**The Mole and Molar Mass**

**Press Release!**

Scientists have, through countless hours of research and experimentation, derived a remarkable new constant: the mole. This number was derived to represent a specific number of particles. Study the exciting, highlighted conclusion in the box below:

**1 mole = 6.022 x 1023 particles**

It is expected to be the breakthrough discovery that will change life and laws if chemistry and physics, as we know them, forever!

**Your Task**

As with any new scientific discovery, this one must be exposed to the rigorous testing of the scientific community. Can this constant withstand such scrutiny?

1. Use the periodic table to complete the following calculations.

1 mole of carbon = atoms of carbon

= g

Therefore, one mole of carbon has a mass of g/mol.

1 mole of gold = atoms of gold

= g

Therefore, one mole of gold has a mass of g/mol.

1 mole of water = molecules of water

= g

Therefore, one mole of water has a mass of g/mol.

1. Use your calculations from question 1 to complete the table below. The scientific community – no, the world! – Thanks you. I thank you.

|  |  |  |  |
| --- | --- | --- | --- |
| **Substance** | **No. of moles** | **Mass** | **No. of Particles** |
| carbon | 2 mol |  |  |
|  |  | 6.2x1024 |
|  |  | 4.0x1018 |
| 7.5 mol |  |  |
| gold | 22 mol |  |  |
| 5 mol |  |  |
|  |  | 2.10x1026 |
|  |  | 1.3 x 1013 |
| water | 0.4 mol |  |  |
|  |  | 6.0 x 106 |
|  |  | 7.5x1045 |
| 12 mol |  |  |

1.    How many moles of Na are in 42 g of Na?

2.    How many moles of O are in 8.25 g of O?

3.    How much does 2.18 mol of Cu weigh?

4.    What is the mass of 0.28 mol of iron?

5.    How many atoms are in 7.2 mol of chlorine?

6.    How many atoms are in 36 g of bromine?

7.    How many moles are in 1.0 x 109 atoms?

8.    What is the mass of 1.20 x 1025 atoms of sulfur?

9.    How many moles of CO molecules are in 52 g of CO?

10.    How many moles of C2H6 are in 124 g?

11.    How many moles of CCl4 are there in 56 g?

12.    How much does 2.50 mol of H2SO4 weigh?

13.    How much does 0.25 mol of Fe2O3 weigh?

14.    How many molecules are there in 52 g of CO?

15.    How many formula units are in 22.4 g SnO2?

16.    How many molecules are in 116 g CCl4?

17.    What is the mass of 3.01 x 1023 formula units of Fe2O3?

18.    What is the mass of 1.2 x 1025 molecules of CO?

19.    How many O atoms are in 1.25 mol of SO2?

20.    How many moles of O atoms do you have when you have 1.20 x 1025 N2O5 molecules?

21.    How many formula units are in 5.33 mol of CuCl2?

22.    How many copper atoms are in 5.33 mol of CuCl2?

23.    How many moles of Cl atoms are in 5.33 mol of CuCl2?

24.    How many moles of CuCl2 contain 1.2 x 1023 atoms of Cl?

25.    How many O atoms are in 3.15 mol of SnO2?

26.    How many H atoms are in 17.5 g (NH4)2C2O4?

Answers

1.    1.8 mol Na   
2.    0.516 mol O   
3.    139 g Cu   
4.    16 g Fe   
5.    8.7 x 1024 Cl atoms   
6.    2.7 x 1023 Br atoms   
7.    1.7 x 10-15 mol   
8.    639 g S   
9.    1.9 mol   
10.    4.12 mol   
11.    0.36 mol   
12.    245 g   
13.    40. g   
14.    1.1 x 1024 molecules   
15.    8.95 x 1022 formula units   
16.    4.54 x 1023 molecules   
17.    79.9 g Fe2O3   
18.    5.6 x 102 g CO   
19.    1.51 x 1024 O atoms   
20.    99.7 mol O   
21.    3.21 x 1024 formula units   
22.    3.21 x 1024 Cu atoms   
23.    10.7 mol of Cl atoms   
24.    0.10 mol CuCl2   
25.    3.79 x 1024 O atoms   
26.    6.79 x 1023 H atoms