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

ID (for office use only)

ZG090

1. Applicant Information

Category (1 or 2):	1
Nationality:	Thai
Name: <Name of the representative if it is a group application>	Jinna Waiwattana
Age:	17
Gender (M/F/X):	F
School:	Mahidol Wittayanusorn School
Major (if applicable):	
e-mail:	Jinna.wai_g30@mwit.ac.th
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

Water sphere disturbance in zero gravity

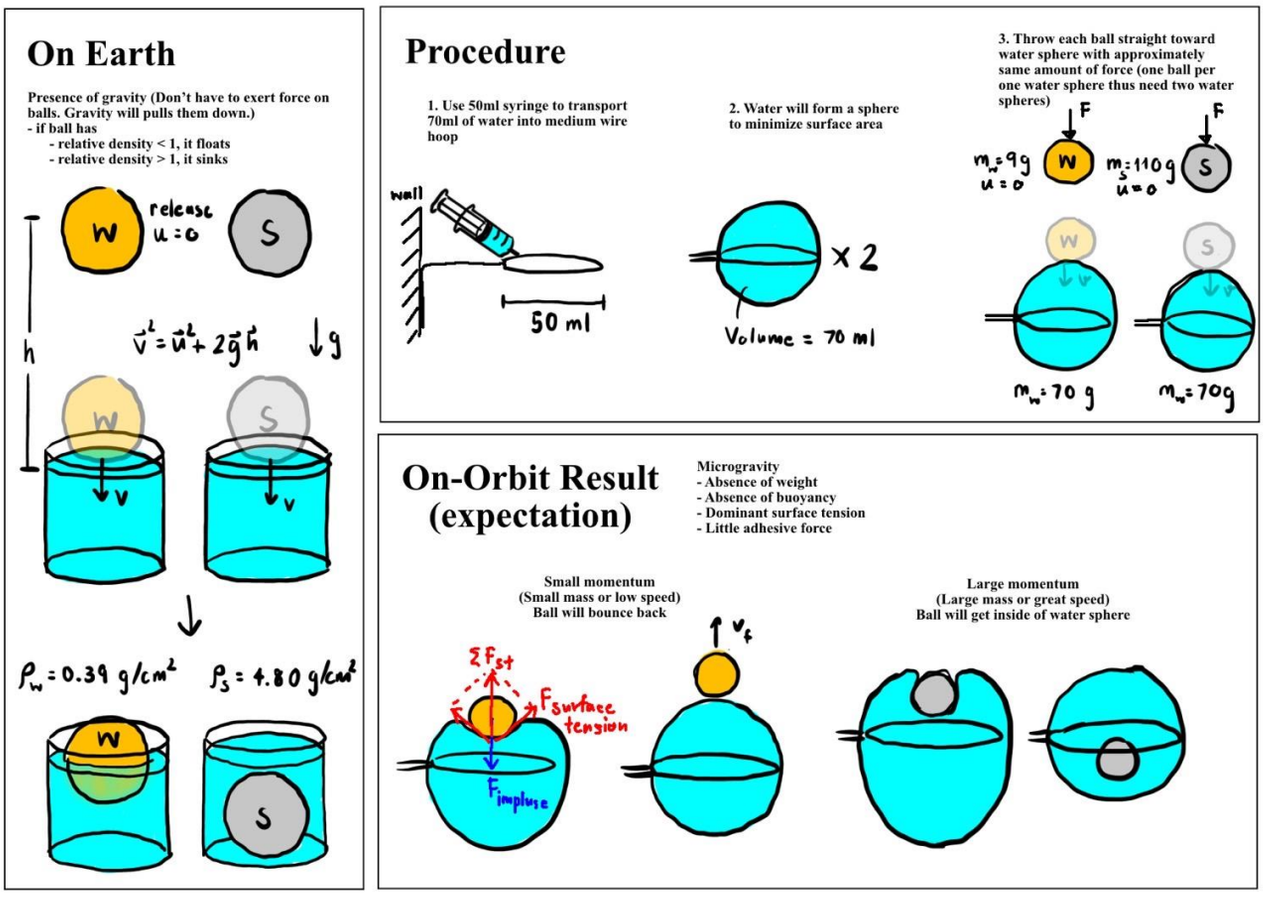
2. Hypothesis and Theory

- Hypothesis

Water is considered as a fluid, which are substances that can't resist any shear force applied to them. Water behaves differently from a rigid body: it has pressure varying with depth; it has buoyant force; it has surface tension, adhesive force and cohesive force; its shape conforms with its container. However, in zero gravity condition the behavior of water changes. Without gravity, objects and water will not acquire weight, therefore buoyancy and hydrostatic pressure are absent. Moreover, surface tension is much more obvious in zero gravity environment resulting in water to form a perfect sphere. Applying these special behaviors of water in zero gravity, we can perform experiments that are hard to perform on Earth. In this set of experiment, I want to study the behavior of water when received impulse from collision and when contacted with spinning object.

