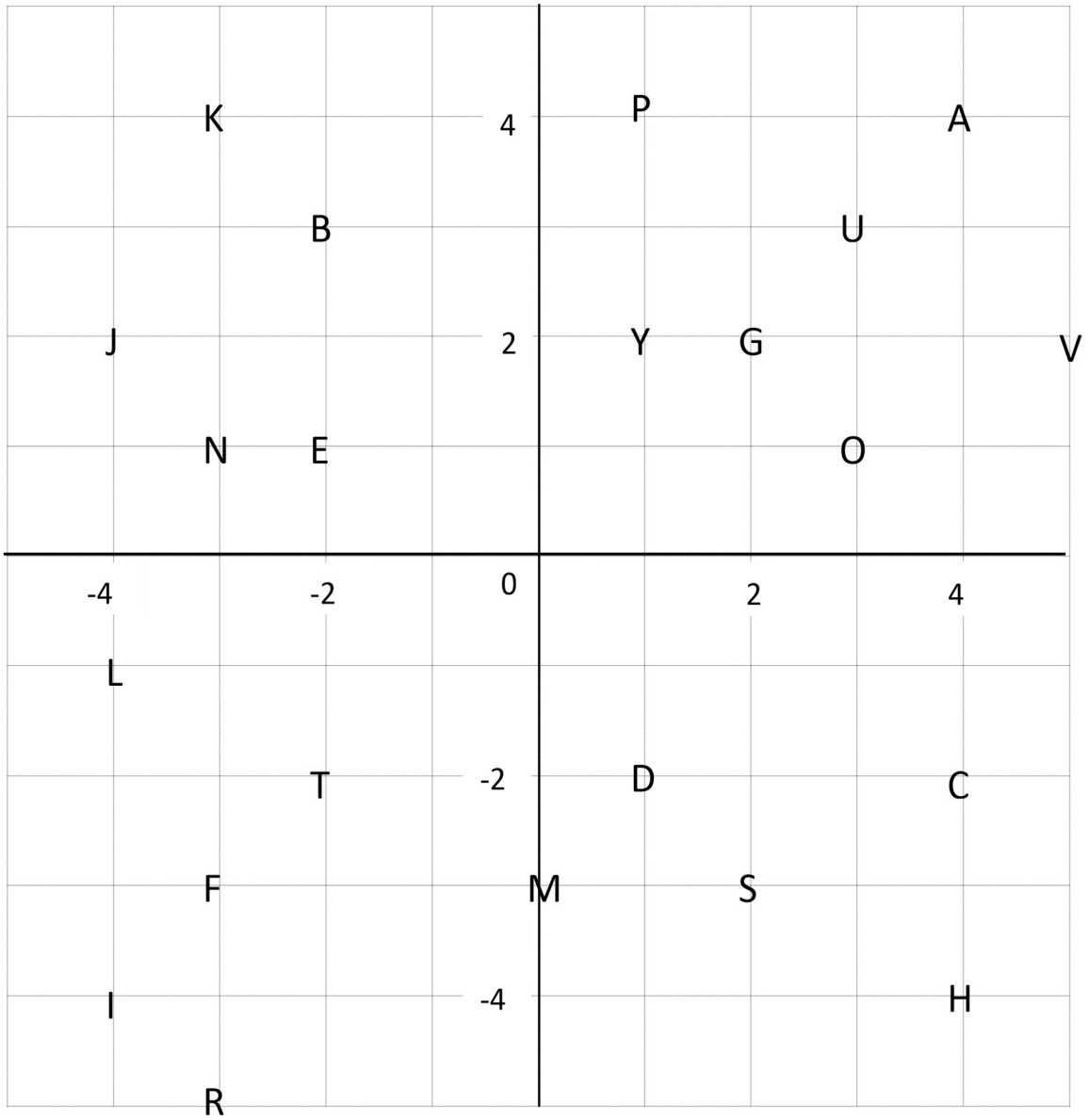
- The first direction begins from **START**.
- All other directions follow on from the previous letter.
- Each movement ends with **/**

A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	R	S	T	U
V	W	X	Y	**START**

The Killer is:

CLUE 4 – *IT'S TIME TO CO-ORDINATE YOUR INVESTIGATION*

- The direction begins <u>from X-axis to Y-axis</u>.



CLUE 5 – *INSPECTOR MORSE ON THE INVESTIGATION*

- Read line by line.

The forty-two-year-old cleaner stepped into the room. Her part-time job did not prepare her for the shock. A body lying on the floor. She nearly fainted. Then she called her full-time supervisor. Phew. At least she had help. The twenty-three-year-old stopped. She stared. Her skin turned a whiter shade of pale. Pulling herself together she dialed 999. The middle-aged operator asked her who she wanted.

She asked for the police. Her father-in-law was a policeman, but he worked in a top-notch ten-year-old department in another constabulary. He was only part-time these days. Once the police had been called, they started looking for the murder weapon.

The cleaner pointed to the large machine in the corner. On the X-ray machine was a note. A coded note. One they could not understand. They made a half-hearted attempt to read it. Twenty-five minutes passed. The police arrived sirens blaring. An ambulance also turned up. The cleaner recognised her ex-boyfriend who was the driver.

Twenty-two minutes later the police began their investigation in the murder at the health spa .....

Activity 11 Notes: Scienceploration Masterpiece

Activity 12 Notes: Do's & Don'ts in UPU Online Application

Activity 13 Notes: Moment with Professor

Speaker's Particulars

Name: Prof. Dr. _____

Field of Expertise: _____

Notes:

Notes