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## **Hydrogen (H<sub>2</sub>) Fuel Cell Model Car Challenge Rules**

### **Spirit of the Race**

The H<sub>2</sub> fuel cell model car competition offers students an opportunity to learn by means of a friendly competition against their peers where students take responsibility for the design, construction, and performance of a model electric vehicle powered by a fuel cell running on hydrogen. The role of the adult is to nurture the spirit of excitement and the joy of discovery and learning that awaits students. Adults should let students assume the responsibility for design decisions, construction, and maintenance of their vehicle, performance at a race, and winning or losing.

### **Race Components**

There are three components to the race and teams will be judged on all three components.

Speed race: The races will be run in a double-elimination format. The top three fastest cars after ALL of the eliminations are complete will compete in the final "head-to-head" race to determine first, second, and third place.

Engineering Design: A panel of judges will evaluate the working design of the fuel cell car. Hydrogen storage, hydrogen delivery, gearing, etc. will be judged in this category. Judges will interview each team and ask design questions to assess the ability of the team to answer technical questions about their car.

Artistic Design: Cars will be judged by a panel to assess the overall appearance and aesthetic design of the car. The name of the car must be represented clearly on the vehicle.

NOTE: All cars must be designed and built by the students with limited assistance from the coach or other adults.

***Remember, this is a student competition!***

## **Materials**

Student teams will be provided a H-Tec fuel cell, motor, battery pack, valves and some tubing, gears, wheels, axles, hydrogen and oxygen gas collection systems and electrical connection wires. Students must use the unaltered H-Tec fuel cell, motor and battery pack that was provided in the fuel cell kits. Valves and tubing are also provided but may be altered or replaced. The rest of the car design and components will be up to the creativity and ingenuity of the students. The vehicle must be the team's design. Teams will be asked about the design process.

## **Vehicle Specifications**

1. The vehicle must be safe to contestants and spectators, e.g., no sharp edges, projectiles, etc.
2. The vehicle must fit the following dimensions: 30 cm. by 60 cm. by 30 cm.
3. The electricity needed for the electrolysis procedure will be provided by the battery pack that was included in fuel cell kit. Additional battery packs will be available on race day. The electrolysis will be completed in a designated charging area prior to the start of the race. Distilled water will be provided at the charging station for the electrolysis process. The only energy source permitted on the vehicle is the fuel cell with the hydrogen that was produced from the electrolysis procedure.
4. Steering: A guide wire attachment must be attached to the car. A guide wire, no more than 1.5 cm. from the surface of the track, will go through the attached guide wire attachment(s) on the car, serving as the steering mechanism, and keeping the car in its lane. The vehicle must be easily removed from the guide wire, without disconnecting the guide wire. This is the only allowable method of steering the car. No radio control is permitted in the cars. Lane changing or crossing will result in disqualification.

## **Track Specification**

1. The length of the race course is 10 meters over flat terrain.
2. Race lanes are at least 60 cm. wide.
3. The guide wire will be located in the center of the track and will not be more than 1.5 cm. above the track surface.
4. The track will be #15 grade tar/roofing paper which will provide a good-gripping surface.

## **Race Conduct**

1. Race will be run in a double-elimination format.
2. Only two members of the race team will be allowed on the track during the race: one at the starting line and one at the finish line. A non-team member may act as a catcher if necessary.
3. Each vehicle must have an assigned student team captain. No student will be assigned team captain to more than one vehicle.
4. There will be a repair table set up separate from the recharging area to help facilitate quick repairs to the cars. Teams that are scheduled to race in the next heat will be given priority in the repair area. There will be a 3 minute time limit for repairs.
5. At race time, the vehicle will be placed behind the starting line with all its wheels in contact with the ground. No more than two team members will be allowed in the start area.
6. An early start or push start may result in disqualification or a re-run of the heat. The determination will be left to the track judges.
7. All vehicles will be started when the official signal is given. The fastest individual time for each car will determine the final placement of teams. The top three fastest cars, after all of the timed trials are complete, will compete in the final "head-to-head" race for first, second, and third place.
8. The judges will note the official time on the heat card. If the car does not finish the race, it will be noted as a Did Not Finish (DNF) on the heat card.
9. One team member must wait at the finish line to catch the vehicle.
10. Team members may not accompany or touch the vehicle on the track.
11. Vehicles stalled on the track may be retrieved after the end of the race has been declared by the Lead Track Judge.
12. The vehicle and team member must remain at the finish line until the time of the race has been noted on the heat card.
13. Lane changing or crossing will result in a DNF.
14. Challenges must be made before the race judges begin the next heat. All challenges must come from the team members who are actively competing and directed to the lead judge. The decisions of the race judges are final.
15. Judges will inspect cars prior to the final heat or at anytime during/after heats.
16. Awards will be given for speed, design, craftsmanship, innovation, and student choice.

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