Potions

Grades: 4-5
Team Size: 1-2 competitors
Event Duration: 40 minutes
Supervisor: Anastasia Yocum

Brief Description:
Each team will answer questions about basic chemistry concepts and complete simple chemistry experiments including those related to environmental science, while exercising basic lab skills and safety procedures.

Concepts Covered
Lab safety, basic lab skills (weighing, measuring, transferring, filtering, chromatography), general chemistry (phases of matter, elements, compounds, mixtures, Bohr atomic model, periodic table of elements, periodic trends, pH, acids & bases, use of metric system, chemical reactions).

Rules/Competition Format
Each team has 40 minutes for the competition. The competition will consist of an experiment-based exam with related written questions in between. Each team will be given equipment and materials and instructed to perform several small experiments or observations. The questions will be presented in several formats including multiple choice, true/false, matching, fill in the blanks and short answers. Students will be graded on their lab skills as well as the correctness of their answers. It is highly recommended that teammates work together through the test. Teams will be given a ten-minute and a five-minute warning.

Scoring
- Scoring will be primarily based on the number of correct answers.
- Students will also be scored based on adherence to lab safety rules, accuracy and interpretation of the experimental results, and how well the students cleaned up their bench space.
- Completion time will **NOT** be considered in scoring.
- Any student not wearing proper lab safety equipment and protective clothing correctly during the event will automatically receive a point deduction. (Long pants, closed toe shoes, lab coats or long-sleeved shirts over their T-shirts, long hair pulled back, and gloves and goggles or safety glasses with side shields during the exam)

Tie Break Criteria
There will be several clearly marked tiebreaker questions, which will be graded only in the event of a tie between teams.

Materials Distributed by WESO

New chemistry lab kits were provided to all new and returning schools a few years ago. Please make sure you locate your kit and check that it is complete. A list of kit contents is below. Students will be expected to be familiar with all items in the kit. For 2025, WESO will replenish some consumable items for all schools. All necessary supplies will be provided by WESO for the competition day.

	WESO Potions Kit Contents	**Per school since 2015**
1	Polypropylene Beakers, 250ml	2
2	Flask, Erlenmeyer, 250ml	1
3	Polypropylene graduated cylinders, 50ml	2
4	Polypropylene graduated cylinders, 250ml	2
5	Weighing dishes	100
6	Spatulas	50
7	Transfer pipets	25
8	Gloves, small	1 box
9	Gloves, extra-small	1 box
10	pH indicator strips, 0-14 scale	100 strips
11	Funnel	1
12	Glass Rods	2
13	Filter paper	100 sheets
14	Plastic rack for 13mm diameter tubes	1
15	Polypropylene tubes, 13 X 100m	20
16	Safety goggles, small	4
17	50 ml tubes with Styrofoam rack, 25/rack	1
18	Container for storing	1
		Per school since 2019 and 2022
19	Chromatography paper strips	50
20	Iodine solution, 50ml	1
Notes	Popsicle sticks can be used as stirrers instead of glass rods	
	Coffee filters can be used instead of standard filter papers.	

Additional Materials Useful for Practices

The school is responsible for providing a balance for their coaching sessions.

Materials to be Brought to Competition

- Wear protective clothing (lab coats, long pants, close toed shoes, gloves, and safety goggles/glasses).
- Gloves will be supplied by WESO for the test.
- It is recommended that students get their own safety goggles from the school kit that we have provided (if needed, WESO can provide too).

****No cell phones or smart watches are allowed in event rooms. Participants who bring those items will be asked to leave them with the event supervisor for the duration of the event. Participants observed using them during the event will be disqualified.**

Study Guide

Students are expected to know the following:

Safety rules:

- Do not experiment on your own – always have an adult nearby.
- Read and follow all directions for your activity and use materials carefully. Read all warning labels on all materials being used.
- Wear protective clothing (lab coats, long pants, close toed shoes, gloves, and safety goggles/glasses).
- Long hair must be pulled back.
- When finished, clean up and dispose of all materials properly.
- Wash your hands after the activity.
- Never taste or directly smell any reagents.
- Keep materials away from your eyes.
- Never use any lab containers for food storage.
- Never eat or drink while conducting an experiment.
- Never play around/near chemicals.

Basic chemistry facts: Cover the following concepts at the level comparable to how it is explained at www.chem4kids.com. Excellent quizzes on this site. Only cover topics listed below.

