

Note: Problems listed here are at a higher level. Please attempt these only after completing your assigned textbook homework. Solving these problems help you with the written portion of the upcoming quizzes and exam(s). Rewrite these problem statements and do all problems in your homework notebook. Don't memorize any of these problems. Learn the concept behind each and identify your weaknesses. If you are not solving these correctly, identify the missing links from your learning. Next, go back to your notes and study the concepts and examples we did in class and review your textbook homework. The hardest situation to deal with from both student and instructor's point of view is: "*I don't know what I don't know*"! Turn this into 'I know what I don't know' and work on that by getting the right help from your instructor and productive study partners.

- 1) How many molecules are in 3.65 moles of oxygen gas?

- 2) How many atoms of nitrogen are in 12.0 g of nitrogen gas?

- 3) What is the molar mass of caffeine, $C_8H_{10}N_4O_2$? Report to correct significant figures.

- 4) How many atoms of hydrogen are present in 13.9 g of caffeine?

- 5) How many moles of nitrogen are present in 125 g of caffeine?

- 6) How many moles of carbon are present with 650 g of nitrogen in caffeine?

- 7) Calculate percent nitrogen (by mass) in caffeine.
- 8) What mass of hydrogen is present with 6.5×10^{27} atoms of oxygen in caffeine?
- 9) Consider ammonium sulfate. Calculate percent (by mass) of ammonium ion.
- 10) Calculate count of ammonium ion with 139 g sulfate ion in ammonium sulfate.
- 11) Calculate percent (by mass) of hydrogen in ammonium sulfate.
- 12) A student weighs a piece of paper with a mass of 1.7529 g. Next, he writes his name with a pencil and reweighs the paper and it now weighs 1.7535 g. Assuming that the pencil marking is composed of graphite which is a form of pure carbon, calculate the number of atoms that student's name is composed of.
- 13) A cup of pure water has a volume of 270 mL of water. Calculate the number of water molecules in the cup. (you need an important conversion factor).

Answers:

Note: "E" means exponent of base 10. For example, 1.67E23 means: 1.67×10^{23}

- 1) 2.20E24 ct. mlc
- 2) 5.16E23 ct. atom
- 3) 194.27 g/mol
- 4) 4.31E23 ct. atom
- 5) 2.57 mol
- 6) 93 mol
- 7) 28.85%
- 8) 5.4E4 g
- 9) 27.30%
- 10) 1.74E24 ct. ion
- 11) 6.102%
- 12) 3E19 ct. atom
- 13) 9.0E24 ct. mlc