Chemistry I-H

Unit 1: Atomic Theory & Nuclear Chemistry

Test Qualifier

**DIRECTIONS**: Complete the following qualifier in its entirety. The purpose of a qualifier is to “qualify” you for completion of a reassessment. This document is consistent with the rules and regulations of the CMS Reassessment/Remediation Grading Policy.

**I. Atomic Theory**

1. Atomic Theory Timeline:

In the space provided below, create an atomic theory timeline. Your timeline should include the following scientists: Empedocles, Bohr, Millikan, Rutherford, Thomson, Dalton, Aristotle, and Chadwick. Your timeline should include his: (1) contribution to the Modern Atomic Theory, (2) discovery year, and (3) country of origin. Your timeline should be neat and organized. It does not have to be to scale.

2. Subatomic particles True / False

For the following statements determine if they are true or false. If the statement is false, rewrite the statement so that it is true.

(a) T – F The number of electrons is always equal to the atomic number because the electrons are the provide the identity of the element.

(b) T – F The number of neutrons in an isotope may be found by subtracting the atomic number from the mass number.

(c) T – F Isotopes of an element differ in their number of electrons.

(a) T – F When an atom forms a positive ion (a cation) the number of electrons lost is equal to the number in the exponent of the atom (i.e. Ca2+ will lose 2 electrons).

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3. Atomic Theory Chart:

Complete the following chart. For the shaded gray boxes describe (in depth) in the space below how you arrived at these conclusions.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Isotopic Name | Symbol | Z | A | p+ | n0 | e- |
| silicon – 28  |  |  |  |  |  |  |
| palladium – 115  |  |  |  |  |  |  |
| iron – 56 (cation, 3+) |  |  |  |  |  |  |
| polonium – 212 (anion, 2-) |  |  |  |  |  |  |

Explanations

4. Average Atomic Mass:

(a) Define isotopic abundance and average atomic mass. What is the difference between these two terms?

For the next couple of problems, explain how you would solve these problems. Do not attempt to solve for a numerical answer.

(b) An element M has two isotopes. One of the isotopes has a percentage abundance of 35.6245%. What is the average atomic mass of this element?

(c) Another element – G – has three isotopes: G-105, G-109, and G-110. The average atomic mass of element G has an average atomic mass of 107.8682. The heaviest isotope is three times larger than the lightest. The middle isotope is known to be 17.896%. What is the percent abundance of the lightest isotope?

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**II. Nuclear Chemistry**

5. Write the complete nuclear reaction for the following:

uranium-235 emits an alpha \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

thorium-231 emits a beta and a gamma \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

protactinium-231 emits an alpha and a gamma \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

actinium-227 emits a beta \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Th-227 emits an alpha and a gamma \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ra-223 emits an alpha \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Rn-219 emits an alpha \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Po-215 emits an alpha and a gamma \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The product from above emits a beta \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The product from above emits an alpha \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The product from above emits a beta and a gamma\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. From the nuclear reactions above give an example of each of the four types of nuclear reactions and explain why these are the type of reaction you chose.