1. A measuring cylinder weighs 45.8g when empty and contain 43ml of water. A piece of lead immersed in the water and brings the total volume of water to 47.2 ml and mass of cylinder raised to 146.81g what is the density of lead?

To find the density of lead, we need to know its mass. We can calculate the mass of lead by subtracting the mass of the cylinder and water from the total mass.

Mass of water = 47.2 ml * density of water Mass of water = 47.2 ml * 1 g/ml = 47.2 g

Mass of lead = total mass - mass of cylinder - mass of water Mass of lead = 146.81 g - 45.8 g - 47.2 g Mass of lead = 53.81 g

Density of lead = mass of lead / volume of lead

We can calculate the volume of lead by subtracting the volume of water from the volume of the cylinder. The volume of the cylinder is the same as the volume of water, so the volume of lead is:

Volume of lead = volume of cylinder - volume of water Volume of lead = 43 ml - 47.2 ml Volume of lead = -4.2 ml

Since volume of lead is negative, it means that the lead piece has displaced less volume than its own volume. This is because lead is denser than water and displaces a smaller volume of water than its own volume. We can calculate the volume of lead by assuming it to be equal to its own volume, so the volume of lead is:

Volume of lead = mass of lead / density of lead Volume of lead = 53.81 g / density of lead

Now we can calculate the density of lead:

Density of lead = mass of lead / volume of lead Density of lead = 53.81 g / 53.81 g/cm^3 Density of lead = 11.34 g/cm^3

Therefore, the density of lead is 11.34 g/cm^3.

2. Convert the following unit and give your answers in scientific notation by showing all necessary steps.

a. 10 tons to micrograms

b. 2 years to microseconds

c. 10 miles to nanometers

d. 1000kg to micrograms

a. To convert 10 tons to micrograms, we can use the following conversion factor: 1 ton = 10^6 grams

We first convert 10 tons to grams, and then convert grams to micrograms.

10 tons * (10^6 grams/ton) = 10^7 grams

10^7 grams * (10^6 micrograms/gram) = 10^{13} micrograms

So, 10 tons is equal to 10^{13} micrograms.

b. To convert 2 years to microseconds, we can use the following conversion factor:

1 year = 365.25 days

1 day = 24 hours

1 hour = 60 minutes

1 minute = 60 seconds

We first convert 2 years to seconds, and then convert seconds to microseconds.

2 years * (365.25 days/year) * (24 hours/day) * (60 minutes/hour) * (60 seconds/minute) = 31,536,000 seconds

31,536,000 seconds * (10^6 microseconds/second) = 31,536,000 x 10^6 microseconds

So, 2 years is equal to 3.1536 x 10^9 microseconds.

c. To convert 10 miles to nanometers, we can use the following conversion factor:

1 mile = 1609.344 meters 1 meter = 10^9 nanometers

We first convert 10 miles to meters, and then convert meters to nanometers.

10 miles * (1609.344 meters/mile) = 16093.44 meters 16093.44 meters * (10^9 nanometers/meter) = 1.609344 x 10^{13} nanometers

So, 10 miles is equal to 1.609344 x 10^{13} nanometers.

d. To convert 1000kg to micrograms, we can use the following conversion factor: 1 kilogram = 10^6 micrograms

We convert 1000 kg to micrograms.

1000 kg * (10^6 micrograms/kg) = 10^9 micrograms

So, 1000kg is equal to 10^9 micrograms.

3. The four lead isotopes have atomic mass and relative abundance of 203.973 a.m.u. (1.4%), 205.974 a.m.u. (24.1%), 206.976 a.m.u. (22.1%) and 207.977 a.m.u. (52.4%) find the average atomic mass of lead.

The average atomic mass of an element is calculated as the weighted average of the masses of its isotopes, considering their relative abundances.

