IB: The Mole Day 4 4/18/2017

1 nucleon (proton/neutron) mass = 1.67×10^{-24} g

6.02×10^{23} nucleons = mass = 1 gram

Result: 6.02×10^{23} is Avogadro's Number (N_A)

Avogadro's number (a mole) of nucleons has a mass of 1 gram, so the mass of a mole of molecules will equal the mass number in units grams

Ex. Find the mass of

1 mole of CO_2 ⟹ 44 grams

Problem w/ Video using H_2O 2+2+16 = 20 grams

$^{16}_{8}O$ $^{12}_{6}C$ 12 + 16 + 16 = 44

Time 4:34 Question 1 The mole is defined as

Solution defined in terms of number of particles

Choice B

Time 5:57 Question 2 What is the mass of C-12 that contains the same number of atoms as 14g of Silicon-28

Silicon-28 So 1 mole has mass 28 g

If only have 14g you only have .5 moles

C-12 → 12 grams but .5 moles leads to 6 grams

Time 7:05 Question 3

Have 6 grams of C If 6 grams (.5 moles) is 2x Oxygen → .25 moles

.5 mole 4 grams

Choice C

Tue
7:59

Question #4 The density of copper is $8.96\ g\,cm^{-3}$ and its molar mass is $63.5\ g\,mol^{-1}$

Conversions

$8.96\ g = 1\ cm^3$

$63.5\ g = 1\ mole$

$6.23 \times 10^{23}\ atoms = 1\ mole$

a) Find the mass of an atom of Copper

b) Find the # of copper atoms per m^3

a) Want

$$\frac{grams}{atom} \quad \frac{63.5\ g}{mol} \times \frac{1\ mole}{6.23 \times 10^{23}\ Atoms} = 1.05 \times 10^{-22}\ g/atom$$

b) Want

$$\frac{atoms}{m^3} \quad \frac{1\ Atom}{1.05 \times 10^{-22}\ g} \times \frac{8.96\ g}{1\ cm^3} \times \frac{1{,}000{,}000\ cm^3}{1\ m^3}$$

$(100\ cm)^3 = 1\ m^3$

$1\ m^3 = 1{,}000{,}000\ cm^3$

$= 8.5 \times 10^{28}\ Atoms/m^3$