- States of Matter: solid, liquid, gas
    - Do **NOT** need to know about plasmas and Bose-Einstein condensates
- Properties of solids, liquids, gases
    - Need to know the basic concepts of volume and density
- Transitions between phases: melting/freezing, evaporation/condensation, sublimation
- Law of Conservation of Matter/Mass
- Structure of matter: atoms, elements, molecules, compounds
- Basic atomic structure:
    - Electrons, protons, neutrons, nucleus
    - Identifying atomic and mass numbers, number of protons in an atom
    - Identifying elements based on Bohr atomic models

- Mixtures: Types of Mixtures
    - Homogeneous: solutions, alloys
    - Heterogeneous: suspensions, colloids, emulsions
    - Solutions: solutes, solvents
- Periodic table of elements: (Do not memorize! Students will be given a table)
    - Basic organization and information represented, understand the rationale behind periods and groups
    - General Understanding of characteristics of the families: Metals, Nonmetals, and Metalloids in periodic table
    - Basic elements:
        - Hydrogen, Oxygen, Nitrogen, Carbon, Aluminum, Sodium, Copper, Chlorine, Phosphorus, Sulfur, Helium, Argon
        - General Characteristics of these elements, group classification, where you would commonly find the element, physical state at room temperature, its pure form (solid, liquid, gas)
- Acids and Bases (**Brønsted-Lowry definition only**), pH scale
- Physical vs. Chemical Properties and Changes
- Principles and examples of renewable and non-renewable energy sources
- General Purpose of Clean Water Act
- 'Point' versus 'nonpoint' sources of waste water pollution

<u>Basic lab skills</u>:

- Use of the metric system: volume, weight
- Identification and appropriate use of glassware and all components of the Potions Kit provided to the school
- Weigh out powders using electronic balance.
- Measure liquid volumes using graduated cylinders.
- Pour liquids into narrow-mouthed containers (with and without using a funnel; practice with water).
- Use a pipet/dropper to measure and transfer small amounts of liquid.
- Filter solutions using funnel and paper filters.
- The only heat source to be used will be warm tap water.
- Estimate pH of liquids with pH indicator paper.
- Chromatography
- Identify powders by examining their physical or chemical properties. (For example: using solubility, color and pH to distinguish starch from salt from baking soda).
- Identify liquids by examining their physical or chemical properties (viscosity, pH, color, etc.).
- Separation of mixtures and solutions based on physical properties. (For example: how would you separate sand, salt and water from a bucket of sea water)

Additional topics for 5th Grade Only

- Chemical reactions (activation energy, reaction rates, equilibrium, reactants and

Products, equations, and stoichiometry)
- Ions (cations and anions) and Isotopes (what are they and how are they represented)
- Chemical Bonding (ionic vs. covalent)
- Periodic Trends:
    - Atomic Radius Trends
    - Metallic Character Trends
- Iodine Test

Additional Resources

Please use any material that you can find on the web/library that is appropriate for upper elementary to middle school. Some useful websites are listed below (activities are suitable for getting familiar with basic facts and chemistry techniques). Please note that some concepts have been covered in more depth than we expect and not all of the following may apply to all grades:

- What's Matter? - Crash Course Kids #3.1
- https://quizlet.com/526343157/basic-equipment-identification-chemistry-flash-cards/ (identification of labware and equipment – not all apply)
- https://www.sciencegeek.net/Chemistry/Presentations/Equipment/ (identification of labware and equipment – not all apply)
- http://www.uen.org/Lessonplan/preview.cgi?LPid=33067 (5 experiments of physical and chemical changes)
- http://www.uen.org/Lessonplan/preview.cgi?LPid=16252 (Blobber – chemical changes)
- http://www.uen.org/Lessonplan/preview?LPid=2176 (How to identify powders and liquids) (This is a great exercise but **do not have them taste the powders!)**
- http://www.uen.org/Lessonplan/preview.cgi?LPid=631 (Changes in matter)
- http://www.uen.org/Lessonplan/preview.cgi?LPid=2683 (Dissolving Salt – physical change)
- http://www.uen.org/Lessonplan/preview.cgi?LPid=16250 (What a Reaction)
- http://www.uen.org/Lessonplan/preview.cgi?LPid=639 (What's the Matter?)
- http://www.uen.org/Lessonplan/preview.cgi?LPid=2686 (Chemical reactions: Borax & Glue. Cream)
- http://www.acs.org/content/acs/en/education/whatischemistry/adventures-in-chemistry.html (3 experiments that are fun to watch and well explained)
- https://www.scitech.org.au/experiment/easy-ink-chromatography/ (Ink Chromatography)
- https://www.childrensmuseum.org/blog/saturday-science-incredible-iodine (Iodine Test for Starch)

? Event Questions

Please go to https://wesoscience.org/events/ for information on how to submit questions about this event to the supervisor.