Review -- Interim 1 Exam 2013

AKS Covered
- design and conduct scientific investigations (GPS, HSGT, ACT) (SCCH_A2005-1)
  - 1a - identify, develop and investigate questions/problems that can be answered through scientific inquiry
  - 1c - develop procedures for solving scientific problems (GPS)
  - 1d - collect, organize and record appropriate data (GPS)
  - 1f2 - recognize universal principles are discovered through observation and experimental verification and basic principles are the same everywhere (e.g., law of conservation of matter) (GPS)
- apply standard safety practices for all classroom laboratory and field investigations (GPS, HSGT) (SCCH_A2005-2)
  - 2a - follow correct procedures for use of scientific apparatus (GPS)
  - 2b - demonstrate appropriate techniques in all laboratory situations (GPS)
- apply computation and estimation skills necessary for analyzing data and developing conclusions (GPS, HSGT, ACT) (SCCH_A2005-5)
  - 5b - examine the possible effects of measurement errors on calculations (GPS)
  - 5c - explain the relationship between accuracy and precision (GPS)
  - 5d - express appropriate number of significant figures for calculated data, using scientific notation where appropriate (GPS)
  - 5e - solve scientific problems by substituting quantitative values, using dimensional analysis and/or simple algebraic functions as appropriate (GPS)
  - 5f - compare and analyze data points graphically and/or summary statistics (GPS)
- analyze the nature of matter and its classifications (GPS, HSGT) (SCCH_B2005-8)
  - 8a - identify substances based on chemical and physical properties/changes (GPS)
  - 8a1 - calculate density when given a means to determine mass and volume of a material
- evaluate the motion and behavior of atoms and molecules in chemical and physical processes (GPS, HSGT) (SCCH_B2005-13)

Chapters <u>1</u> and <u>2</u>

1. Identify the steps of the scientific method.

   Define:
   a) hypothesis   b) control   c) theory
   d) scientific law   e) independent variable   f) dependent variable

2. **Safety:**
   a) What types of safety clothing should be worn?
   b) What are the general rules for conducting lab experiments and reporting accidents?
   c) How do you rinse chemicals out of your eyes?
   d) How do you rinse chemicals off your clothes?

3. What lab equipment should be used to find each of the following?
   a) mass   b) volume   c) length   d) time   e) temperature

   What two things must all forms of measurement include?

   What are the SI Units of measurement for the following?

   a) mass   b) volume   c) length   d) time   e) temperature

4. **Define:**
   a) precision   b) accuracy   c) percent error
   d) density   e) quantitative data   f) qualitative data

   Give two examples of both quantitative and qualitative data.

Use the data table below to answer the following questions. The accepted value is 1.59 g/mL.

Density of Liquid in g/mL			
Trial	Group A	Group B	Group C
1	1.54	1.40	1.70
2	1.60	1.68	1.69
3	1.57	1.45	1.71
Average	**1.57**	**1.51**	**1.70**

5. Which set of data is most accurate?
6. Which set is precise but not accurate?
7. Which set is most precise?
8. Calculate the percent error for Group A.

9. Write the following numbers in standard (ordinary) notation

   a) 4.5×10^{-5} b) 8.7×10^{6}

10. Write the following numbers in scientific notation:

a) 238,000   b) 0.00072

Determine the number of significant figures in both (a) and (b) above.

11. Find density in g/mL of an object that has a volume of 70.0 mL and a mass of 21.0 g.

12. A 75-g rock is placed in 50.0 mL of water. The water rises to 70.0 mL. Calculate the density of the rock.

What process was used to find the volume of the rock?
What pieces of scientific equipment were used to determine the mass and volume of the rock?

13. Suppose that a sample of an element has a mass of 20.0 g and a volume of 5.00 mL. Which sample would have the same density as the element sample described?
a) 60.0 g and 25 mL   b) 30.0 g and 7.50 mL   c) 50.0 g and 15.0 mL

14. How do you read a graduated cylinder? What is the volume shown in the picture on the right?

Close-up view

Graduated
cylinder

15. What must all graphs have?

Which variable goes on the x-axis of a line graph? The y-axis?

Chapter 3

16. **Define**:

(a) physical change

(b) physical property

(c) chemical change

(d) chemical property

(e) substance

(f) matter

(g) Law of Conservation of Mass/Matter

17. Tell whether the following indicates physical or chemical changes.

a) cutting piece of plastic

b) rotting meat

c) water evaporating

d) dissolving salt in water

e) bubbles formed when vinegar (a weak acid) and baking soda are mixed

f) gold conducting electricity

g) magnesium burning

18. The "bubbles" formed in question 17e) are a sign of what?

What are indicators that a chemical change has taken place?

