

Physical Science 430
LaurenHill Academy

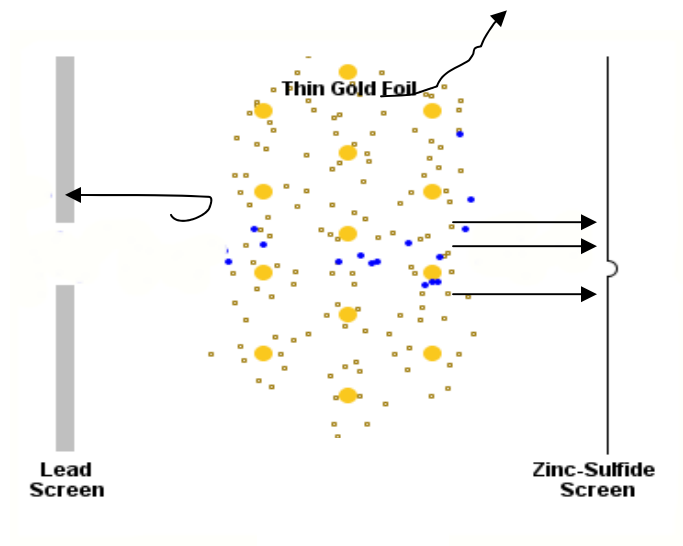
Mid -year Exam

January 2007

Allowed materials: Non-graphing Calculator, included periodic table

Instructions: Answer all questions on the questionnaire itself. The mark total is 100.

Time: 1 hour



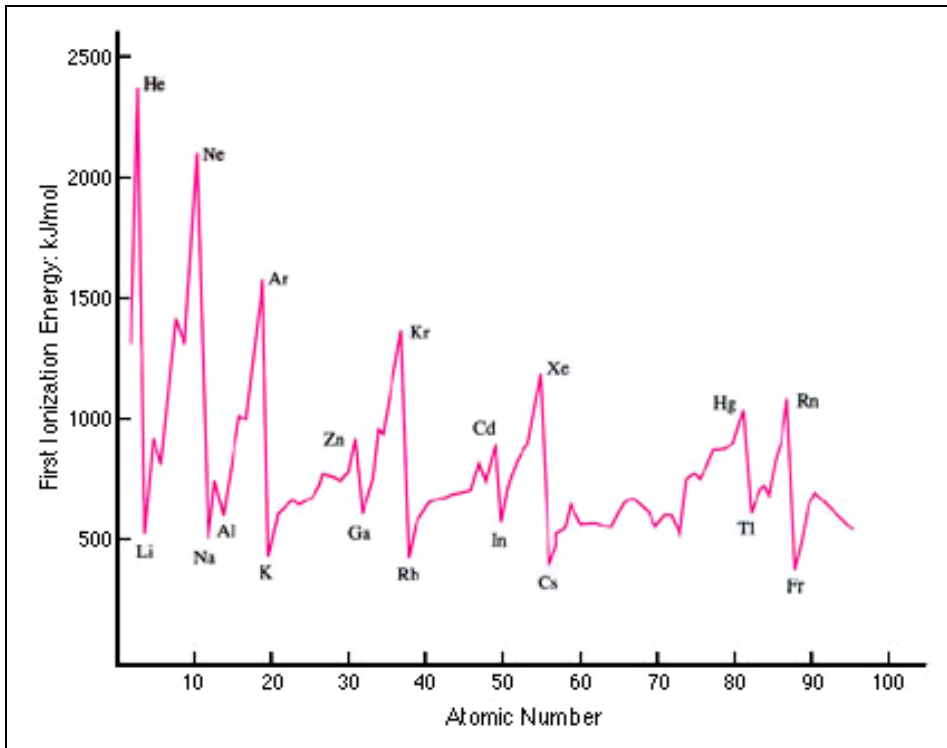
1. In Rutherford's experiment (refer to the above diagram)....
 - a) why did most alpha particles go right through the gold foil?

