556-430

Physical Science 430
LaurenHill Academy

Mid -year Exam

January 2005

Allowed materials: Non-graphing Calculator, included periodic table

Instructions: Answer all questions in the answer booklet provided. See more detailed instructions within each section.

Time: 1 hour

1. Unlike atomic numbers, atomic masses do *not* increase steadily throughout the periodic table.

    Which of the following best explains why this is so?

A) The number of protons increases irregularly.
B) The number of electrons increases irregularly.
C) Both the number of protons and electrons increase irregularly.
D) The number of neutrons increases irregularly.
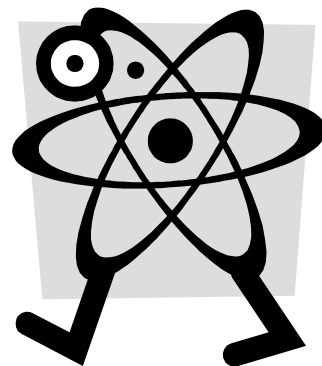
2. The element chromium, Cr, has four stable isotopes:

Isotope	Natural Abundance (%)
^{50}Cr	4
^{52}Cr	x
^{53}Cr	y
^{54}Cr	2

Given that the average atomic mass of Cr is 52.00, what are the % abundances for ^{52}Cr and ^{53}Cr?

A) x = 92 and y = 2

B) x = 90 and y = 4

C) x = 88 and y = 6

D) x = 86 and y = 8

3.   Which of the following is **TRUE?**

A)   Among second period elements, lithium has the highest electronegativity.
B)   Radium's numerous shells raise its electronegativity.
C)   Beryllium's two valence electrons are responsible for its high electronegativity.
D)   Oxygen's high electronegativity is due to its "appetite" for electrons.

4.   What is the mass of a 0.25 mole sample of calcium phosphate, $Ca_3(PO_4)_2$?

A) 2.2×10^1 g

B) 7.8×10^1 g

C) 3.1×10^2 g

D) 1.2×10^3 g

5.   Which of the following is most likely to form a covalent bond with oxygen?

A)   Ca

B)   He

C)   Na

D)   N

6.   What is the charge of the polyatomic ion HSO_4 in $Al(HSO_4)_3$?

A)   +3

B)   -3

C)   -1

D)   +4

7.   Use a dot structure to reveal the covalent bonds in C_2H_2.

8.   Calculate the mass of a single *molecule* of Cl_2.

9.   Which atom has a bigger atomic volume, Li? or Ne? Explain.

10.   Element X has 6 valence electrons. Element Y has 7 valence electrons. State what kind of elements are involved (metal/non-metal) and predict a reasonable formula for the compound formed when X reacts with Y. Show work.

11.   **Balance** the following equation to predict how many moles of CO_2 will be released when 13 moles of octane, C_8H_{14}, burn.

        $$C_8H_{14} + \qquad O_2 \rightarrow \qquad CO_2 + \qquad H_2O$$

12.   a. What specific observation in Rutherford's experiment led to the conclusion that the nucleus is positively charged?
        b. What specific observation in Rutherford's experiment led to the conclusion that the nucleus is extremely small?

13.   Propane burns according to the following equation:

        $$C_3H_{8(g)} + 5\ O_{2(g)} \rightarrow 3\ CO_{2(g)} + 4\ H_2O_{(g)} + energy$$

        What mass of CO_2 and H_2O will be produced for every 40.0 g of oxygen that react?

14.   If 45.00 ml of solution contains 0.025 g of $Ca(OH)_2$, what is its concentration in moles/L?