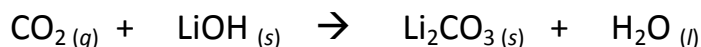


Stoichiometry

Name _____

Use reaction stoichiometry to answer the following questions. When making your calculations, completely set up all your work, including units. **Your answer should have the correct number of SIG FIGS and appropriate units. Please box your answer.** Also, as a hint, balance the reactions before you start your calculations. If the reactions look balanced, double check that they are before begin your work.

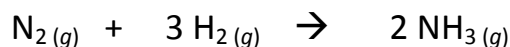
1. In a spacecraft, the carbon dioxide exhaled by astronauts can be removed by its reaction with lithium hydroxide, LiOH, according to the following chemical equation. (*Hint: Balance the equation first.*)



How many moles of lithium hydroxide are required to react with 20.0 mole of CO₂, the average amount exhaled by a person each day?

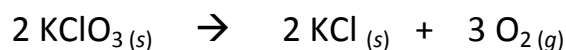
$$\frac{\quad}{\quad} =$$

2. Ammonia, NH₃ is widely used as a fertilizer and in many household cleaners. How many moles of ammonia are produced when 6.00 mol of hydrogen gas react with excess nitrogen gas?



$$\frac{\quad}{\quad} =$$

3. The decomposition of potassium chlorate, KClO₃, is used as a source of oxygen in the laboratory. How many moles of potassium chlorate are needed to produce 15.0 moles of oxygen?

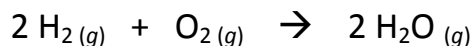


$$\frac{\quad}{\quad} =$$

If you start with 2.8 mols of KClO₃, how many mols of KCl will you create?

$$\frac{\quad}{\quad} =$$

4. Hydrogen and oxygen react under a specific set of conditions to produce water according to the following:



- (A) How many moles of hydrogen would be required to produce 5.0 moles of water?

_____ =

- (B) How many moles of oxygen would be required?

_____ =

5. If 4.5 mol of ethane, C_2H_6 , undergo combustion according to the equation below, how many moles of oxygen are required? (*Need to balance first.*)



- (A)

_____ =

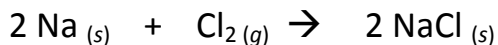
- (B) How many moles of water are formed?

_____ =

- (C) How many moles of carbon dioxide would form if 18.5 moles of oxygen completely reacted with unlimited ethane?

_____ =

6. Sodium chloride is produced from its elements through a synthesis reaction.

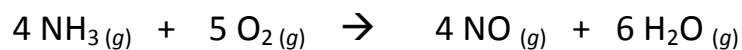


What mass of each reactant would be required to produce 25.0 mol of sodium chloride?

_____ =

_____ =

12. The first step in the industrial manufacturing of nitric acid is the catalytic oxidation of ammonia.



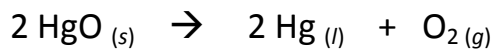
The reaction is run using 824 g of NH_3 and excess oxygen, how many moles of NO are formed?

=

13. If the same reaction from #12 is run using 824 g of NH_3 and **excess** oxygen, how many moles of water are formed? (*Excess oxygen means that you won't run out of O_2 . The reaction will be complete when you use up all the NH_3 .*)

=

14. Oxygen was discovered by Joseph Priestly in 1774 when he heated mercury(II) oxide and it decomposed into mercury and oxygen.



(A) How many moles of mercury(II) oxide, HgO , are needed to produce 125 g of oxygen, O_2 ?

=

(B) How many moles of mercury are produced?

=

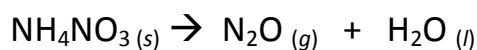
15. Tin(II) fluoride, SnF₂, is used in some toothpastes. It is made by the reaction of tin with hydrogen fluoride according to the following equation.



How many grams of SnF₂ are produced from the reaction of 30.00 g HF with excess Sn?

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16. Laughing gas (nitrous oxide, N₂O) is sometimes used as an anesthetic in dentistry. It is produced when ammonium nitrate is decomposed according to the following reaction.



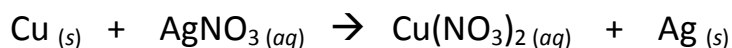
(A) How many grams of NH₄NO₃ are required to produce 33.0 g of N₂O?

