

Worksheet 3: Mole Problems

- 1- How many atoms are there in 75.0 g of gold?
- 2- How many moles of zinc, sulphur and oxygen are present in 5.0 moles of zinc thiosulphate? How many atoms are there in total?
- 3- a) What is the mass of 8.56×10^{23} molecules of SO_3 ?
b) If you have the same mass of zinc bromide, how many molecules of zinc bromide will you have?
- 4- What is the density of carbon disulphide gas at STP?
- 5- What mass of nitrogen dioxide gas will there be in 78.5 L of the gas at RTP?
- 6- Find the identity of the gaseous element with a density of 1.31 g/L at RTP.
- 7- a) What mass of carbon monoxide gas is present in 125 L of gas at STP?
b) What volume would be occupied by a similar mass of ammonia at RTP?
- 8- Which element has the most atoms per millilitres of substance, zinc or potassium? The density of zinc is 7.14 g/mL and the density of potassium is 0.86 g/mL.
- 9- Iron has a density of 7.86 g/mL. How many atoms are present in 25.0 mL of iron?
- 10- Mercury has a density of 13.6 g/mL. What is the volume of 1 atom of mercury?

ANSWERS

- 1- ? atoms Au = $(6.02 \times 10^{23} \text{ atoms / mole}) (1 \text{ mole / } 197.0 \text{ g}) (75.0 \text{ g}) = 2.29 \times 10^{23} \text{ atoms Au}$
- 2- Zinc thiosulphate = ZnS_2O_3
5.0 moles of ZnS_2O_3 contain: 5.0 moles Zn atoms, 10. moles S atoms, 15 moles O atoms.
Total # atoms = $(6.02 \times 10^{23} \text{ atoms/mole}) (30. \text{ moles}) = 1.8 \times 10^{25} \text{ atoms}$
- 3- a) 114 g of SO_3 b) 3.05×10^{23} molecules of ZnBr_2
- 4- ? g / L = $(76.2 \text{ g/mole}) (1 \text{ mole}/22.4 \text{ L}) = 3.40 \text{ g / L}$
- 5- Mass = 147 g of NO_2
- 6- The element is oxygen, O_2 .
- 7- a) Mass = 156 g of CO b) Volume = 225 L of NH_3
- 8- ? atoms_{Zn}/mL = $(6.02 \times 10^{23} \text{ atoms/mole}) (1 \text{ mole}/65.4 \text{ g})(7.14 \text{ g/mL}) = 6.57 \times 10^{22} \text{ atoms Zn per mL}$
? atoms_K/mL = $1.3 \times 10^{22} \text{ atoms K per mL}$
There are more Zn atoms per mL than there are K atoms.
- 9- There are 2.12×10^{24} atoms of iron.
- 10- An atom of mercury has a volume of $2.45 \times 10^{-23} \text{ mL}$.