Atomic Mass, Number of atoms, and the Mole

1. What is the atomic mass and the molar mass of iron, Fe? Use the correct units for each.

The atomic mass is 55.845 μ
The molar mass is 55.845 g/mol

2. How many atoms are in 65.34 g of silicon, Si?

g → mole → atoms

28.0855 g = 1 mole and 1 mole = 6.02 x 10^{23} atoms

$$65.34\ g \times \frac{mole}{28.0855\ g} \times \frac{6.02 \times 10^{23}\ atoms}{1\ mole} = 1.401 \times 10^{24}\ atoms$$

3. A 1.55 g sample of element X has 1.28 x 10^{22} atoms. What is the identity of element X?

$$\text{Atomic mass in g/mol} = \frac{1.55\ g}{1.28 \times 10^{22}\ atoms} \times \frac{6.02 \times 10^{23}\ atoms}{1\ mol} = 72.89\ g/mol$$

X = germanium, Ge

4. How many grams are in 2.65 moles of nitrogen?

moles → g and 1 mole of N = 14.0067 g

$$2.65\ mol \times \frac{14.0067\ g}{1\ mol\ N} = 37.1\ g\ N$$

5. How many moles are in 23.26 g of sodium? How many sodium atoms is this?

g → mole and mole → atoms

22.99 g = 1 mole and 1 mole = 6.02 x 10^{23} atoms

$$23.25\ g \times \frac{1\ mol}{22.99\ g} = 1.01\ mol\ Na$$

$$1.01\ mol \times \frac{6.02 \times 10^{23}\ atoms}{1\ mol} = 6.08 \times 10^{23}\ atoms$$