Asian Try Zero-G 2022 Experiment Proposal Form (Attachment-2)

ID (for office use only)

ZG206

1. Applicant Information

Category (1 or 2):	**2**
Nationality:	Thailand
Name: <Name of the representative if it is a group application>	Inthiraporn Choadee
Age:	23
Gender (M/F/X):	F
School:	Thammasat University
Major (if applicable):	Pharmaceutical Sciences
e-mail:	inthiraporn.choadee@gmail.com
Attach My/Group photo (if you wish to participate in the photo session. The image/picture will be open to the public and broadcast.)	

Member List for a group application if applicable

Name (Age) Add lines here as needed.	**Name**	**Age**

☒ I agree to the Terms and Conditions indicated in the Asian Try Zero-G 2022 Entry Guideline

☒ I am not from the EU and do not live in the EU,

☐ I reside or am from the EU and agree to GDPR in Entry Guideline (check if applicable)

*Check is needed to send proposal, if applicable.

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2. Experiment Information.

1. Activity

- Name of Experiment

  Study of the height of water which is risen up in microgravity

2. Hypothesis and Theory

- Hypothesis

  Capillary action is the natural action which has been seen in daily life. Microcapillary tube is the useful one which has this action. It is used for control the quantity of spot on chromatography paper. However, the simply thing likes straw also has capillary action too. We will observe the effect of capillary action when some water is brought up higher in tube. The height is depending on the factors like density of liquid (ρ), surface tension (T), radius of tube (r), angle of contact (θ), and standard acceleration due to gravity (g). In the microgravity system, the g constant is less than on the earth. From the compared equation, the height of water in microgravity is 1.11 time of the earth. So, I propose that we can observe the height in microcapillary tube in microgravity compare on the earth. In the larger radius, A straw will be seen the water climb lower than in microcapillary following the radius which inverse to the height of water. If this hypothesis is true, I propose that the capillary action will not only more important to the translocation of water in plant especially the vessel that has tiny radius but also other fluid transports in the microgravity.

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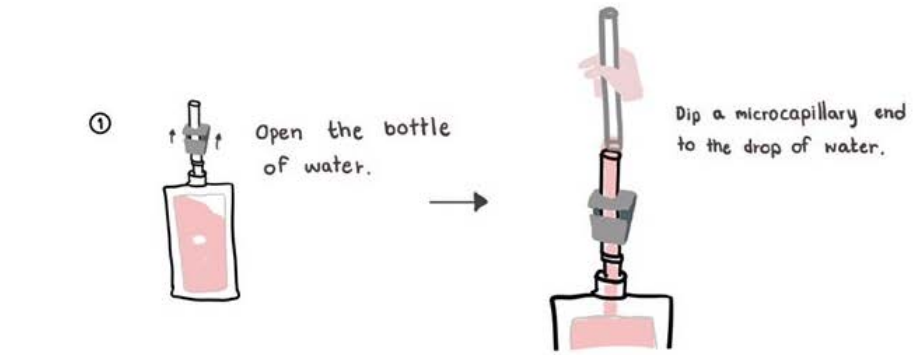
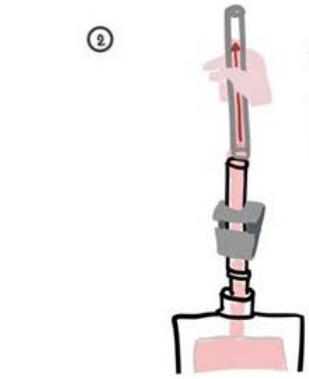
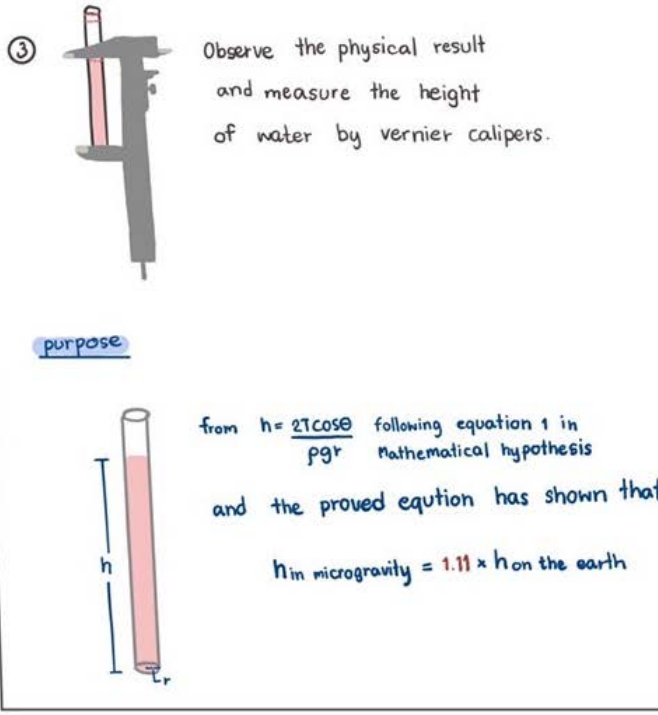
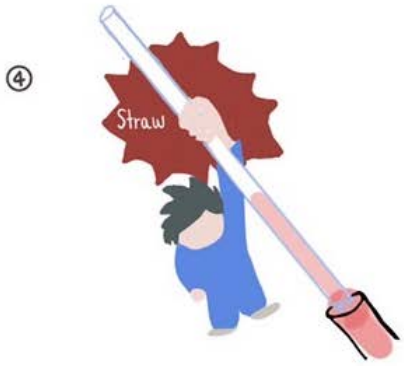
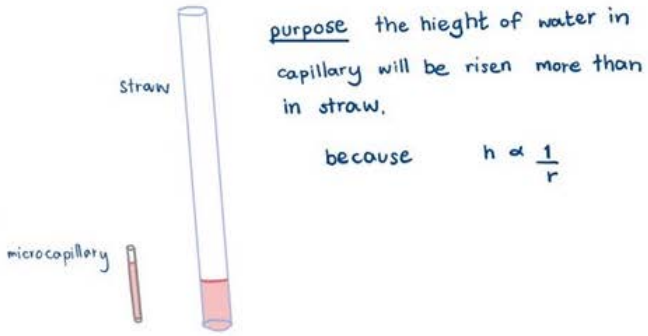
- Schematic Model











