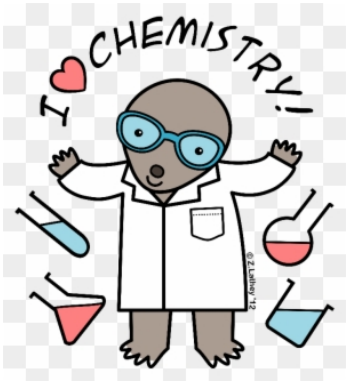
MASTERING THE MOLE



Another look at a *tricky*…but
***VERY* IMPORTANT**…

Chemistry 11 concept

FOR EACH QUESTION, THOROUGHLY SHOW ALL WORK,
AND DEMONSTRATE CLEARLY HOW THE UNITS CANCEL IN YOUR SOLUTION.

1. If you have 48 cinnamon buns, how many dozen is that?

48 cinnamon buns X $\frac{1 \text{ dozen}}{12 \text{ cinnamon buns}}$ = 4.0 dozen (2 significant figures)

2. If you have 6 chocolate croissants, how many dozen is that?

6 croissants X $\frac{1 \text{ dozen}}{12 \text{ croissants}}$ = 0.5 dozen (1 significant figure)

The Number 12 is not counted in significant figures, as it is a "set" value.
Only the "6" is used to determine the number of sig figs to report in the answer.

3. If a ream of paper is 500 sheets of paper, and a shipment contains 226 reams of paper, then how many sheets of paper are in the shipment?

226 reams X $\frac{500 \text{ sheets}}{1 \text{ ream}}$ = 113, 000 sheets of paper (3 significant figures)

The Number 500 is not counted in significant figures, as it is a "set" value

4. If 1.00 mole of atoms is equivalent to 6.02×10^{23} atoms, then how many atoms are in 3.25 moles?

3.25 moles X $\frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mole}}$ = 1.96×10^{24} atoms (3 significant figures)

5. A beaker contains 4.97×10^{35} molecules of water. How many moles is that?

4.97×10^{35} molecules X $\frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ molecules}}$ = 8.26×10^{11} moles (3 significant figures)

6. What is the atomic mass of Sn? (sometimes we use the term MOLAR mass. This is just a generic way of saying atomic mass).

118.711 g / mole

7. 118.71 g of Tin is equivalent to how many moles?

$118.71\ g \times \frac{1\ mole}{118.711\ g} = 0.999991576\ldots = 1.0000\ mole$

(5 significant figures, since our periodic table provides so many digits)

8. How many tin atoms are in 118.71 g of Tin?

$1.0000\ mole \times \frac{6.02 \times 10^{23}\ atoms}{1\ mole} = 6.02 \times 10^{23}\ atoms$ (3 significant figures)

9. What is the mass of a single Tin atom?

$\frac{118.711\ g}{1\ mole} \times \frac{1\ mole}{6.02 \times 10^{23}\ atoms} \times \frac{1\ Sn\ atom}{} = 1.97 \times 10^{-22}\ g$

(3 significant figures)

10. What is the molecular mass of ammonia gas (NH_3)? (sometimes we use the term MOLAR mass. This is just a generic way of saying molecular mass).

14.007 = 3(1.008) = 17.031 g / mole

BTW, the molecules you should just KNOW are:

Water, Carbon dioxide, methane, and ammonia.

11. How many moles of Platinum are there in 315 g?

$315\ g \times \frac{1\ mole}{195.085\ g} = 1.61\ mol$ "mol" is the short form for MOLES

12. How many ATOMS are there in 315 g of Platinum?

$315\ g \times \frac{1\ mole}{195.085\ g} \times \frac{6.02 \times 10^{23}\ atoms}{1\ mole} = 9.72 \times 10^{23}\ atoms$

13. How many molecules in 521 g of water?

$521\ g \times \frac{1\ mole}{18.015\ g} \times \frac{6.02 \times 10^{23}\ molecules}{1\ mole} = 1.74 \times 10^{25}\ molecules\ of\ water$

14. If you have 10 donuts, and each donut has 8 chocolate chips on top, how many chocolate chips do you have in total?

10 donuts x $\frac{8 \text{ chocolate chips}}{1 \text{ donut}}$ = 80 chocolate chips

15. How many carbon atoms are there in ONE molecule of aluminum oxalate?

$Al_2(C_2O_4)_3$ contains 6 carbon atoms

16. If you have 1.00 moles of aluminum oxalate, how many molecules will there be?

1.00 mole = 6.02×10^{23} molecules

17. If you have the number of molecules (**from #16**) of aluminum oxalate, how many carbon atoms will there be?

6.02×10^{23} molecules X $\frac{6 \text{ carbon atoms}}{Al_2(C_2O_4)_3 \text{ molecule}}$ = 3.61×10^{24} Carbon Atoms

18. If you have this number of molecules (from #16) of aluminum oxalate, how many oxygen atoms will there be?

ONE molecule X $\frac{12 \text{ oxygen atoms}}{Al_2(C_2O_4)_3 \text{ molecule}}$ = 7.22×10^{24} Oxygen Atoms

19. What is the mass of one molecule of magnesium sulphide?

1 molecule X $\frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ molecules}}$ X $\frac{56.371 \text{ g}}{1 \text{ mole}}$ = 9.36×10^{-23} grams

20. If you have 8.62×10^{21} molecules of carbon dioxide, what would the mass of that sample be?

8.62×10^{21} molecules X $\frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ molecule}}$ X $\frac{44.009 \text{ g}}{1 \text{ mole}}$ = 0.630 g

LET's STEP IT UP A NOTCH:

21. If you have 4.13×10^{37} zinc atoms in a sample of zinc phosphate, how many molecules of zinc phosphate would you have?

4.13×10^{37} Zinc atoms X $\frac{1\ Zn_3(PO_4)_2 \text{ molecule}}{3 \text{ Zinc atoms}}$ = 1.38×10^{37} $Zn_3(PO_4)_2$ molecules

There is no short form for the word molecules ☹

22. If 42 g of NO_2 gas takes up 71 litres of space (at certain temperature and pressure conditions), then what is the density of the gas?

$\frac{42\ g}{71\ L}$ = 0.59 g / L

23. If a 63.42L sample, that contains 3.01×10^{23} molecules, has a density of 1.26 g / L, then what is the identity of the molecule?

$\frac{1.26\ g}{L}$ X 63.42 L = 79.9 g

3.01×10^{23} molecules X $\frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ molecule}}$ = 0.500 moles

$\frac{79.9\ g}{0.500 \text{ moles}}$ = 159.8 g / mole This is liquid Bromine!!!! Br_2 (ℓ)