



Connexio 2016

Urban Innovation Problem Statement

Design a car with Sustainable Mechanism

- **Objective:**

The Idea behind this competition is to present a solution to the environmental concerns presented by the use of fossil fuels and look for some alternate methods to drive a car, which is a daily requirement in the Urban Areas of today. Connexio 2016 gives you a chance to build a car completely based on a Chemical Reaction, and pitch it to an intellectual audience. Detailed description of the Competition are given below.

- **General Rules:**

1. Students from high School, undergraduate as well as postgraduate (including Ph.D.) are eligible to participate.
2. Maximum Number of Participants in a team: 4 members
3. The vehicle build will be checked for Size and Safety. (Details specified below.)

Round 1: Abstract Submission

1. Abstract must contain the following details about the model:
 - i. *Name* of all the participants including Contact Numbers.
 - ii. *Schematic Diagram* of the Vehicle along with dimensions of the Car.
 - iii. Procedure for *setup* of the car
 - iv. Detailed description of the Chemical *Reaction/s* used to run the car
 - v. Chemicals used for the Reaction and the *cost (Capex and Opex)* of operation. (Cost of chemicals should be taken from <http://www.sigmaaldrich.com>)
 - v. *Environmental and Safety* features.
 - vi. Creativity and Uniqueness in design (if any).
2. Send your abstracts in '**.pdf**' format to **connexio.vortex16@gmail.com** . Subject of mail should be **<Team-ID>_Chem-E-Car Abstract** and file name must be **UrbanInnovation_<Team_ID>.pdf** .
3. Selection to final rounds will be purely based on abstract submitted.
4. Deadline of Abstract Submission: 15th October 2016
5. Any Changes in the model as to what is written in the Abstract will result in penalty points.



Round 2: Testing of cars & Presentation:

Each team will be given one trial run to execute their car run according to the details mentioned and will give a presentation of the model to the esteemed judge/s and an intellectual audience. Teams will be eliminated if the model emits harmful chemicals during its trial run or the judges deem the car harmful to surroundings.

• **Details of the competition:**

1. Starting the Car

Maximum three members will be allowed to start the car. Time allotted for setup of the car - 2 min. Once the car crosses the starting line members of the team are not allowed to touch their vehicle. Pushing the vehicle or a mechanical starting device is not allowed. If car is placed at the starting line and not moving you can retouch the vehicle if you are within your time limit of 2 minutes.

2. Load Specifications

Car is expected to carry a load in the form of a container that holds upto 500 ml of water with clearance to avoid spilling. Container will be supplied before the trial run and filled up to the 500 ml mark; hence each vehicle must have provisions to hold the container.

Dimensions of Container-

Type of Container: Borosil Beaker

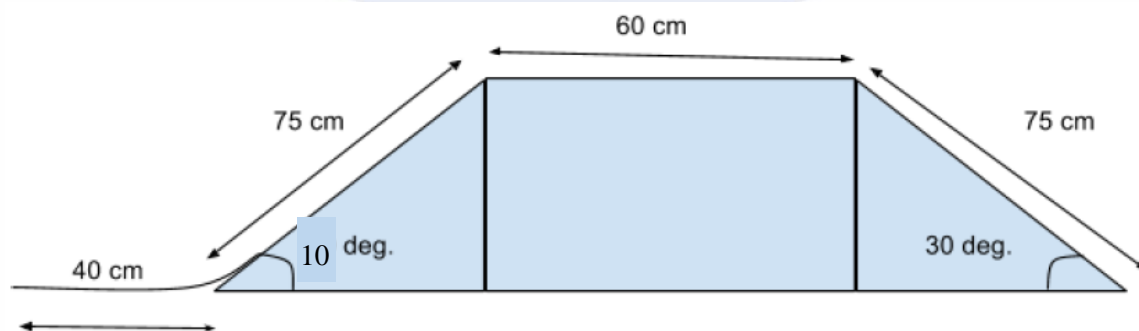
Diameter: 8 cm

Height: 10 cm

NOTE: Teams are not permitted to bring their own Containers.

