

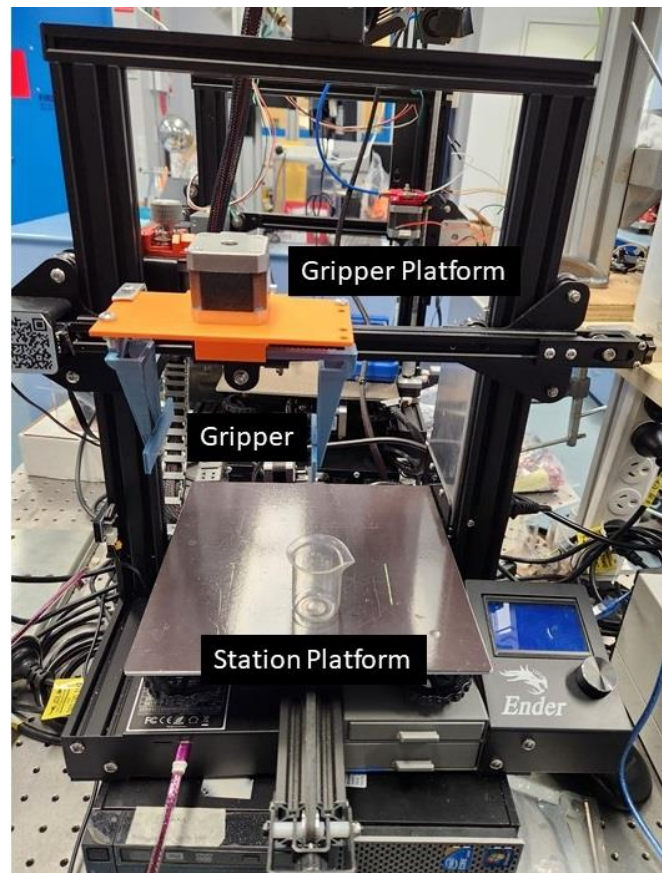
Project Assignment A [7 marks]

Title:

Reagent Pendulum Mixer

Brief:

The reagents that are prepared often have to be properly mixed. It is required for a pendulum mixer to be installed on the testing station (see figure). One distal end of the pendulum is to be attached via an adapter to the gripper platform of the testing station. The other distal end of the pendulum is to be immersed into a beaker that contains a reagent. This end of the pendulum also has a rectangular paddle. The pendulum is to be non-motorized. When the beaker containing the reagent is moved back and forth along one axis, the flexing and twisting of the pendulum (caused by fluid drag) is meant to facilitate the reagent mixing through the movement of the paddle.



Testing station

Specifications:

Pendulum adapter

- Material: PLA or PLA+.
- Dimensions: No restrictions.
- Attachment: Via fasteners to the holes available on the gripper platform.

Pendulum

- Material: No restrictions
- Length: 100 mm
- Cross-sectional dimensions: No restrictions.
- It must be rigidly attached to the adapter.

- It does NOT have to be monolithic (single structure). It can consist of separate structures that are connected together. Any of the constituent structures can be flexible or rigid.

Pendulum paddle

- Material: No restrictions.
- Width: 12 mm.
- Height: 6 mm.
- Thickness: No restrictions.
- It must be attached to one distal end of the pendulum; such that the entire assembly (pendulum adapter, pendulum, pendulum paddle) exists as one unit.

Testing:

- Each team will be allowed to have ONE half hour slot to test their FINAL fabricated pendulum assembly. Teams are advised to have multiple pieces of the SAME assembly for standby in case of any damage during testing.
- The team is expected to operate the workstation on their own.
- Just before the test, a drop of food dye will be dropped into the beaker.
- The beaker is to filled to 20 mL of water with the pendulum assembly in place.
- When the beaker with reagent is set to move in one axis on the workstation, a video recording is to be made of the entire assembly in operation to illustrate the mixing process.
- Failure of the team to be present on time for the testing will be noted and penalties will apply.
- Any tipping over or spillage from the beaker will be noted and penalties will apply.
- Any additional time taken for the test will be noted and penalties will apply. Teams are advised to plan the process carefully before proceeding.

Submission (as a single .zip file):

This is a team submission with only ONE submission by a representative of the team. The deadline for submission is Week 7 Friday 6/8/2024. The submission MUST include:

Video recording

- Single .mp4 file
- Not exceeding 1 minute
- Effective captions to highlight important features of design and mixing effectiveness

Documentation

- Single .pdf file
- Not exceeding 1000 words
- Up to 10 figures are permitted
- Clear and concise explanation of the operation of the model using grammatically correct sentences with no spelling errors

Grading criteria:

Awards:

	Poor (0-0.49)	Acceptable (0.5-0.69)	Good (0.6-0.79)	Excellent (0.8-1.0)
(a) Physical assembly installation (required – it is firmly attachable to the gripper platform using nuts and bolts; desirable – it is firmly and quickly attachable to the gripper platform using snapped-on fixtures built into the pendulum adapter and can also be quickly attached and detached from the gripper platform) [1%]				
(b) Physical assembly operation (required – it is able to flex OR twist properly using liquid drag forces applied in one direction; desirable – it is able to simultaneously flex AND twist properly using liquid drag forces applied in one direction) [1%]				
(c) Physical assembly robustness (required – it is built as one unit and can be handled in any way with no operational changes after; desirable – it is built as one unit and can be dropped from a height of 1m onto the floor with no operational changes after) [1%]				
(d) Physical assembly mixing (required – dye is able to be uniformly mixed in water using 10 displacements of liquid drag forces applied in one direction; desirable – dye is able to be uniformly mixed in water using only 2 displacements of liquid drag forces applied in one direction) [1%]				
(e) Creativity (the physical assembly incorporates innovations that encourage simplification or the ready scaling up to support more demanding or complex schemes in the future) [1%]				
(f) Documentation effectiveness (the physical assembly are described, explained, and discussed in an organized, logical and succinct fashion) [2%]				

Penalties:

- (a) Failure to adhere closely to the specifications.
- (b) Grammatical and spelling errors in the documentation.
- (c) Poorly constructed and difficult to understand sentences in the documentation.
- (d) Hand drawn sketches and unclear images used as figures in the documentation.