

Molar Conversions Worksheet

1. How many moles does 80.0 grams of H_2O represent?

$$\text{H}_2\text{O} = 2(1.01) + 16 = 18.02 \text{ g mol}^{-1}$$

$$\frac{80.0 \text{ g}}{18.02 \text{ g mol}^{-1}} = 4.4 \text{ mol}$$

2. How many moles does 22.0 grams of CO_2 represent?

$$\text{CO}_2 = 12 + 2(16) = 44 \text{ g mol}^{-1}$$

$$\frac{22 \text{ g}}{44 \text{ g mol}^{-1}} = 0.5 \text{ mol}$$

3. What is the mass of 5.0 moles of $\text{Ba}(\text{CN})_2$?

$$\text{Ba}(\text{CN})_2 = 137.2 + 2(12) + 2(14) = 189.2 \text{ g mol}^{-1}$$

$$5 \text{ mol} (189.2 \text{ g mol}^{-1}) = 946 \text{ g}$$

4. What is the mass of 3.5 moles of water?

$$\text{H}_2\text{O} = 2(1.01) + 16 = 18.02 \text{ g mol}^{-1}$$

$$3.5 \text{ mol} (18.02 \text{ g mol}^{-1}) = 63.1 \text{ g}$$

5. How many molecules are in 0.25 moles of CH_4 ?

$$0.25 (6.02 \times 10^{23}) = 1.51 \times 10^{23} \text{ molecules}$$

6. How many sodium ions are in 3.0 moles of NaCl ?

$$3 (6.02 \times 10^{23}) = 1.8 \times 10^{24} \text{ ions}$$

7. Convert 3.01×10^{23} molecules of C_2H_6 to moles.

$$\frac{3.01 \times 10^{23}}{6.02 \times 10^{23}} = 0.5 \text{ mol}$$

8. How many moles of glucose do 1.2×10^{24} molecules represent?

$$\frac{1.2 \times 10^{24}}{6.02 \times 10^{23}} = 2.0 \text{ mol}$$

9. What would be the mass of 1.20×10^{24} molecules of water?

$$\frac{1.2 \times 10^{24}}{6.02 \times 10^{23}} = 2 \text{ mol}$$

$$\text{H}_2\text{O} = (1.01)2 + 16 = 18.02 \text{ g mol}^{-1}$$

$$2 \text{ mol} (18.02 \text{ g mol}^{-1}) = 36 \text{ g}$$

10. How much mass does 1.51×10^{22} atoms of neon represent?

$$\frac{1.51 \times 10^{22}}{6.02 \times 10^{23}} = 0.025$$

$$\text{Ne} = 20.2 \text{ g mol}^{-1}$$

$$0.025 \text{ mol} (20.2 \text{ g mol}^{-1}) = 0.51 \text{ g}$$

11. How many molecules does 36.0 grams of water represent?

$$\text{H}_2\text{O} = 2(1.01) + 16 = 18.02 \text{ g mol}^{-1}$$

$$\frac{36 \text{ g}}{18.02 \text{ g mol}^{-1}} = 2.0 \text{ mol}$$

$$2.0 (6.02 \times 10^{23}) = 1.2 \times 10^{24} \text{ molecules}$$

12. How many atoms does 3.0 grams of carbon represent?

$$\text{C} = 12 \text{ g mol}^{-1}$$

$$\frac{3 \text{ g}}{12 \text{ g mol}^{-1}} = 0.25 \text{ mol}$$

$$0.25 (6.02 \times 10^{23}) = 1.5 \times 10^{23} \text{ atoms}$$

13. Calculate the mass of 1.58 moles CH_4 .

$$\text{CH}_4 = 12 + 4(1.01) = 16.04 \text{ g mol}^{-1}$$

$$1.58 (16.04 \text{ g mol}^{-1}) = 25.3 \text{ g}$$

14. How many molecules are there in a 0.00583 mole sample of H_2O ?

$$0.00583 (6.02 \times 10^{23}) = 3.51 \times 10^{21} \text{ molecules}$$

15. How many molecules are in a 35.0 gram sample of H_2O ?

$$\text{H}_2\text{O} = 2(1.01) + 16 = 18.02 \text{ g mol}^{-1}$$

$$\frac{35 \text{ g}}{18.02 \text{ g mol}^{-1}} = 1.9 \text{ mol} = 1.14 \times 10^{24} \text{ molecules}$$