 - b) why were a few scattered at wide angles?

 - c) why did a few particles come right back towards their source?

(3 marks each)

2. The above graph of ionization energy versus atomic number reveals how difficult it is to ionize noble gases.



- Which **noble gas** has the lowest ionization energy? _____
- Which **family** of the periodic table has the lowest ionization energies? _____
- In which periodic trend would you **not** see the noble gases listed? _____
- In the second period (from Li to Ne included), which atom is the smallest? _____

(3 marks each)

3. Use dot structures to explain how Ca reacts with Cl to produce calcium chloride.

In this box show the reaction using dot structures.

Now show the ionic product with the charges of each ion.

Write a balanced chemical equation to show what happened with the appropriate chemical formula for the product calcium chloride.

(3 marks each)

4. Carbon has the ability to bond to itself repeatedly while also bonding to other atoms.
Respect the octet rule in using dot structures to show how **3 carbon atoms** can form **two** different compounds **with hydrogen**. (5 marks each)

--	--

5. Atomic masses of elements in the periodic table are due to the relative abundance of isotopes in nature.

Calculate the average atomic mass of an element from the data provided in the table below.

Isotope	Mass number (u)	Natural abundance (%)
1	288	48.89
2	290	37.81
3	295	13.30

(5 marks)

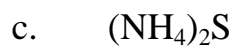
6. Explain the difference between ionic and covalent bonding. Tell me as much as you know. (6 marks)

7. Let's say that the **average atomic mass** of fictitious element X is 315.013. We are told that the isotope with a mass of 313 accounts for 32.9% of all X.

What is **mass** of **three moles** of the only other existing isotope?

(5 marks)

8. Calculate molar mass.



(3 marks each)

9. Match the following **types of radiation with the correct property from the list on the right hand-side.** (3 marks each)

1. alpha_____
2. gamma_____

Properties

a. fast, negatively charged lightweight particles
b. essentially helium nuclei
c. highly energetic electromagnetic radiation
d. a fast-moving neutron

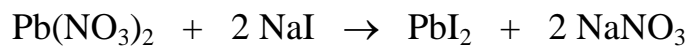
10. Predict the formula of the compound containing the following ions:

NH_4^+ and PO_4^{-3} (3 marks)

11. What is the charge of the Fe ion in FeSO_4 ? Show work. (4 marks)

12. The density of alcohol ($\text{C}_2\text{H}_6\text{O}$) is 0.76 g/cm^3 . How many molecules are there in 1 cm^3 of alcohol? (5 marks)

13. When lead nitrate, $\text{Pb}(\text{NO}_3)_2$, reacts with a solution of sodium iodide (NaI) a yellow precipitate (lead iodide, PbI_2) is produced.

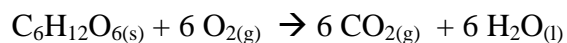


How many moles of yellow PbI_2 will form if a total of 8.0 grams of NaI react?
(5 marks)



14. Glucose, $\text{C}_6\text{H}_{12}\text{O}_6$, is often used by cells as an energy source.

The ***balanced*** equation for the aerobic breakdown of this sugar is:



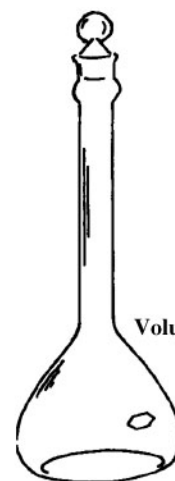
If in a reaction, 120.0 grams of $\text{C}_6\text{H}_{12}\text{O}_6$ are oxidized, how many grams of oxygen will be consumed?
(6 marks)

15.

- A technician had 5.0 L of a solution containing 2.0 g of NaOH.
- He removed part of it and transferred it to a 500 mL flask.
- He added water to the 500 mL mark and mixed it.
- In doing so, he created a 0.001 mole/L solution.

How much did he remove from the 500 mL flask?

(6 marks)



Volumetric Flask