

# Chemistry Olympics

Designed by *Alpha Chi Sigma Gamma Zeta*

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**Target Audience:** *Grades K-3*

**Event Goals:** *Outreach to local communities, spark interest in science for young audiences*

**Event Type:** *Outreach*

**Setting:** *Auditorium/Large open area*

**Time Frame:** *Year-round*

**Led by:** *College students*

**Approximate Cost:** *~\$100*

**Event Length:** *~30 min per class group*

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## **BRIEF DESCRIPTION**

*The Chemistry Olympics is an event designed for a group of university students to get involved with their local community in the form of a fun and engaging outreach event! This event was initially performed by the Gamma Zeta chapter of the Alpha Chi Sigma fraternity at California Polytechnic State University at a local elementary school for 6 groups of 25-30 kids (1st and 2nd grade). The format of the event is 5 stations, each with an interactive experience designed to engage the kids while teaching them some of the basic chemistry principles behind it. Emphasize asking probing questions to the kids to get them to think about the experiments a little harder.*

*Events include Elephant toothpaste, PPE relay race, slime-making, fake snow, CO<sub>2</sub> balloons, and emission lamp viewing. The ideal venue is a multi-purpose room or large open area such as a courtyard with 6 tables in a circuit. The class of 25-30 is split up into 5 groups that will rotate stations every 5 minutes (use your discretion), the last 5 minutes will be dedicated to a full-group demonstration of elephant toothpaste.*

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## **CHECKLISTS**

### **Prep Checklist (chronological):**

Ex:

- Get approval from the school/department to host the event.*
- Plan event (delegate committees, plan date/time/location)*
- Get approval from school district (see notes)*
- Reserve space at school for event (if no tables provided, source tables)*
- Buy Supplies*
- Organize transport of supplies*

### **Day-Of Event Checklist:**

Ex:

- Check in to school, have staff show you to reserved space*
- Set up*
- Perform event*
  - 5 interactive stations rotating every ~5 minutes, final 6th station is a demonstration with every kid*
- Clean up*

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## **COMMITTEE DESCRIPTIONS**

Logistics Committee 2-4 people	<ul style="list-style-type: none"> <li>● <i>Outline and plan event</i></li> <li>● <i>Organize rest of committees and volunteers before and during event</i></li> </ul>
Outreach Committee 1-2 people	<ul style="list-style-type: none"> <li>● <i>Primary point of contact with school district</i></li> </ul>
Fundraising Committee 1-3 people	<ul style="list-style-type: none"> <li>● <i>Funding project through fundraisers</i></li> <li>● <i>Reimburse people who purchase supplies for event</i></li> </ul>
Activities Committee 6-10 people	<ul style="list-style-type: none"> <li>● <i>Creating list of activities</i></li> <li>● <i>Designing the activity stations</i></li> </ul>
Inventory Committee 4-8 people	<ul style="list-style-type: none"> <li>● <i>Buying/sourcing supplies from stockroom</i></li> <li>● <i>Transporting supplies to event</i></li> </ul>

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### **GENERAL SUPPLIES**

<b><u>Item</u></b>	<b><u>Quantity</u></b>	<b><u>Where to Buy</u></b>
<i>White Glue</i>	<i>4 gallons</i>	<i>Office supply store</i>
<i>10% borax solution</i>	<i>3 gallons</i>	<i>Grocery store for borax powder, make solution with distilled water</i>
<i>Food Dye</i>	<i>2 boxes of 5 small bottles</i>	<i>Grocery store</i>
<i>Sandwich bags</i>	<i>130</i>	<i>Grocery store</i>
<i>Sharpie</i>	<i>1</i>	<i>Office supply store</i>
<i>Vapor Emission lamps</i>	<i>As many as possible, in this event we had Mercury, Xenon, Hydrogen, Helium, and Lithium</i>	<i>University stockroom</i>
<i>Diffraction grating lens glasses</i>	<i>6</i>	<i>University stockroom</i>
<i>16oz plastic water bottles (empty)</i>	<i>12</i>	<i>Grocery store</i>
<i>Balloons</i>	<i>1 bag or 12 balloons</i>	<i>Office supply/ party store</i>
<i>Baking Soda</i>	<i>1-2 boxes depending on size of event</i>	<i>Grocery store</i>

<i>White vinegar</i>	<i>1 gallon</i>	<i>Grocery store</i>
<i>Small funnel (to fit inside plastic bottles)</i>	<i>2-3</i>	<i>Walmart/automotive supply (for oil and such)</i>
<i>Gloves</i>	<i>2 boxes if disposable, 6 pair if reusable</i>	<i>Hardware store</i>
<i>Child-size labcoats</i>	<i>6</i>	<i>University stockroom</i>
<i>Eye protection</i>	<i>6</i>	<i>University stockroom</i>
<i>paper bowls</i>	<i>Large pack of ~100</i>	<i>Grocery store</i>
<i>Water</i>	<i>2 gallons</i>	<i>Can bring jug and fill on site, or buy at grocery store</i>
<i>Spoon</i>	<i>Can be reused, 6 minimum</i>	<i>Grocery store</i>
<i>Sodium polyacrylate powder</i>	<i>Depends on size of event, see notes for procedure</i>	<i>Online/walmart</i>
<i>Straw or toothpicks</i>	<i>Same as cups</i>	<i>Grocery store</i>
<i>Diaper (optional)</i>	<i>1 (for display)</i>	<i>Grocery store</i>
<i>Liquid Detergent</i>	<i>1 small bottle (~200mL)</i>	<i>Grocery store</i>
<i>30% H<sub>2</sub>O<sub>2</sub> solution</i>	<i>~500 mL</i>	<i>Grocery store</i>
<i>Saturated Potassium Iodide solution</i>	<i>~500mL</i>	<i>Chemical supply/ stockroom</i>
<i>Large 250mL graduated cylinder or similar</i>	<i>1</i>	<i>Chemical supply/ stockroom</i>
<i>*The highlighted items were provided in a kit pre-assembled by the chemistry stockroom at our University. See if your university has a similar kit available</i>		