3. Track Details

Total Track Length = 2.5 m (Start and Finish Lines will be disclosed an hour before competition, however team must aim to cover whole track and report quantity and cost on that basis)





4. Judging the Distances

The total distance traversed by the car will be measured. The final distance will be measured from the finish line to the front point of the car. A vehicle that goes outside the course will have its distance measured to where it went out of bounds and accordingly penalty in the form of point of deduction will be imposed.

5. Dimensions of Car

The Car must fit inside a box of dimensions 40cm x 30cm x 30cm. Car maybe disassembled to meet this requirement. This will be checked by the judges and if the judges are uncertain team members will be called to demonstrate the same.

6. Provision of load and disposal of Chemicals

Team will be provided with only water as a load. Other chemicals required for the working of the car is to be arranged by the teams. Disposal of the chemicals and chemical wastes is the sole responsibility of team members. Disposal areas will be provided for the same.

7. Working of Car

The source for the propulsion of the car is a chemical reaction which should be properly controlled. (Chemical Reactions include use of pressurized air-creating oxygen through chemical reaction and allowing it to build up the pressure or application of electro-chemical reaction- using electricity generated by dissolution of metals/non-metals in acids/bases). The vehicle must be powered by a chemical reaction and must be stopped by a proper stopping mechanism (quantifiable change or direct control of the concentration of a chemical species). This chemical reactant species may be a solid, liquid, or vapor. Use of commercial batteries or commercial engines is strictly prohibited in your car's system as main power source.

8. Duration of Run

The maximum time limit for a run is 4 minutes. If the car is still moving at the end of 4 minutes, the position it has at the end of 4 minutes will be considered as its final position and time of travel as 4 minutes. If the car is not moving after its start for a time of one minute, your team will be eliminated OR position of the car will be noted down and time of run will be calculated as 4 minutes.



- **Safety Measures:**

Each team's car must strictly abide to the following set of safety precautions or measures:

- All the major Components (like syringes, reaction vessels, storage, etc.) of the vehicle must be properly labeled.
- Each team should have personal protective equipments depending on the possible hazards. These may include Lab coat, gloves, safety goggles etc.
- All containers on the car containing chemicals must be securely attached to the car to prevent the container from tipping over during the competition. The lid to this container must also be securely attached to the container and must be capable to preventing escape of the chemical during any phase of the competition, including an accident involving tipping over of the car.
- Pressurized vessels and car components represent a significant explosion hazard due to the substantial energy contained in the pressure.
The following restrictions apply to cars
 - Maximum operating pressure - This is the highest pressure within the vessel during normal operation. For initial design purposes the maximum operating pressure can be estimated from the stoichiometry — but the actual pressure must still be measured once the car is operational.
 - Pressure requirement - If the pressure of your car is greater than 1 psig, then your car should have the following: pressure gauge, emergency relief device (must be in proper location), pressure certification, proper management system to prevent potential hazards.
- Proper measures must be taken during chemical handling in the car preparation area to prevent human exposure to these chemicals.
- All wiring and exposed electrical components must be electrically insulated or covered to prevent the possibility of electrical shock or ignition of any component of a car.

- **Inspiration:**

https://www.youtube.com/watch?v=c7M_9M1Ap88



- **Winners will be decided based on the following factors:**

1. The team which takes minimum time to cover the entire length of path is declared winner. In case, no team is able to traverse the whole track then the team which traverses the maximum distance is declared the winner.
2. Amount of water spilled during the run.
3. Cost effectiveness of the model.
4. Environmental concerns.
5. Starting Mechanism
6. Fuel Used
7. Specifications of the car
8. Extra points will be awarded to the teams for:
 - a) Uniqueness in the design
 - b) Stopping Mechanism (if any)

All these parameters will be judged on the basis of both model and presentation in front of the judge/s.

- **Violation and Disqualifications:**

Teams should strictly abide to the following rules violation of which may lead to elimination from the competition-

1. No team is allowed to hinder the functioning of other participating teams.
2. No team is allowed to touch the vehicle during its run on the track.
3. Any kind of damage to the venue

Judges have the right to disqualify any team if they feel the team is not playing with fair interests. In case of any disputes judge's decision will be considered final and no argument from the teams will be entertained.

- **Contact Information:**

For any issues contact-

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