

## Chapter 6: Supplementary Problems – Answers to Odd Problems

### Multiple Choice and Short Answer:

1. **Answer: c**

Four moles of chlorine for every mole of methane.

3. **Answer: d**

One mole of molecular oxygen gives two moles of water.

5. **Answer: b**

Five moles of oxygen give four moles of NO; therefore, 0.25 moles of oxygen give 0.20 moles of NO.

7. **Answer: b**

One mole of sulfuric acid is produced from every mole of pyrite. One kg of pyrite is 8.34 moles. This corresponds to 0.82 kg of sulfuric acid.

9. **Answer: e**

One mole of  $\text{H}_3\text{AsO}_4$  yields one mole of  $\text{K}_3\text{AsO}_4$ . If you have 7.10 grams, this is 0.0500 moles; multiply this by the molar mass of  $\text{K}_3\text{AsO}_4$  and you get 12.8 grams.

11. **Answer: c**

Two moles of chlorine give one mole of dichlorine monoxide, therefore, you expect 0.200 moles of product.

13. **Answer: d**

Five moles of fluorine react with two moles of fluorine; therefore, 13.6 moles of fluorine require two-fifths of this amount.

15. **Answer: d**

Three moles of carbon yield two moles of iron.

17. **Answer: c**

Four moles of sodium fluoride give one mole of sulfur tetrafluoride. Convert the mass into moles and divide by four; this gives moles of NaF. Convert this to mass using the molar mass.

19. **Answer: e**

Write and balance the equation. One mole of oxygen react with two moles of Mg. Convert the mass of Mg into moles and divide by two; this is moles of oxygen. Convert this into mass using the molar mass.

21. **Answer: d**

Write and balance the equation. Four moles of phosphine give one mole of tetraphosphorus decaoxide. Convert the mass into moles and divide by four. Convert this into mass using the molar mass.

23. **Answer: e**

Write and balance the equation. Two moles of aluminum requires three moles of chlorine. Convert the mass of Al into moles, divide by two and multiply by three; this is moles of chlorine. Convert this into mass using the molar mass.

25. **Answer: d**

Write and balance the equation. Three moles of hydrogen react with one mole of nitrogen. Convert the mass of H into moles and divide by three; this is moles of nitrogen. Convert this into mass using the molar mass.

27. **Answer: b**

It takes two moles of carbon for every mole of  $\text{SnO}_2$ .

29. **Answer: a**

Convert the masses into moles; 3.057 moles of Al will give 1.528 moles of product; 3.677 moles of  $\text{O}_2$  will give 2.451 moles of product. Aluminum is limiting; convert the moles to mass using the molar mass.

31. **Answer: e**

Convert the masses into moles; 0.03706 moles of Al will give 0.03706 moles of product; 0.04728 moles of  $\text{I}_2$  will give 0.03152 moles of product. Iodine is limiting; convert the moles to mass (12.85 g) using the molar mass.

33. **Answer: b**

Convert the masses into moles; 0.184 moles of Zn will give 0.184 moles of product; 0.203 moles of S will give 0.203 moles of product. Zinc is limiting; convert the moles to mass using the molar mass.

35. **Answer: b**

Convert the masses into moles; 0.288 moles of Li will give 0.144 moles of product; 0.0625 moles of  $O_2$  will give 0.125 moles of product. Oxygen is limiting; convert the moles to mass using the molar mass.

37. **Answer: d**

Convert the masses into moles; 4.167 moles of pyrite will give 2.048 moles of product; 12.50 moles of  $O_2$  will give 2.273 moles of product. Pyrite is limiting; convert moles to mass using the molar mass.

39. **Answer: d**

Again, convert the masses into moles; 1.69 moles of Mg will give 1.69 moles of product; 1.08 moles of  $FeCl_3$  will give 1.62 moles of product.  $FeCl_3$  is limiting; 1.62 moles of product require 1.62 moles of Mg, therefore 0.07 moles remain... convert this to mass.

41. **Answer: Oxygen is limiting. 2.99 grams of  $CO_2$**

a. Convert the masses into moles; 0.1134 moles of propane require 0.567 moles of oxygen and only 0.03125 moles are available; oxygen is limiting. b. One gram of propane is 0.2268 moles and this will give 0.0680 moles of  $CO_2$ ; this is 2.99 grams.

43. **Answer: Water is limiting; 9.46 grams of  $H_2S$ ; 1.11 grams of  $Al_2S_3$  remain.**

a. Convert the masses into moles; 0.0999 moles of aluminum sulfide require 0.5994 moles of water and only 0.5551 moles are available; water is limiting. b. 0.5551 moles of water will give 0.2776 moles of  $H_2S$ ; this is 9.46 grams. c. 0.5551 moles of water will consume 0.00925 moles of aluminum sulfide, leaving 0.00738 moles, or 1.11 grams.

45. **Answer: a**

Three oxygens have a mass of 48 g/mol; the mass of sodium hydrogen carbonate is 84.00 g/mol, or 57.1%.

47. **Answer: b**

Convert mass to moles; 0.608 moles of  $P_4$  yields 0.608 moles of product; 1.21 moles of oxygen yields 0.403 moles of product; oxygen is limiting and this represents 88.65 grams of product; this is 48.8%.

49. **Answer: c**

Convert mass to moles; 0.864 moles of chlorine yields 0.864 moles of product and this represents 179.9 grams of product; this is 66.3%.