CHEMKATON

CHEMKATON 2024 – international edition

ELIMINATIONS

Description of the elimination task

*The task is to prepare a mixture that will achieve the lowest possible temperature. To prepare it, use only products available in stores and stationary hypermarkets offering food products**

Task conditions

1. The mixture must fit in a tall glass beaker with a **nominal capacity of 150 ml** (real total capacity depending on the type, approx. 185 ml but not more than 200 ml), example dimensions of the beaker are: diameter 54 mm, height 95 mm) or in a vessel designed by the teams themselves and printed on a 3D printer.
2. If Teams prepare their own vessel, it should have a total internal capacity equal to 185 ml. PLA filament should be used as the material, and the maximum dimension (height, width, depth) of the vessel in any direction cannot exceed 95 mm, and the total weight of the empty printed vessel cannot exceed** 100 g. In addition, the design of the vessel must allow for insertion in the axis of vessel temperature sensor with a diameter of 5 mm.
3. The mixture cannot be self-igniting, cannot escape from the outside of the vessel (e.g. by foaming), and should not emit dangerous fumes.
4. The initial temperature of all components of the mixture and the vessel under the conditions of measurement should be equal to the ambient temperature (approx. 22°C).
5. The vessel must not be damaged or cracked during the measurement.
6. The use of additional insulation and external cooling sources is not allowed. Update 14.05.2024: the use of various compressed gases or compressed substancesin the form of freezers, compressed air, compressed CO2 or vacuum chambers/liophilisers, etc., to reduce temperature is not acceptable and will be treated as an external cooling source. This means that the components of the mixture should be at both ambient temperature and ambient pressure before mixing.
7. Preparation of the mixture should take a maximum of 15 minutes. Manual mixing of ingredients is allowed.
8. The temperature of the mixture will be measured for a period of 3 minutes in vessel geometric axis at the bottom. The lowest temperature recorded during the measurement is taken as the result.

* *a store or hypermarket offering food products should be considered one whose key activity is the sale of food products. If you have any doubts whether a given substance is permissible, please contact the competition organizers (email: chemkaton@agh.edu.pl).*

** *this information is provided when preparing the model for printing in PrusaSlicer (available for free https://www.prusa3d.com/page/prusaslicer_424/).*

Files to be submitted for evaluation

In order to evaluate the elimination task, please send[***] the following files:

1. The composition of the mixture, the procedure for its preparation, the result of measuring the ambient temperature and the minimum temperature observed for a period of 3 minutes from the moment of completing the preparation of the mixture - in accordance with Attachment 1.
2. Demonstration video of the experiment (maximum length 3 minutes)
3. For teams that have developed their own vessels - a vessel geometry file in .stl format and a file for a 3D printer (.gcode) - configured for the Prusa i3 MK3S+ 3D printer and PLA filament.

[***]*File upload instructions, including a link to the remote folder, will be sent to the Team Leader at the e-mail address provided during registration.*

Rules for assessing the task by the competition Jury

1. The composition and procedure of making the mixture can be reproduce on the basis of the information sent by the competition jury in the AGH laboratory, where the temperature will be measured in accordance with point. 8 task conditions.
2. The measurement will be recorded with a calibrated TP-100 digital thermometer with an accuracy of 0.1°C.
3. The mixture will be measured in a tall glass beaker (type Simax 150 ml) from point 1 of the task conditions or in a PLA vessel designed by the Teams.
4. Based on the measurement results, a ranking list will be prepared in accordance with the scoring described in the Chemkaton Competition Regulations.

Attachment 1

Team name: ……

Ingredients used and quantity:

1. …..
2. …..
3. …..
4. ….

Type of vessel: glass beaker*, PLA vessel* (delete as appropriate)

Procedure for making the mixture:

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Ambient temperature: ..... °C

Minimum temperature of the mixture (reached within 3 minutes): ..... °C