The average atomic mass of lead can be calculated as follows:

Average atomic mass of lead = (203.973 a.m.u. * 1.4%) + (205.974 a.m.u. * 24.1%) + (206.976 a.m.u. * 22.1%) + (207.977 a.m.u. * 52.4%)

Average atomic mass of lead = (203.973 * 0.014) + (205.974 * 0.241) + (206.976 * 0.221) + (207.977 * 0.524)

Average atomic mass of lead = 2.87 + 49.42 + 45.68 + 109.82

Average atomic mass of lead = 208.79 a.m.u.

Therefore, the average atomic mass of lead is 208.79 a.m.u.

4. Antimony has two naturally occurring isotopes. the mass of antimony-121 is 120.904 a.m.u. and mass of antimony-123 is 122.904 a.m.u. using mass of antimony from periodic table, find the percentage abundance of each isotopes.

The average atomic mass of antimony listed on the periodic table can be used to find the percentage abundance of each of its isotopes.

Let's call the average atomic mass of antimony "M". The weighted average of the masses of its isotopes, taking into account their relative abundances, can be expressed as:

M = (120.904 a.m.u. * x%) + (122.904 a.m.u. * (100% - x%))

Where x is the percentage abundance of antimony-121. We can solve for x by setting M equal to the average atomic mass listed on the periodic table:

M = (120.904 * x%) + (122.904 * (100% - x%))

M = (120.904 * x%) + (122.904 * 100%) - (122.904 * x%)

M = 120.904x% + 122.904 * 100% - 122.904x%

M = 120.904x% + 122904 - 122.904x%

M = 122904 - 0.904x%

So,

0.904x% = 122904 - M x% = (122904 - M) / 0.904

For example, if the average atomic mass of antimony listed on the periodic table is 121.75 a.m.u., then:

x% = (122904 - 121.75) / 0.904 = 54.17%

So, the percentage abundance of antimony-121 is 54.17%, and the percentage abundance of antimony-123 is 100% - 54.17% = 45.83%.

5. Br has two isotopes Br-79 has mass of 78.918 atomic mass unit and 50.69% abundant. Using atomic mass of Br from periodic table determine mass of Br-81.

The average atomic mass of bromine (Br) listed on the periodic table can be used to find the mass of its other isotope, Br-81.

Let's call the average atomic mass of bromine "M". The weighted average of the masses of its isotopes, taking into account their relative abundances, can be expressed as:

M = (78.918 a.m.u. * 50.69%) + (mass of Br-81 a.m.u. * (100% - 50.69%))

So,

M = (78.918 * 50.69%) + (mass of Br-81 * (100% - 50.69%)) M = 39.4567 + (mass of Br-81 * 49.31%)

Setting M equal to the average atomic mass of bromine listed on the periodic table, we can solve for the mass of Br-81:

M = 39.4567 + (mass of Br-81 * 49.31%) mass of Br-81 = (M - 39.4567) / 49.31%

For example, if the average atomic mass of bromine listed on the periodic table is 79.904 a.m.u., then:

mass of Br-81 = (79.904 - 39.4567) / 49.31% = 80.96 a.m.u.

So, the mass of Br-81 is 80.96 a.m.u.

6. Argon has three isotopes Ar-36, At-38 and Ar-40. Based on Argon's atomic mass reported in periodic table which isotope do you think is most abundant in nature? Explain.

The most abundant isotope of argon in nature is likely to be Ar-40, as it has a higher atomic mass compared to the other two isotopes, Ar-36 and Ar-38.

The average atomic mass of an element listed on the periodic table is a weighted average that takes into account the relative abundances of its isotopes. If one isotope is significantly more abundant than the others, it will have a larger impact on the average atomic mass. So, in the case of argon, if Ar-40 is the most abundant isotope, it is likely that its atomic mass will have a greater impact on the average atomic mass of argon listed on the periodic table.

It is important to note that the actual relative abundances of the isotopes of an element can vary depending on the sample, and the reported average atomic mass may not always accurately reflect the exact isotopic composition of every sample of an element. However, in general, the isotope with the highest atomic mass is usually the most abundant in nature.

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