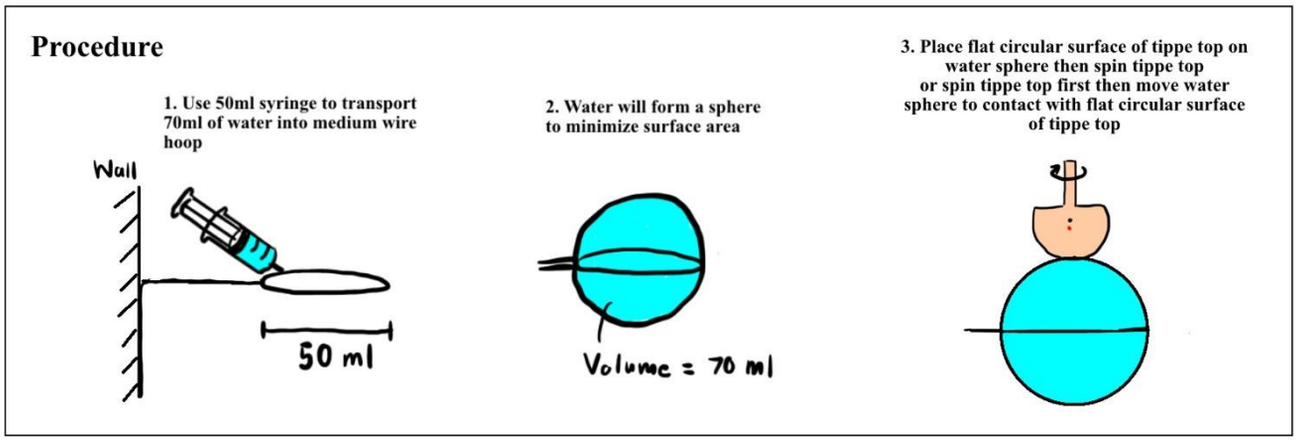
- Schematic Model

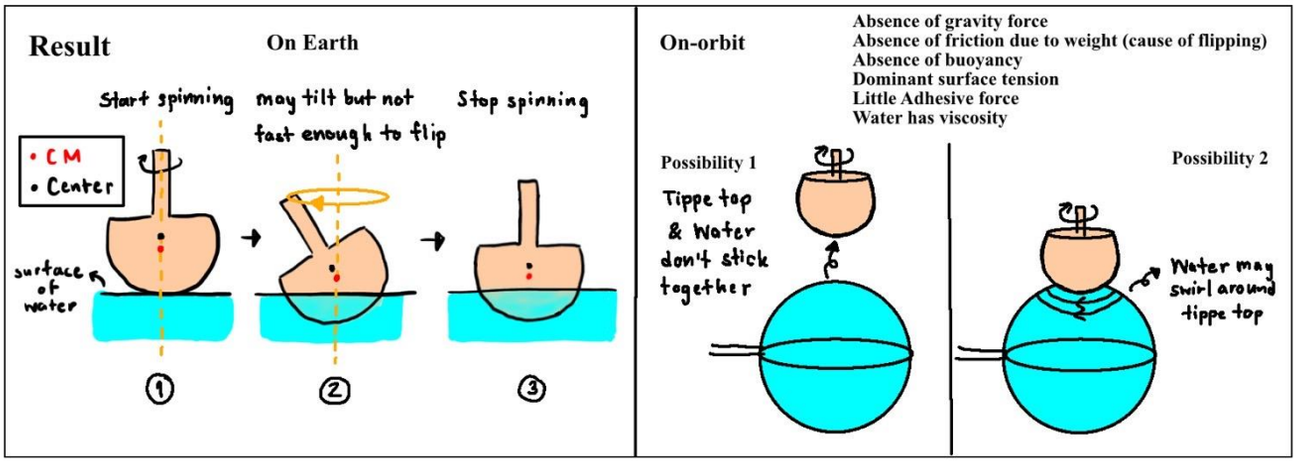
Experiment 1



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

Experiment 2





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

Experiment 1

On the Earth if we release balls from some value of height into the water in the container, the water will splash in the amount depending on momentum of balls. After that, the ball with higher density than water will sink and the ball with lower density than water will float due to buoyancy. In zero gravity environment where neither weight nor buoyancy exist, if we throw the balls straight toward the water sphere, the water will not splash due to high surface tension. I hypothesize that momentum of the ball will affect both on movement of water and ball after collision. If ball has small momentum (small mass or low speed), it will bounce back in contrast if the ball has high momentum (large mass or great speed), it will get inside water sphere

