
**OFFICIAL RULES FOR THE
2010 TULSA ENGINEERING CHALLENGE**

Sponsored by the Tulsa Engineering Foundation

CHEMICAL SWITCH COMPETITION

TULSA TECHNOLOGY CENTER
Riverside Airport Campus
801 East 91st Street - Jenks, Oklahoma

OBJECTIVE

To turn off a light bulb using a chemical reaction.

COMPETITION ENTRY REQUIREMENTS

Each registered entrant (individual or team) may submit one (1) chemical switch into the competition. Each entry must be accompanied by design documentation. The design documentation must use the form at the end of these official rules. No entry will be accepted without completed design documentation. An entrant will have the opportunity to resubmit incomplete documentation. The design documentation will be used to judge the safety of the design.

CHEMICAL REACTION OPTIONS

The students may use any chemical reaction that can be safely operated indoors. Entries using open flames or reactions that release smoke or spray will be disqualified. The Officials have the right to rule that a chemical reaction is unsafe for indoor operation. Since no fume hood will be available, chemicals must not require the use of a fume hood. Any dilutions should be done before transporting chemicals to the site. A container for the disposal of acids will be provided, but entrants must make arrangements for the disposal of other chemicals.

Sample ideas: Students may use gas-producing reactions and harness the gas to turn the light bulb off. A wire in the circuitry may be dipped in acid, which will react with the wire and eventually break the circuit. An iodine clock reaction may be used to trigger a switch.

The entry must not leave any residue on the table or surrounding area. The entry must not spill any liquids or release any sprays. The light bulb may not be turned off by destroying it.

CONSTRUCTION SPECIFICATIONS

HS Division (10th – 12th grades): High school students must use a chemical reaction. Dissolution and phase changes are not allowed as sole process.

MS and younger Division (9th – and lower grades): Middle school and younger students may use a chemical reaction, dissolution, or phase change.

A circuit containing a light-emitting diode as a light bulb, a 9-volt battery as a power source, and associated wiring will be provided. The entry must be connected to the circuit through the alligator clips that will be part of the provided circuit.

The entry must be self-contained and must fit on a table two feet (2') wide and six feet (6') long.

COMPETITION SPECIFICATIONS

During all phases of the competition, the decisions of the Judges are FINAL.

Students may bring no more than 250 mL of each chemical. Chemicals must be transported safely to the site – unsafe transportation will result in disqualification. Each container must be clearly and legibly labeled with the name of the chemical, the concentration, the student's name, the school name, the teacher's name, and a phone number. Chemicals must be brought to the event table immediately upon arrival and will be stored there until the group is ready to leave.

Appropriate gloves and safety goggles must be used during the setup and operation of the entry.

After the competition officials have decided that an entry has met the safety requirements of the competition, the entrant will be allowed to start the chemical reaction. The judging official will start timing at the point indicated on the design documentation. Timing must begin within one minute of mixing the chemicals. Once the timing has begun the students may not touch the entry. The competition official will time the entry with a stopwatch. If the entry does not turn off the light bulb within three (3) minutes, a second attempt may be made.

JUDGING AND SCORING

For each entry, the time required to turn the light bulb off will be recorded. The goal is to turn off the light closest to 20.0 seconds without turning it off early (before 20.0 seconds).

HS: Any entries that turn off the light bulb before twenty (20.0) seconds will be disqualified. Any entries that do not turn off the light bulb within three (3) minutes will be allowed one second attempt.

MS: Any entries that turn the light bulb off before ten (10.0) seconds will be disqualified. Any entries that turn off the light bulb $10.0 \text{ s} \leq t < 20.0 \text{ s}$ will be penalized 1 minute. Any entries that do not turn off the light bulb within three (3) minutes will be allowed one second attempt.

The Officials will determine a First, Second, and Third Place winner for each of the two student divisions. When the winners are announced, at the end of the competition, the winning team members need not be present. In the event of a tie, the judges will award the prize to the entrants deemed to have had the most fun during the competition.

GENERAL

Each entry may be an individual or a team project. The team size may be as large as an entire classroom.

The number of entries to this contest is not limited.

A team may enter only one design. Each entry may be used by one and only one team or individual. No re-registration is permitted.

We will be using the website for registration. Please check the web site for details:
www.tulsaengineer.org

Questions? E-mail: techallenge@yahoo.com.

PRIZES

Prizes will be awarded as follows: High School Division (10th thru 12th), Middle School Division (7th thru 9th) as follows:

First Place: \$100 cash or equivalent gift.

Second Place: \$75 cash or equivalent gift.

Third Place: \$50.00 cash or equivalent.

Any cash prizes will be awarded by a bank check and issued to the teacher/school listed on the registration. We will mail a check to the address listed on the registration within a few weeks of the competition. If you do not receive your prize within a few weeks, please email tech@tulsaengineer.org with your team name, school, and competition won.

**2010 TULSA ENGINEERING CHALLENGE
DESIGN DOCUMENTATION**

CHEMICAL SWITCH COMPETITION

PLEASE TYPE OR PRINT CLEARLY AND LEGIBLY

Name of school: _____

School address, city, zip: _____

Sponsoring teacher: _____

Phone number: _____

Name(s) of entrant(s):(1) _____

(2) _____

Chemicals used (name, concentration, and amounts)

Balanced chemical reaction (HS); chemical reaction or chemical process (MS)

Chemical switch mechanism: describe how the chemicals above are used to turn off the light bulb:

Timing start point: The competition officials will start timing your entry at this designated point. This should be something like when you have shaken up your chemicals and set the entry down to react, or when you drop a wire into an acid bath, or start dripping a second reactant into the first.

