Accompanying Questions
Topic 10: Stoichiometry

Objective:

This is to provide guiding questions to help you comprehend the material we have covered in this section of the class. These questions or very similar questions have been answered within the video lecture and/or live class.

Instructions and Notes:

- Most of these questions/concepts are taken or derived from the chapters in the Chemistry: Atoms First 2e Online Textbook (OpenStax)
- Book sections covered: 7.3, 7.4, 7.5

Submission:

Students do not submit this and it is not graded.

Helpful Tips:

- These questions or very similar questions may appear on the exams so I strongly recommend that you complete them.
- Download the lectures and rewatch the lectures.
- Pause the lectures and rewind them through concepts you don't fully understand.
- Go to tutoring in the ASTC or MESA, ask your classmates in our Discord room, watch YouTube Videos, come to office hours, etc.

In-Lecture Questions

Lecture 1 of 4

1. 2 Bread + 1 Cheese → 1 sandwich; using this recipe, What is the ratio of bread to sandwich?
2. 2 Bread + 1 Cheese → 1 sandwich; using this recipe, if we have 10 bread, how many cheese do we need to make as many sandwiches as possible?
3. 2 Ag + 1 S → Ag_2S; using this chemical equation, if we have 20 silver sulfides, how many silver do we have?
4. 2 Ag + 1 S → Ag_2S; using this chemical equation, if we have 3 sulfur, how many silver sulfides can we make if we had unlimited silver?
5. What is the mole ratio?
6. $N_2 + 3H_2 \rightarrow 2\ NH_3$; using this chemical equation, what is the mole ratio of N_2 to H_2? N_2 to NH_3? H_2 to NH_3?
7. In a water molecule, what is the mole ratio of H to O? O to H_2O? H to H_2O?
8. When using our conversion sheet, what does the dashed line separate?
9. When using out conversion sheet, what two things can you do to cross the dashed line?
10. $2Al + 3I_2 \rightarrow 2AlI_3$; using this chemical equation, how many moles of I_2 are required to react with 0.429 mol of Al?

11. $N_2 + 3H_2 \rightarrow 2\ NH_3$; using this chemical equation, how many mol of H_2 do we need to fully react 2 mol of N_2?
12. $N_2 + 3H_2 \rightarrow 2\ NH_3$; using this chemical equation, how many mol H_2 do you need to synthesize 12 mol NH_3?
13. $N_2 + 3H_2 \rightarrow 2\ NH_3$; using this chemical equation, if we have 1.5 mol N_2, how many mol NH_3 can we make if we had unlimited H_2?
14. $3Ca(OH)_2 + 2H_3PO_4 \rightarrow Ca_3(PO_4)_2 + 6H_2O$; using this equation, how many moles of $Ca(OH)_2$ are required to react with 1.36 mol of H_3PO_4 to produce $Ca_3(PO_4)_2$?

Lecture 2 of 4

15. What are the four (4) steps when using our conversion sheet?
16. $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$; using this equation, how many carbon dioxide molecules are produced when 0.75 mol of propane is combusted according to this equation?
17. $(NH_4)_2SO_4 + Ca(OH)_2 \rightarrow 2NH_3 + CaSO_4 + 2H_2O$; using this equation, how many NH_3 molecules are produced by the reaction of 4.0 mol of $Ca(OH)_2$
18. $MgCl_2(aq) + 2NaOH(aq) \rightarrow Mg(OH)_2(s) + 2NaCl(aq)$; using this equation, what mass of sodium hydroxide, NaOH, would be required to produce 16 g of the antacid milk of magnesia [magnesium hydroxide, $Mg(OH)_2$]?
19. $4Ga + 3O_2 \rightarrow 2Ga_2O_3$; using this equation, what mass of gallium oxide, Ga_2O_3, can be prepared from 29.0 g of gallium metal?
20. $2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O$; using this equation, what mass of oxygen gas, O_2, from the air is consumed in the combustion of 702 g of octane, C_8H_{18}, one of the principal components of gasoline?
21. $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$; using this equation, what mass of CO is required to react with 25.13 g of Fe_2O_3?

Lecture 3 of 4

22. 2 Bread + 1 Cheese → 1 sandwich; using this recipe, how many sandwiches can we make if we had 11 slices of cheese and 28 slices of bread? Which one was the limiting ingredient? Which one was the excess ingredient? How many of the excess did we have left over?
23. $H_2 + Cl_2 \rightarrow 2HCl$; using this equation; if we started with 3 mol of H_2 and 2 mol of Cl_2, how many HCl could we make? Which reactant was limiting? Which reactant was excess? How much of the excess did we have left over?
24. $3Si(s) + 2N_2(g) \rightarrow Si_3N_4(s)$; using this equation, which is the limiting reactant when 2.00g of Si and 1.50g of N_2 react? Which is the excess?
25. Which is the limiting reactant when 5.00 g of H_2 and 10.0 g of O_2 react and form water? Write out the balanced chemical equation first.

Lecture 4 of 4

26. What does the molarity equation let us do?
27. How do we choose which reactant or product to start with on our conversion sheet?
28. True/False; when using the molarity equation, you should have your volume in liters (L).
29. $Ca(OH)_2(aq) + 2HBr(aq) \rightarrow CaBr_2(aq) + 2H_2O(l)$; using this equation, what volume of 0.0105M HBr solution is required to titrate 125 mL of a 0.0100M $Ca(OH)_2$ solution?

30. $HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$; using this equation, the end point in a titration of a 50.00-mL sample of aqueous HCl was reached by addition of 35.23 mL of 0.250 M NaOH titrant. What is the molarity of the HCl?
31. $2MnO_4^-(aq) + 5H_2C_2O_4(aq) + 6H^+(aq) \rightarrow 10CO_2(g) + 2Mn^{2+}(aq) + 8H_2O(l)$; using this net ionic equation, A 20.00-mL sample of aqueous oxalic acid, $H_2C_2O_4$, was titrated with a 0.09113-*M* solution of potassium permanganate, $KMnO_4$. A volume of 23.24 mL was required to reach the end point. What is the oxalic acid molarity?