

Science Olympiad Coaches Clinic 2003

PERIODICITY

Dr. Joseph Bularzik
Purdue University Calumet
(219) 989-2327
Bularzik@calumet.purdue.edu

Powerpoint presentation can be accessed through
www.calumet.purdue.edu
Click on Academic Program
Scroll down for School and Department Home Page
Click on Department of Chemistry and Physics
Click on Chemistry Faculty
Click on Joseph Bularzik
Click on Periodic pdf file

Some suggested activities for students to prepare for science olympiad:
Some of the activities are simple enough to do at home, and some will need a coach or teacher supervision and help.

Please e-mail for any further information or questions.

**Example Laboratories and Demonstrations
Laboratory Manuals**

The Heat Capacity of Metals
The Reactivity of Metals with Hydrochloric Acid
The Chemistry of Oxygen: Basic and Acidic Oxides and the Periodic Table
Chemistry in the lab 4th ed.
Robert, Hollenberg and Postma
Freeman

The Structure of Crystals- An Experiment Using Models
The Alkaline Earths and the Halogens – Two Families in the Periodic Table
Chemical Principles in the Lab 6th ed.
Slowinski, Walsey and Masterton
Saunders

Relative Chemical Activity of Some Metals
Basic Laboratory Studies in General Chemistry 10th ed.
Hered
Houghton Mifflin Co.

Relative Reactivity of Metals and the Activity Series
Chemical Periodicity of the Halide Ions
Standard and Microscale Experiments in General Chemistry
Bishop, Bishop and Whitten
Harcourt, Inc.

Activity Series
The Chemistry of Oxygen: Basic and Acidic Oxides and the Periodic Table
Lab Experiments for Brown and LeMay 4th ed.
Nelson and Kemp
Prentice Hall

Solubilities Within a Family
Experiments in General Chemistry 6th ed.
Wentworth
Houghton Mifflin Co.

Solubilities Within a Family
Experiments in General Chemistry 6th ed.
Ebbing and Wentworth
Houghton Mifflin Co.

STATION D

SCHOOL NAME: _____

Given three strips of metal: Copper, Magnesium and Zinc

Given three different metal salt solutions: Copper Nitrate, Magnesium Nitrate and Zinc Nitrate

Observe the nine beakers containing:

Magnesium nitrate solution

- A) Copper metal in magnesium nitrate solution
- B) Zinc metal in magnesium nitrate solution

Zinc nitrate solution

- C) Copper metal in zinc nitrate solution
- D) Magnesium metal in zinc nitrate solution

Copper nitrate solution

- E) Magnesium metal in copper nitrate solution
- F) Zinc metal in copper nitrate solution

List any evidence for a reaction in each of the six beakers containing a metal in a solution
If there is not evidence of a reaction, write "No Reaction"

Then list the three metals in order of increasing activity (From the least active to the most active)

BEAKER

OBSERVATIONS:

B _____

C _____

E _____

F _____

H _____

I _____

Order of activity

Lowest Activity

Higher Activity

Highest Activity

STATION F

SCHOOL NAME: _____

Given a Periodic Table

Answer these questions about elements and compounds

Give the electron configuration for the following elements:

P _____

Ne _____

Ca _____

Mn _____

Using arguments about the element's electron configuration and coulombs law attractions, explain why a fluorine atom has a smaller radius than a carbon atom, even though fluorine has more electrons.

Using arguments about trends of properties of elements, explain why elements on the left hand side of the periodic table form cations and elements on the right hand side of the periodic table form anions in ionic compounds, such as NaCl.

Using arguments about trends of properties of elements, explain why an ionic compound is often described as a close packed structure of anions with cations stuck in holes between the anions?

NATIONAL SCIENCE OLYMPIAD MAY 10, 2003

Activity Series Activity and Question:

Two 0.1 M solutions were found on another shelf in the stockroom, their labels were laying on the shelf near them. One bottle contains copper (II) chloride, the other contains aluminum nitrate. One has been colored to hide its identity. Use magnesium ribbon and an iron nail to determine the contents of each container.

Write reasons for your identification

Write balanced chemical reactions for your observations.

Bonding Type and Ionic Charge Activity and Question:

Use a conductivity probe to identify solutions of sugar, sodium chloride and calcium chloride.

Write reasons for your identification

Write balanced chemical reactions for your observations.

Periodic Table Questions:

A blank periodic table showing 26 spaces for the alkali metal, alkaline earth metals and the main group elements was given. 26 letters are used in place of the elemental symbols. Clues are given about each of the elements. The students must identify the elements and put them in the correct corresponding place on the periodic table.

Clues include:

Color and natural state of matter:

a red corrosive liquid or a smelly yellow powder found in period 3

Chemical property:

Is produced by green plants and is required for combustion

Periodic properties:

First ionization energy is the smallest of its group

Comparing Properties:

Atomic radius is smaller than L and larger than A

Has one more proton than V

Electron Configuration Question:

Write out electron configuration for elements and common ions (no transition metals)

Bonding Type Questions:

Identify bonding types: ionic, polar covalent or nonpolar covalent for several compounds.