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CHMG-141 GENERAL & ANALYTICAL CHEMISTRY I
With Dr. Bailey

Group members: _____

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Recitation
Week 2

Key Skills: (Ch. 1)

- **Working with atomic numbers, mass numbers, and Isotope symbols**
- **Calculating atomic weight**
- **Converting between Moles and numbers of atoms**
- **Converting between mass and amount (in Moles)**
- **Nuclear reactions**

1). Working with the Periodic table:

a) Name the third-period noble gas Argon (Ar)

b) Name the 5-th period alkaline earth metal Strontium (Sr)

c) Name the ~~second~~ Third-period halogen Clorine (Cl)

second period halogen – Fluorine (F)

2). Which of the following pairs of elements do you expect to be most similar? Why?

a) N and Ni
b) Mo and Sn
c) Na and Mg
d) Cl and F ← Cl and F are halogens, group 7A; they have the same number (7) of valence electrons.
e) Si and P

3). What element is defined by the following information?

a) p+ = 50, n° = 20, e- = 50 a) Tin (Sn), Z = 50

b) p+ = 13, n° = 14, e- = 10 b) Aluminum Al (Al^{+3} ion)

Z = 13

4). Write symbols for the following isotopes:

a) Polonium-210 $^{210}_{84}Po$

b) Z = 27 and A = 60 $^{60}_{27}Co$

5) Given the following nuclear notations:

$_{9}F^{19}$ $_{32}Ge^{73}$ $_{9}F^{18}$ $_{27}Co^{59}$ $_{44}Nb^{93}$

a) Which one has 32 protons? $^{73}_{32}Ge$

b) Which one has the same number of neutrons as it has protons? $_{9}F^{18}$ (9 protons, 18 − 9 = 9 neutrons)

c) Which one has an incorrect atomic number? $_{44}Nb^{93}$ (Nb has Z = 41)

d) Which two are isotopes?

e) Which one has 41 neutrons? $_{32}Ge^{73}$ (73 − 32 = 41)

→ $_{9}F^{19}$ and $_{9}F^{18}$

6). Rubidium has two naturally occurring isotopes with the following masses and natural abundance:

Isotope	Mass (amu)	Abundance	contribution
Rb-85	84.9118	72.15	0.7215 × 84.9118 = 61.26 amu
Rb-87	86.9092	27.85	0.2785 × 86.9092 = 24.20 amu

Calculate the atomic weight of rubidium

Total = 85.46 amu

7). Calculate:

a) How many moles of nickel are in 44.03 grams?

$$44.03\ g\,Ni \times \frac{1\ mol\,Ni}{58.69\ g\,Ni} = \boxed{0.7502\ mol\ Ni}$$

b) What is the mass of 9.041×10^{24} lithium atoms?

$$9.041 \times 10^{24}\ at.\,Li \times \frac{1\ mol\,Li}{6.022 \times 10^{23}\ at.\,Li} \times \frac{6.94\ g\,Li}{1\ mol\,Li} = \boxed{104.2\ g\,Li}$$

c) How many grams of Ca are in 4.55 moles?

$4.55 \text{ mole Ca} \times \frac{40.08 \text{ g Ca}}{1 \text{ mole Ca}} = \boxed{182 \text{ g Ca}}$

d) 27.92 grams of iron are how many atoms of iron?

$27.92 \text{ g Fe} \times \frac{1 \text{ mole}}{55.85 \text{ g Fe}} \times \frac{6.022 \times 10^{23} \text{ atoms}}{1 \text{ mole}} = \boxed{3.010 \times 10^{23} \text{ atoms Fe}}$

e) There are how many moles are in 18.0×10^{21} atoms of Pt?

$18.0 \times 10^{21} \text{ at. Pt} \times \frac{1 \text{ mole}}{6.022 \times 10^{23} \text{ at. Pt}} = \boxed{3.00 \times 10^{-2} \text{ mole Pt.}}$

Problem 8: You have a piece of copper that is 9.36 cm long, 7.23 cm wide and 0.95 mm thick. Density of copper is 9.00 g/cm^3

How many atoms of copper are in this piece of copper?

The strategy:

1. Find mass of the piece of copper (dimentions→volume→mass)
2. Find how many moles of copper are in this sample
3. Find how many atoms of copper are in this sample

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Problem 9: Recently, there has been concern about pollution in the home from radon, a radioactive gas whose elemental molar mass is 222 g/mol. The Environmental Protection Agency believes that a level of radon of 3.6×10^{-17} g/L of air is unhealthy. At this level,

1. How many moles of radon would there be in a living room whose volume is 2455 L?
2. How many atoms is this?

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Problem 10:

(a) $^{126}_{50}Sn \rightarrow {}^{0}_{-1}e + ?$
(b) $^{210}_{88}Ra \rightarrow {}^{4}_{2}He + ?$
(c) $^{77}_{37}Rb \rightarrow {}^{0}_{1}e + ?$
(d) $^{76}_{36}Kr + {}^{0}_{-1}e \rightarrow ?$

Radium ↓ Tin ← β-Radiation ← electron.

a) $^{126}_{50}Sn \rightarrow {}^{0}_{-1}e + {}^{126}_{51}Sb$ ← Antimony

α-Radiation

b) $^{210}_{88}Ra \rightarrow {}^{4}_{2}He + {}^{206}_{86}Rn$ ← Radon

c) $^{77}_{37}Rb \rightarrow {}^{0}_{1}e + {}^{77}_{36}Kr$ → positron Emission

d) $^{76}_{36}Kr + {}^{0}_{-1}e \rightarrow {}^{76}_{35}Br$

Electron capture

Problem 8: You have a piece of copper that is 9.36 cm long, 7.23 cm wide and 0.95 mm thick. Density of copper is 9.00 g/cm^3
How many atoms of copper are in this piece of copper?

The strategy:

1. Find mass of the piece of copper (dimensions→volume→mass)
2. Find how many moles of copper are in this sample
3. Find how many atoms of copper are in this sample

(1) $V = 9.36\,cm \times 7.23\,cm \times \left(0.95\,mm \times \frac{10^{-1}\,cm}{1\,mm}\right) = 6.43\,cm^3$

$mass = 6.43\,cm^3 \times 9.00\,\frac{g}{cm^3} = 57.9\,g$

(2) $\#\,moles = 57.9\,g \times \frac{1\,mole\,Cu}{63.55\,g} = 0.910\,mole$

(3) $\#\,atoms = 0.910\,mole \times \frac{6.022 \times 10^{23}\,atoms}{1\,mole} = 5.5 \times 10^{23}\,atoms$

Problem 9: Recently, there has been concern about pollution in the home from radon, a radioactive gas whose elemental molar mass is 222 g/mol. The Environmental Protection Agency believes that a level of radon of 3.6×10^{-17} g/L of air is unhealthy. At this level,

1. How many moles of radon would there be in a living room whose volume is 2455 L?
2. How many atoms is this?

$$\#\,moles = \left(3.6 \times 10^{-17}\,\frac{g}{L} \times 2455\,L\right) \times \frac{1\,mol}{222\,g} =$$

$$= 3.98 \times 10^{-16}\,mole$$

$$\#\,atoms = 3.98 \times 10^{-16}\,mole \times \frac{6.022 \times 10^{23}\,atoms}{1\,mole}$$

$$= 2.4 \times 10^{8}\,atoms$$