

MOLE CALCULATIONS WORKSHEET

1. 1 mole = 6.022×10^{23} objects (these can be anything). *A mole is like a dozen.* This definition of a mole is called Avogadro's Number. It is used as a conversion factor to convert from mol \rightarrow objects (e.g. atoms) and objects (e.g. atoms) \rightarrow mol.
2. Chemical formulas show the mole ratio between atoms in a compound or molecule. For example, the mole ratio of carbon in a molecule of CO_2 is 1:1 and the mole ratio of oxygen is 2:1. This is written like this: 1 mole C = 1 mole CO_2 and 2 mole O = 1 mole CO_2 . These mole ratios are used as conversion factors.
3. The coefficients in a balanced chemical reaction also show the mole ratios of the compounds reacting and the products. For example $2\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$ shows that 2 mol of hydrogen reacts with 1 mol of oxygen to produce one mole of water. This is written like this 2 mol H_2 = 1 mol O_2 and 2 mol H_2 = 1 mol H_2O and 1 mol O_2 = 1 mol H_2O . These are used as conversion factors, along with the molar mass (see below) to calculate the number of grams of all the substances involved in a chemical reaction.
4. 1 mole of a substance also has mass. This is called the molar mass. The molar mass of a molecule is its formula weight determined by adding up the atomic weights of all the atoms in its formula. For example, the molar mass of CO_2 is 44.01 grams. This is written as 1 mole CO_2 = 44.01 g. Molar masses are used as conversion factors to convert from g \rightarrow mol and from mol \rightarrow g.

Use this information to do the calculations on the next page.

1. How many moles are in 1.0×10^9 atoms?
2. How many formula units are in 5.33 mol of CuCl_2 ?
3. How many moles of Cl atoms are in 5.33 mol of CuCl_2 ?
4. How many O atoms are in 3.15 mol of SnO_2 ?
5. How many atoms are in 7.2 mol of chlorine?
6. How many copper atoms are in 5.33 mol of CuCl_2 ?
7. How many moles of CuCl_2 contain 1.2×10^{23} atoms of Cl?
8. How many O atoms are in 1.25 mol of SO_2 ?
9. How many moles of O atoms do you have when you have 1.20×10^{23} N_2O_5 molecules?
10. How many moles of Na are in 42 g of Na?
11. How many moles of O are in 8.25 g of O?
12. How many moles of C_2H_6 are in 124 g?
13. How many moles of CO molecules are in 52 g of CO?
14. How much does 2.18 mol of Cu weigh?
15. What is the mass of 0.28 mol of iron?
16. How many moles of CCl_4 are there in 56 g?
17. How much does 2.50 mol of H_2SO_4 weigh?
18. How much does 0.25 mol of Fe_2O_3 weigh?
19. How many molecules are there in 52 g of CO?
20. How many formula units are in 22.4 g SnO_2 ?
21. How many molecules are in 116 g CCl_4 ?
22. How many H atoms are in 17.5 g $(\text{NH}_4)_2\text{C}_2\text{O}_4$?
23. What is the mass of 1.20×10^{25} atoms of sulfur?
24. What is the mass of 3.01×10^{23} formula units of Fe_2O_3 ?
25. What is the mass of 1.2×10^{23} molecules of CO?
26. How many atoms are in 36 g of bromine?

- ✓ 1. How many moles are in 1.0×10^9 atoms? $1.7 \times 10^{-15} \text{ mol}$
- ✓ 2. How many formula units are in 5.33 mol of CuCl_2 ? $3.21 \times 10^{24} \text{ form. units}$
- ✓ 3. How many moles of Cl atoms are in 5.33 mol of CuCl_2 ? $10.66 \text{ mol Cl atoms}$
- ✓ 4. How many O atoms are in 3.15 mol of SnO_2 ? $3.79 \times 10^{24} \text{ O atoms}$
- ✓ 5. How many atoms are in 7.2 mol of chlorine? (Cl_2) $8.7 \times 10^{24} \text{ Cl atoms}$
6. How many copper atoms are in 5.33 mol of CuCl_2 ? $3.21 \times 10^{24} \text{ Cu atoms}$
- ✓ 7. How many moles of CuCl_2 contain 1.2×10^{23} atoms of Cl? 0.10 mol CuCl_2
8. How many O atoms are in 1.25 mol of SO_2 ? $1.5 \times 10^{24} \text{ atoms O}$
9. How many moles of O atoms do you have when you have 1.20×10^{23} N_2O_5 molecules?
- ✓ 10. How many moles of Na are in 42 g of Na? 1.8 mol Na
- ✓ 11. How many moles of O are in 8.25 g of O? 0.516 mol O
- ✓ 12. How many moles of C_2H_6 are in 124 g? $4.12 \text{ mol C}_2\text{H}_6$
13. How many moles of CO molecules are in 52 g of CO? $52 \text{ g CO} \times \frac{1 \text{ mol}}{28.01 \text{ g}} = 1.9 \text{ mol CO}$
14. How much does 2.18 mol of Cu weigh? $2.18 \text{ mol Cu} \times \frac{63.55 \text{ g}}{1 \text{ mol}} = 138 \text{ g Cu}$
15. What is the mass of 0.28 mol of iron? 16 g Fe
16. How many moles of CCl_4 are there in 56 g? 0.36 mol CCl_4
17. How much does 2.50 mol of H_2SO_4 weigh? $245 \text{ g H}_2\text{SO}_4$
18. How much does 0.25 mol of Fe_2O_3 weigh? $40. \text{ g Fe}_2\text{O}_3$
- ✓ 19. How many molecules are there in 52 g of CO? $1.12 \times 10^{24} \text{ molecules}$
- ✓ 20. How many formula units are in 22.4 g SnO_2 ? $8.95 \times 10^{22} \text{ form. units SnO}_2$
21. How many molecules are in 116 g CCl_4 ? $4.54 \times 10^{23} \text{ molecules}$
- ✓ 22. How many H atoms are in 17.5 g $(\text{NH}_4)_2\text{C}_2\text{O}_4$? $6.80 \times 10^{23} \text{ H atoms}$
23. What is the mass of 1.20×10^{23} atoms of sulfur? (S) 638 g S
24. What is the mass of 3.01×10^{23} formula units of Fe_2O_3 ? $79.8 \text{ g Fe}_2\text{O}_3$
25. What is the mass of 1.2×10^{23} molecules of CO? 560 g CO
26. How many atoms are in 36 g of bromine? Br_2 $2.7 \times 10^{23} \text{ Br atoms}$