

10-2 Practice Problems

1. Find the mass of 0.89 mol of CaCl_2 .

$$0.89 \text{ mol } \text{CaCl}_2 \left(\frac{110.98 \text{ g } \text{CaCl}_2}{1 \text{ mol } \text{CaCl}_2} \right) = 99 \text{ g } \text{CaCl}_2$$

9. Determine the number of atoms that are in 0.58 mol of Se.

$$0.58 \text{ mol Se} \left(\frac{6.02 \times 10^{23} \text{ atoms Se}}{1 \text{ mol Se}} \right)$$

2. A bottle of PbSO_4 contains 158.1 g of the compound. How many moles of PbSO_4 are in the bottle?

$$\frac{158.1 \text{ g } \text{PbSO}_4}{303.27 \text{ g } \text{PbSO}_4} \left(\frac{1 \text{ mol } \text{PbSO}_4}{1 \text{ mol } \text{PbSO}_4} \right) = 0.523 \text{ mol } \text{PbSO}_4$$

10. How many moles of barium nitrate (BaNO_3) contain 6.80×10^{24} formula units?

$$\frac{6.80 \times 10^{24} \text{ F.U.}}{6.02 \times 10^{23} \text{ F.U. } \text{BaNO}_3} \left(\frac{1 \text{ mol } \text{BaNO}_3}{1 \text{ mol } \text{BaNO}_3} \right) = 11.3 \text{ mol } \text{BaNO}_3$$

3. Find the mass of 1.112 mol of HF.

$$1.112 \text{ mol HF} \left(\frac{20.01 \text{ g HF}}{1 \text{ mol HF}} \right) = 22.25 \text{ g HF}$$

11. Determine the number of atoms that are in 1.25 mol of O_2 .

$$1.25 \text{ mol } \text{O}_2 \left(\frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol } \text{O}_2} \right) = 7.53 \times 10^{23} \text{ atoms } \text{O}_2$$

4. Determine the number of moles of C_5H_{12} that are in 362.8 g of the compound.

$$\frac{362.8 \text{ g } \text{C}_5\text{H}_{12}}{72.18 \text{ g } \text{C}_5\text{H}_{12}} \left(\frac{1 \text{ mol } \text{C}_5\text{H}_{12}}{1 \text{ mol } \text{C}_5\text{H}_{12}} \right) = 5.026 \text{ mol } \text{C}_5\text{H}_{12}$$

12. How many moles of magnesium bromide (MgBr_2) contain 5.38×10^{24} formula units?

$$\frac{5.38 \times 10^{24} \text{ F.U.}}{6.02 \times 10^{23} \text{ F.U.}} \left(\frac{1 \text{ mol } \text{MgBr}_2}{1 \text{ mol } \text{MgBr}_2} \right) = 8.94 \text{ mol } \text{MgBr}_2$$

HW5. Find the mass of 0.159 mol of SiO_2 .

$$0.159 \text{ mol } \text{SiO}_2 \left(\frac{60.08 \text{ g } \text{SiO}_2}{1 \text{ mol } \text{SiO}_2} \right) = 9.55 \text{ g } \text{SiO}_2$$

HW13. Determine the number of formula units that are in 0.688 mol of AgNO_3 .

$$0.688 \text{ mol } \text{AgNO}_3 \left(\frac{6.02 \times 10^{23} \text{ F.U. } \text{AgNO}_3}{1 \text{ mol } \text{AgNO}_3} \right) = 4.14 \times 10^{23} \text{ F.U. } \text{AgNO}_3$$

HW6. You are given 12.35 g of $\text{C}_4\text{H}_8\text{O}_2$. How many moles of the compound do you have?

$$\frac{12.35 \text{ g } \text{C}_4\text{H}_8\text{O}_2}{88.12 \text{ g } \text{C}_4\text{H}_8\text{O}_2} \left(\frac{1 \text{ mol } \text{C}_4\text{H}_8\text{O}_2}{1 \text{ mol } \text{C}_4\text{H}_8\text{O}_2} \right) = 0.1401 \text{ mol } \text{C}_4\text{H}_8\text{O}_2$$

HW7. How many moles of ethane (C_2H_6) contain 8.46×10^{24} formula units?

$$\frac{8.46 \times 10^{24} \text{ F.U.}}{6.02 \times 10^{23} \text{ F.U.}} \left(\frac{1 \text{ mol } \text{C}_2\text{H}_6}{1 \text{ mol } \text{C}_2\text{H}_6} \right) = 14.1 \text{ mol } \text{C}_2\text{H}_6$$

HW Find the mass of 3.66 mol of N_2 .

$$3.66 \text{ mol } \text{N}_2 \left(\frac{28 \text{ g } \text{N}_2}{1 \text{ mol } \text{N}_2} \right) = 102.48 \text{ g } \text{N}_2$$

HW15. Determine the number of formula units that are in 1.48 mol of NaF.

$$1.48 \text{ mol } \text{NaF} \left(\frac{6.02 \times 10^{23} \text{ F.U. } \text{NaF}}{1 \text{ mol } \text{NaF}} \right) = 8.91 \times 10^{23} \text{ F.U. } \text{NaF}$$