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## **EVENT SPECIFIC NOTES/CONSIDERATIONS**

### **Important Notes**

- *The San Luis Obispo school district required **90 days** of notice for facility usage request*

- They also required an insurance certificate of \$1 million, this may vary depending on your local school district
- School district also required preliminary background checks for ALL volunteers, so ensure that event is at least structure before requesting the space

## **Experimental procedures**

### ***Slime-Making***

- have the children hold their plastic bags open
- pour about half a cup (3 oz cups) of glue into the bag
- Add food coloring (added by supervisors at station so kids clothes don't get stained)
- add a squirt of the borax solution
- Seal the bag for the children and have them mix by squeezing the bag and shaking it
- add more borax if needed (add more borax rather than too little so the children are not sticky)
- tell them not to open it until they get home (dont make teachers mad)
- write child's name on bag with a sharpie

**Learning Objective:** How does a borax solution change the physical properties of the glue? At the molecular level, how are the macromolecules that comprise white school glue changing to form slime?

### **Emission Lamps/Diffraction grating glasses**

- Give each child a pair of diffraction grating glasses, ask them to make observations as they look for light sources around the room
- Turn on one emission lamp, ask them to make observations
- Repeat for each lamp, kids should make predictions about what each lamp will look like (will it look the same or different?)

**Learning Objective:** Be able to make observations in a way that others can understand, introduce wavelength and how diffraction grating works (can be very broad)

### **CO<sub>2</sub> Balloons (WILL BE IN PAIRS)**

- Have the children scoop the baking soda (abt two teaspoons) into the
- balloon using the funnel
- Put ~5mL of vinegar into the plastic bottle
- Depending on the age group-ask them what might happen! See if they know, and if not, explain it to them
- Count to 3 and everyone holds up their balloon so the baking soda falls into the vinegar, blowing up the balloon
- take the balloon off and reuse if for the next children
- rinse out the water bottle if needed into a bucket and reuse it

**Learning Objective:** Introduce concepts of acid-base chemistry, CO<sub>2</sub> is formed as a product of the chemical reaction between baking soda (sodium bicarbonate) and vinegar (acetic acid).

### **PPE Race**

- Set up labcoats, goggles, and gloves on a coat hanger or wall however far away is best for your event
- Kids will race eachother to get to PPE, put it on, and come back

**Learning Objectives:** Familiarize with common PPE equipment. After the race, this station just becomes an opportunity to talk to the kids about the importance of protecting your body when performing experiments. Also serves as a “cool off” station if kids are getting too rowdy in earlier stations.

### **Fake Snow**

- This will be done by us like a demo at each station, but the kids can hold it and play with it
- Grab about a tablespoon of sodium polyacrylate powder (fake snow) and add to a paper bowl.
- Wear gloves. Let the students hold the bowl so they feel how heavy it is, tell them not to touch it
- Add a good amount of water to the cup and let it absorb
- Keep adding water until it stops being absorbed. Let the children hold the bowl again and see how heavy it is
- Try and squish out any excess water. Watch what happens! (the water should be fully absorbed by the powder-no water comes out)
- Let the children feel it; make sure to watch them and ensure they don't eat it

**Learning Objective:** Explain polymer swelling, Can use display diaper to explain that this is how diapers work, liquid is absorbed by beads of sodium polyacrylate

### **Elephant Toothpaste (WEAR EYE PROTECTION)**

- Ratios may depend on purity/concentration of reagents
- Add ~50mL of water to the graduated cylinder, along with ~10mL of H<sub>2</sub>O<sub>2</sub>.
- Add small amount of liquid detergent, and drip food coloring along sides of graduated cylinder to mimic toothpaste swirls
- Once ready, add potassium iodide
- It is helpful to do this experiment inside of a flattened trash bag so the clean up is easy and none of the foam gets on tables provided by the school.

**Learning Objectives:** Potassium iodide acts as a catalyst for the rapid degradation of H<sub>2</sub>O<sub>2</sub>, producing water and steam. Heat is released, so this gets VERY HOT!! Don't let the kids touch it, and have them keep a perimeter around the experiment.

### **SAFETY**

- *Do not allow kids to put anything from these experiments in their mouths*
- *Review SDS for*
  - *Sodium polyacrylate*
  - *30% hydrogen peroxide*
  - *Potassium iodide*
- *Emission lamps may contain hazardous vapours. Take care not to crack or break these lamps while on-site*