What is another name for a chemical change?

19. Define the terms *element* and *compound*. Give an example of each.

20. Distinguish between solids, liquids, and gases. Be sure to compare how the particles are packed, the degree of energy and movement of particles, and their shape and volume.

21. Tell whether the following mixtures are homogeneous or heterogeneous.

    a) salt water   b) clay and oil   c) sweet tea

    d) Kool-aid   e) vegetable soup   f) chunky peanut butter

    g) muddy water

22. What separation process would be used to separate the following mixtures?

    a) colors in black ink   b) salt water   c) sand and water

    d) iron filings and sulfur   e) two different liquids

23. Distinguish between solution, colloid, and suspension. Describe each in terms of particle size, Tyndall effect, clarity (cloudy/clear), and the tendency of particles to settle out. Give examples of each.

24. If 17 g of element X reacts with 10 g of element Y to form compound XY, what is the mass of the compound that is formed? What law does this obey?

Chapter 4 and 25

25. **Define**:
    a) atom   b) atomic number   c) isotope
    d) atomic mass unit   e) atomic mass   f) mass number
    g) transuranium element   h) half- life   i) radioactive decay

26. Distinguish between the three subatomic particles: proton, neutron, and electron. Give the charge, relative mass, and location of each.

27. The atomic number identifies the element and gives the number of _____ in an atom.

    a) What is the atomic number of the element on the right?

    b) How many protons and electrons are in a neutral atom of this element?

    c) What is the most common isotope of the element on the right?

    d) How many neutrons would this isotope have?

3
Li
6.941
Lithium

28. Find the number of protons and neutrons in the isotope shown on the right: $_{47}^{107}\text{Ag}$

    What is the name of this isotope?

29. How many neutrons are in an atom that has a mass number of 57 and atomic number of 26?

    Write the isotopic symbol for this element.

30. a) What are the 3 types of radiation and what are their symbols?

    b) What things can stop their penetration?

    c) Complete the following equations and determine the type of radiation emitted in each reaction.

    ① $_{88}^{226}\text{Ra} \rightarrow {}_{86}^{224}\text{Rn} + \text{?}$ ② $_{6}^{14}\text{C} \rightarrow {}_{7}^{14}\text{N} + \text{?}$ ⑤ $_{92}^{238}\text{U} \rightarrow {}_{2}^{4}\text{He} + \text{?}$

31. Distinguish between nuclear fission and fusion.

    Which one occurs in a nuclear power plant? Which one gave rise to all the elements on the periodic table?

32. Explain the pros and cons of nuclear energy as an alternative energy source compared to other energy sources.

33. Technetium-104 (Te-104) has a half-life of 18.0 minutes.
    a) How much of a 165.0-g sample would be left after 90.0 minutes?
    b) If there are 2.50 mg of Te-104 remaining after 2 half-lives have passed, how much was present at the beginning?

34. What is a practical application of half-life? What isotope is commonly used for this?

35. Magnesium has three isotopes: Mg-24, Mg-25, and Mg-26. If the atomic mass of magnesium is 24.3050 amu, which isotope is in the greatest abundance? How do you know?

Chapter 5

36. **Define**:
    a) atomic orbital   b) energy sublevel   c) ground state   d) electron configuration,
    e) valence electron   f) atomic emission spectrum   g) excited state

37. a) What are the four energy sublevels/orbitals?

    b) Describe their shape.

    c) Determine the maximum number of electrons each sublevel can hold

38. Write both the standard and shortened (noble gas) electron configuration for the following elements.

    a) lithium   b) neon   c) Al   d) Ca

    Which of these elements would have the most stable electron configuration and why?

39. Draw an orbital diagram for the following elements.

    a) silicon   b) fluorine   c) sodium

    Where are the valence electrons for each of these elements found?

40. Determine the number of valence electrons for the following elements.
    a) beryllium   b) nitrogen   c) argon   d) sulfur   e) boron
    Draw Lewis Dot structures for each of these elements.

41. What is the practical application for knowing an element's atomic emission spectrum? Explain how this spectrum is produced, using the Flame Test Lab.

42. Identify the element based on the electron configuration endings given.

    a) $4p^1$ b) $5s^2$ c) $6p^6$ d) $7s^1$

43. What do elements in the same group on the periodic table have in common?