International Chemistry Competition

Edition of 2026

Qualification Round

A: Elements around Us (5 Points)

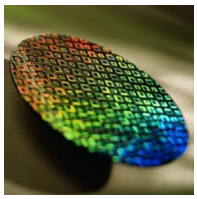
Chemical elements are the building blocks of all matter around us, from the air we breathe to the devices we use every day. Each element has unique properties that make it essential for different applications. Identify each element and its symbol from the pictures below:

Element _____

Symbol _____

Element _____

Symbol _____



Element _____

Symbol _____

Element _____

Symbol _____

Element _____

Symbol _____

Element _____

Symbol _____

Element _____

Symbol _____

Element _____

Symbol _____

B: Physical and Chemical Changes (5 Points)

During an ordinary day, you notice a series of changes happening in the world around you. Some of them only change the form of a substance, while others create something entirely new.

1. A steel bicycle left outside overnight develops a thin orange-brown layer after a rainy day.
2. A candle is lit in the evening and slowly gets shorter as it gives off light and heat.
3. A plastic bottle is squeezed flat and stays in that shape.
4. A block of chocolate melts in your hand on a warm day and becomes solid again later.
5. A gas stove is turned on and a blue flame appears above the burner.
6. A silver spoon stored for a long time in a kitchen drawer becomes dark and dull.

Problem: Determine whether each situation represents a *physical change* or a *chemical reaction*.

C: Molecular Shapes and Polarity (5 Points)

Understanding the three-dimensional shape of molecules helps predict their properties and behavior. Consider the following four molecules:

CH_4	NH_3	H_2O	CO_2
(methane)	(ammonia)	(water)	(carbon dioxide)

Problem: Draw the Lewis structure for each molecule, showing all bonding pairs and lone pairs of electrons. Determine whether each molecule is polar or nonpolar.

D: Balloon Filling (5 Points)

A school science club wants to fill identical balloons for a festival using oxygen they generate in the lab. Their oxygen comes from heating a white solid labeled *potassium chlorate*. The reaction written on the container is:

$$2\ KClO_3\ (s) \longrightarrow 2\ KCl\ (s) + 3\ O_2\ (g)$$

The club measures out 24.5 g of $KClO_3$ for the day's balloon-filling. Each balloon they use has a volume of 2.50 L when tied off, and the club assumes the oxygen behaves like an ideal gas at standard conditions for temperature and pressure.

Problem: How many balloons can the club fill completely with the oxygen produced, and approximately how many oxygen molecules will be inside one filled balloon?

E: Experiment with Cola, Rust, and Aluminum (5 Points)

People claim that rubbing rusted iron with aluminum foil and cola makes the rust disappear. For this problem, you will perform a simple experiment to test whether this is really chemistry, or just scraping. For the experiment you will need: *A rusty iron/steel object (nail, bolt, paperclip), cola (any brand), aluminum foil, water, 3 cups, paper towel, timer/phone*






Prepare three tests using similar rusty areas or three similar objects, while keeping time, liquid amount, and rubbing as similar as possible:

1. Cola + no rubbing
2. Cola + aluminum rubbing
3. Water + aluminum rubbing

Problem: Write a short protocol including: your observations (before/after description); which condition removes rust best; explanation of what rust is, what cola does chemically, and why aluminum might change the result compared to water.

Participation Instructions

- ✓ Write your solutions by hand on sheets of paper or type them on a computer.
- ✓ **Submit your solutions online by Sunday, 29 March 2026, 23:59 UTC+0**
  Website: `https://intchc.org/submission`
- ✓ You do not need to include the problem statements in your solution document.
- ✓ Show your work to receive full marks.
- ✓ Clearly label each problem and highlight your final answers.
- ✓ You need to score at least **15/17/20 points** as Junior/Youth/Senior to qualify for the Semi-Final Round. See `https://intchc.org/age-groups` for details.
- ✓ If you have questions, reach out to us at: `info@intchc.org`

Good Luck!