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- Mathematical and Theoretical Hypothesis
  (Optional for Category 1 and required for Category 2)

$$h = \frac{2T\cos\theta}{\rho g r} \quad \text{--- equation 1}$$

g inverses to h and other factors can be made in a constant (K).

Therefore; $h_{earth} = K/g_{earth}$ ---equation 2

And $h_{micro} = K/g_{micro}$ -----equation 3

Divide the equation 3 by equation 2;

$$h_{micro}/h_{earth} = K/g_{micro} \times g_{earth}/K$$

When the 90% of g_{earth} is equal to g_{micro} approximately. So, g_{earth} is 100/90 of g_{micro}

$$h_{micro}/h_{earth} = (K/g_{micro}) \times (100\, g_{micro}/90K)$$

Then; $h_{micro}/h_{earth} = 1.11$ ----- The summary is shown that the height of water in the microgravity is more than on the earth around 1.11 time

Description

h is elevation of the liquid (m)

- h_{earrth} is elevation of the liquid (m) on the earth
- h_{micro} is elevation of the liquid (m) in microgravity

T is surface tension (Nm^{-1})

θ is angle of contact between the liquid with the capillary tube (radians)

ρ is density of liquid (kgm^{-3})

g is standard acceleration due to gravity (ms^{-2})

- g_{earth} is standard acceleration due to gravity on the earth (ms^{-2})
- g_{micro} is standard acceleration due to gravity in microgravity (ms^{-2})

r is radius of capillary tube (m)

When consider the inversed relation of radius to height of water in equation 1, Water in microcapillary tube will be brought up higher than in straw following the different time of both radiuses because the equation has still been true on the microgravity.

3. Verification Methods and Procedures

- Verification Methods

  Observe the height of water in microcapillary and straw by physical and measure by vernier calipers in both microgravity and on the earth. Then, compare and analyze the result.

- Step by step procedures and their expected time with each procedure

  1. Open the bag of water and dip a microcapillary end to the drop of water. (1 minute)
  2. Wait for some water that will be brought up until it is steady. (1 minute)
  3. Observe the physical result and measure the height of water by vernier calipers. (1 minute)
  4. Do the experiment in step 1-3 but replace microcapillary by straw. (3 minutes in overall)

4. Tools and Items

- Tools and Items required

  1. Microcapillary
  2. Translucent or clear straw
  3. The bag of water (If there is some colored water, it will be observed clearly)
  5. vernier calipers

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