NAME \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_

Subatomic Particles and Isotopes

1. Classify the following as: element, compound, homogeneous mixture, or heterogeneous mixture.
2. Lead b. vitamin water c. snickers bar d. carbon dioxide
3. Complete the following table to describe properties of subatomic particles.

|  |  |  |  |
| --- | --- | --- | --- |
| Subatomic particle | Relative mass | Relative Charge | Location in atom |
| Proton |  |  |  |
| Neutron |  |  |  |
| Electron |  |  |  |

1. In the space provided, show the relationships and equations needed to calculate the following:

Nuclear Symbol (show what the top and bottom number represent) =

Atomic Number = Neutrons =

Mass Number = Electrons =

Protons = Atomic Charge=

Nuclear Charge =

3.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Element**  **name** | **Nuclear symbol** | **Atomic #** | **Mass #** | **# of protons** | **# of electrons** | **# of**  **neutrons** | **Atomic**  **Charge** | **Nuclear Charge**  **(charge of nucleus)** |
| Calcium | 41 Ca2+ | 20 | 41 | 20 | 18 | 21 | 2+ | 20+ |
|  | 54 Fe |  |  |  | 26 | 28 |  |  |
| Sulfur |  |  | 34 |  |  |  | 2- |  |
|  |  | 53 | 130 |  | 54 |  |  |  |
|  |  |  | 58 | 27 |  |  | 2+ |  |
|  | 39 Ar |  |  |  |  | 21 | 0 |  |
|  |  | 7 |  |  |  | 7 | 3- |  |
| Sodium |  |  | 24 |  | 10 |  |  |  |
|  | 36 Cl1- |  |  |  |  | 19 |  |  |
|  |  |  | 65 | 30 |  |  | 2+ |  |
|  |  | 2 |  |  |  | 2 | 0 |  |

Answer the following questions and ***show your work*** if a calculation is required.

1. Complete the table by describing the work or theory of each scientist:

|  |  |  |
| --- | --- | --- |
| John Dalton | J.J. Thomson | Ernest Rutherford |
| 4 Components of Atomic Theory | Cathode Ray Experiment and Discover | Gold Foil Experiment and Discovery |

1. How are **isotopes** of the same elements alike? Different?
2. How are **ions** of the same element alike? Different?
3. The atomic mass of Cl-35 is 34.968 and the atomic mass of Cl-37 is 36.956. Cl-35 has an abundance of 75.53% and Cl-37 has an abundance of 24.47%. Calculate the average atomic mass of chlorine.
4. Manganese is composed of two stable isotopes: Mn-54 and Mn-57. Use the periodic table and predict which of these isotopes is more abundant? Explain your prediction.
5. When a sample of neon is run through a mass spectrometer there are three peaks for each of the three neon isotopes: Ne-20, Ne-21, and Ne-22. The masses and abundances of the three isotopes are in the following table.

|  |  |  |
| --- | --- | --- |
| **Isotope** | **Mass** | **Abundance** |
| Ne-20 | 19.984 | 90.92% |
| Ne-21 | 20.911 | .257% |
| Ne-22 | 21.996 | 8.823% |

Calculate the average atomic mass of neon.

1. Draw a labeled diagram of a mass spectrometer and explain how the isotopes are separated and how the masses are measured.