HW8. A bottle of KMnO_4 contains 66.38 g of the compound. How many moles of KMnO_4 does it contain?

$$\frac{66.38 \text{ g } \text{KMnO}_4}{158.04 \text{ g } \text{KMnO}_4} \left(\frac{1 \text{ mol } \text{KMnO}_4}{1 \text{ mol } \text{KMnO}_4} \right) = 0.4199 \text{ mol } \text{KMnO}_4$$

HW16. How many formula units are in 3.5 g of NaOH?

$$3.5 \text{ g } \text{NaOH} \left(\frac{1 \text{ mol } \text{NaOH}}{40 \text{ g}} \right) \left(\frac{6.02 \times 10^{23} \text{ F.U.}}{1 \text{ mol}} \right) = 5.27 \times 10^{22} \text{ Form. Units } \text{NaOH}$$

10-2 Practice Problems (continued)

molecules + 6.02 x 10²³ molecules/mol

17. If you burned 6.10×10^{24} molecules of ethane (C_2H_6), what mass of ethane did you burn?

$30.07 \text{ g } C_2H_6$

$6.10 \times 10^{24} \text{ molecules ethane} \left(\frac{1 \text{ mol } C_2H_6}{6.02 \times 10^{23} \text{ molecules } C_2H_6} \right)$

24. A chemical reaction produces 0.37 mol of N_2 gas. What volume will that gas occupy at STP?

$30.07 \text{ g } C_2H_6$
 $1 \text{ mol } C_2H_6$

$0.37 \text{ mol } N_2 \left(\frac{22.4 \text{ L}}{1 \text{ mol } N_2} \right) = 8.34 \text{ L } N_2$

18. How many formula units are in 5.1 g of TiO_2 ?

$5.1 \text{ g } TiO_2$

$\left(\frac{1 \text{ mol } TiO_2}{79.87 \text{ g } TiO_2} \right) \left(6.02 \times 10^{23} \text{ Form. units } TiO_2 \right)$

25. A canister with a volume of 694 L contains how many moles of oxygen at STP?

$694 \text{ L} \left(\frac{1 \text{ mol}}{22.4 \text{ L}} \right) = 31.0 \text{ mol}$

19. What is the mass of 3.62×10^{24} molecules of methanol (CH_3OH)?

$3.62 \times 10^{24} \text{ molecules } CH_3OH$

$\left(\frac{1 \text{ mol } CH_3OH}{6.02 \times 10^{23} \text{ molecules } CH_3OH} \right) \left(32.05 \text{ g } CH_3OH \right)$

26. A chemical reaction produces 13.8 mol of CO gas. What volume will that gas occupy at STP?

$13.8 \text{ mol } CO \left(\frac{22.4 \text{ L } CO}{1 \text{ mol } CO} \right) = 309 \text{ L } CO$

20. How many formula units are in 1.4 g of $PbCl_2$?

$1.4 \text{ g } PbCl_2$

$\left(\frac{1 \text{ mol } PbCl_2}{278.1 \text{ g } PbCl_2} \right) \left(6.02 \times 10^{23} \text{ form. units} \right)$

27. A tube with a volume of 3.68 L contains how many moles of neon gas at STP?

$3.68 \text{ L } Ne \left(\frac{1 \text{ mol } Ne}{22.4 \text{ L } Ne} \right) = 0.164 \text{ mol } Ne$

21. Determine the mass of 2.94×10^{24} molecules of decane ($C_{10}H_{22}$).

$2.94 \times 10^{24} \text{ molecules } C_{10}H_{22}$

$\left(\frac{1 \text{ mol } C_{10}H_{22}}{6.02 \times 10^{23} \text{ molecules } C_{10}H_{22}} \right) \left(142.32 \text{ g } C_{10}H_{22} \right)$

28. A chemical reaction produces 0.884 mol of H_2S gas. What volume will that gas occupy at STP?

$0.884 \text{ mol } H_2S \left(\frac{22.4 \text{ L } H_2S}{1 \text{ mol } H_2S} \right) = 19.8 \text{ L } H_2S$

22. How many formula units are in 5.6 g of H_2S ?

$5.6 \text{ g } H_2S$

$\left(\frac{1 \text{ mol } H_2S}{34.09 \text{ g } H_2S} \right) \left(6.02 \times 10^{23} \text{ form. units} \right)$

29. A container with a volume of 101 L contains how many moles of argon gas at STP?

$101 \text{ L} \left(\frac{1 \text{ mol}}{22.4 \text{ L}} \right) = 4.51 \text{ mol}$

23. A container with a volume of 893 L contains how many moles of air at STP?

$893 \text{ L} \left(\frac{1 \text{ mol}}{22.4 \text{ L}} \right) = 39.9 \text{ L}$

30. A chemical reaction produces 138 mol of HBr gas. What volume will that gas occupy at STP?

$138 \text{ mol} \left(\frac{22.4 \text{ L}}{1 \text{ mol}} \right) = 30.9 \text{ L}$