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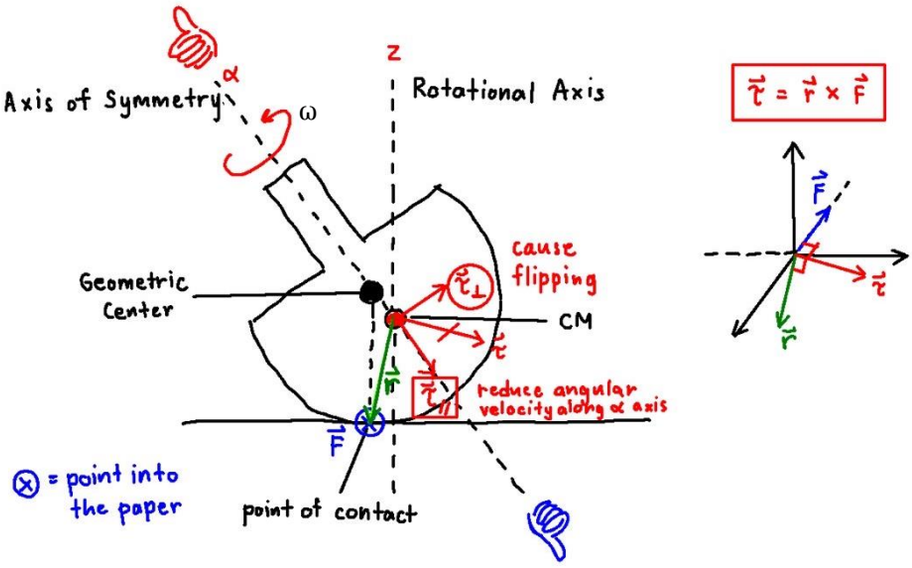
Experiment 2

Because tippe top's center of mass shifts from its geometric center, it can flip upside down when spun at a high angular velocity enough. What cause the inversion (and the increase in potential energy) is a torque due to surface friction.



However, if we spin tippe top on surface of water on Earth, some portion of tippe top will sink which will increase surface area that contact with water. Water will resist the rotation of tippe top and decrease angular velocity. As a result, during rotating tippe top may tilt but doesn't have enough rotational kinetic energy to flip.

On the other hand, if we spin tippe top on water sphere in zero gravity environment where neither buoyancy nor friction due to weight exists, the tippe top will not flip. I hypothesize that there are 2 possibilities of result: 1. Wooden tippe top separates from water sphere after spinning; 2. Wooden tippe top remains spinning on water sphere and water may swirl around contact point. Whether result will fall into possibility 1 or 2 depends on the strength of adhesive force between wood and water.

3. Verification Methods and Procedures

- Verification Methods

Experiment 1

Compare the behavior of water and ball after collision between wooden ball case and steel ball case.

Experiment 2

Compare the behavior of water and tippe top during tippe top spinning in zero gravity environment and those on earth.

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

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

Experiment 1

1. Attach two medium wire hoops on the table or the wall with tape **(1 min)**
2. Use 50ml plastic syringe to transport 70ml of water into each medium wire hoop (Create 2 water sphere in total) **(1 min)**
3. Throw wooden ball straight toward water sphere then throw steel ball toward another water sphere with same speed as those of the wooden ball. (one ball per one water sphere) **(1 min)**
4. Observe what will happen while recording video **(2 min)**

Experiment 2

1. * Use towel to clean up water from one of the wire hoop from experiment 1 **(1 min)**
2. * Use 50ml plastic syringe to transport 70ml of water into medium wire hoop from 1) **(1 min)**
3. Place the flat circular surface of tippe top on the surface of water and then spin tippe top **(1 min)**
4. Observe what will happen while recording video **(2 min)**

   * (if possible) we can reuse one of the water sphere from experiment 1 to perform experiment 2 without making new water sphere.

4. Tools and Items

- Tools and Items required

Tppe Top (1)

Medium Wire Hoop (2)

50ml Plastic Syringe (1)

Wooden ball (1)

Steel ball (1)

Water (approx. 210ml)

Video camera (1)

Towel (1)

Tape (1)