16. How many grams are in 4.5 mole lithium oxide (Li_2O)?

$$\text{Li}_2\text{O} = 2(6.94) + 16 = 29.88 \text{ g mol}^{-1}$$

$$4.5 \text{ mol} (29.88 \text{ g mol}^{-1}) = 134.5 \text{ g}$$

17. How many molecules are in 23 moles of oxygen?

$$23 (6.02 \times 10^{23}) = 1.4 \times 10^{25} \text{ molecules}$$

18. How many moles are in 3.4×10^{23} molecules of sulfuric acid (H_2SO_4)?

$$\frac{3.4 \times 10^{23}}{6.02 \times 10^{23}} = 0.56 \text{ mol}$$

19. How many molecules are in 25 gram of ammonia (NH_3)?

$$\text{NH}_3 = 14 + 4(1.01) = 18.04 \text{ g mol}^{-1}$$

$$\frac{25 \text{ g}}{18.04 \text{ g mol}^{-1}} = 1.39 \text{ mol}$$

$$1.39 (6.02 \times 10^{23}) = 8.4 \times 10^{23} \text{ molecules}$$

20. How many grams are in 8.2×10^{22} molecules of (dinitrogen hexaiodide) N_2I_6 ?

$$\frac{8.2 \times 10^{22}}{6.02 \times 10^{23}} = 0.136 \text{ mol}$$

$$\text{N}_2\text{I}_6 = 2(14) + 6(126.9) = 789.4 \text{ g mol}^{-1}$$

$$0.136 (789.4 \text{ g mol}^{-1}) = 107.4 \text{ g}$$

21. How many moles are in 25g of sodium chloride (NaCl)?

$$\text{NaCl} = 23 + 35.5 = 58.5 \text{ g mol}^{-1}$$

$$\frac{25 \text{ g}}{58.5 \text{ g mol}^{-1}} = 0.43 \text{ mol}$$

22. How many moles are in 125g of sulfuric acid (H_2SO_4)?

$$\text{H}_2\text{SO}_4 = 2(1.01) + 32.1 + 4(16) = 98.12 \text{ g mol}^{-1}$$

$$\frac{125 \text{ g}}{98.12 \text{ g mol}^{-1}} = 1.27 \text{ mol}$$

23. How many moles are in 100. g of potassium permanganate (KMnO_4)?

$$\text{KMnO}_4 = 39.1 + 54.9 + 4(16) = 158 \text{ g mol}^{-1}$$

$$\frac{100 \text{ g}}{158 \text{ g mol}^{-1}} = 0.633 \text{ mol}$$

24. How many moles are in 74g of potassium chloride (KCl)?

$$\text{KCl} = 39.1 + 35.5 = 74.6 \text{ g mol}^{-1}$$

$$\frac{74 \text{ g}}{74.6 \text{ g mol}^{-1}} = 0.99 \text{ mol}$$

25. How many moles are in 35g of copper sulfate pentahydrate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$)?

$$\text{CuSO}_4 \cdot 5\text{H}_2\text{O} = 63.5 + 32.1 + 4(16) + 10(1.01) + 5(16) = 249.7 \text{ g mol}^{-1}$$
$$\frac{35 \text{ g}}{249.7 \text{ g mol}^{-1}} = 0.14 \text{ mol}$$

26. How many grams are in 2.5 moles of sodium chloride (NaCl)?

$$\text{NaCl} = 23 + 35.5 = 58.5 \text{ g mol}^{-1}$$

$$2.5 (58.5 \text{ g mol}^{-1}) = 146.3 \text{ g}$$

27. How many grams are in 0.50 moles of sulfuric acid (H_2SO_4)?

$$\text{H}_2\text{SO}_4 = 2(1.01) + 32.1 + 4(16) = 98.12 \text{ g mol}^{-1}$$

$$0.5 (98.12 \text{ g mol}^{-1}) = 49.1 \text{ g}$$

28. How many grams are in 1.7 moles of potassium permanganate (KMnO_4)?

$$\text{KMnO}_4 = 39.1 + 54.9 + 4(16) = 158 \text{ g mol}^{-1}$$

$$1.7 (158 \text{ g mol}^{-1}) = 268.6 \text{ g}$$

29. What is the mass of one mole of $\text{C}_2\text{H}_6\text{O}$ (ethanol)?

$$\text{C}_2\text{H}_6\text{O} = 2(12) + 6(1.01) + 16 = 46.06 \text{ g}$$

30. Calculate the mass of 1.02×10^{24} molecules of strontium oxide (SrO).

$$\frac{1.02 \times 10^{24}}{6.02 \times 10^{23}} = 1.69 \text{ mol}$$

$$\text{SrO} = 87.6 + 16 = 103.6 \text{ g mol}^{-1}$$

$$1.69 (103.6 \text{ g mol}^{-1}) = 175.1 \text{ g}$$