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(B) How many grams of water are produced in this reaction? (*Hint: 2 ways to solve this... Either start with the answer from (A) or start with 33.0 g N₂O.*)

| | | | |
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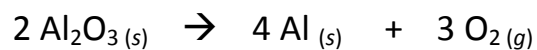
17. When copper metal is added to silver(I) nitrate in solution, silver metal and copper(II) nitrate are produced.



What mass of silver is produced if you start with 100.0 grams of Cu and have unlimited silver(I) nitrate?

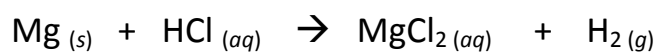
| | | | |
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18. What mass of aluminum is produced by the decomposition of 500.0 g of aluminum oxide, Al_2O_3 ?



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|-------|-------|-------|-------|---|

19. The single replacement reaction of magnesium and hydrochloric acid produces magnesium chloride and hydrogen gas.



(A) What mass of HCl is consumed by the reaction of 2.50 moles of magnesium?

| | | | |
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| _____ | _____ | _____ | = |
|-------|-------|-------|---|

(B) What is the mass of each product in this reaction if you start with 2.50 mol Mg and have excess HCl?

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| _____ | _____ | _____ | = |
|-------|-------|-------|---|

| | | | |
|-------|-------|-------|---|
| _____ | _____ | _____ | = |
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20. Acetylene gas (C₂H₂) is produced as a result of the following reaction.



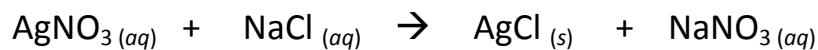
(A) If 32.0 g of CaC₂ are consumed in this reaction, how many moles of H₂O are needed?

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(B) How many moles of calcium hydroxide would be formed?

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21. When sodium chloride reacts with silver(I) nitrate, silver(I) chloride precipitates (*forms a solid*). What mass of AgCl is produced from 75.0 g of AgNO₃?



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22. Acetylene gas (C₂H₂), used in welding, produces an extremely hot flame when it burns in pure oxygen according to the following reaction.



How many grams of each product are produced when 2.50 x 10⁴ grams of C₂H₂ burn completely?

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23. Iron is generally produced from iron ore through the following procedure in a blast furnace:



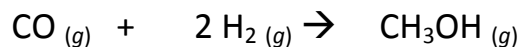
(A) Of 4,150 g of Fe_2O_3 are available to react, how many moles of CO are needed?

_____ =

(B) How many grams of iron are formed in this reaction?

_____ =

24. Methanol, CH_3OH is an important industrial compound that is produced from the following reaction:



What mass of each reactant would be needed to produce 10.0 kg of methanol? (*Hint: convert to grams before you start.*)

_____ =

_____ =

25. Nitrogen combines with oxygen in the atmosphere during lightning flashes to form nitrogen monoxide, NO, and then reacts further with O₂ to produce nitrogen dioxide, NO₂.



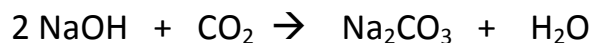
(A) What mass of NO₂ is formed when NO reacts with 384 g of O₂?

=

(B) How many grams of NO are required to react with this amount of O₂?

=

26. As early as 1938, the use of NaOH was suggested as a means of removing CO₂ from the cabin of a spacecraft according to the following reaction:



(A) If the average human body discharges 925.0 g of CO₂ per day. How many moles of NaOH are needed each day for one person in the spacecraft?

=

(B) How many moles of sodium carbonate are formed in this reaction?

=

27. The double-replacement reaction between silver(I) nitrate and sodium bromide produces silver(I) bromide, a component of photographic film.



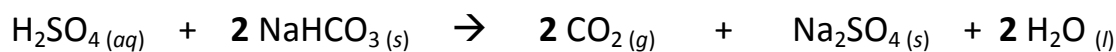
- (A) If 4.50 moles of silver(I) nitrate reacts, what mass of sodium bromide is required?

_____ =

- (B) What mass of silver(I) bromide is formed?

_____ =

28. In a soda-acid fire extinguisher, concentrated sulfuric acid reacts with sodium hydrogen carbonate to produce carbon dioxide, sodium sulfate, and water.



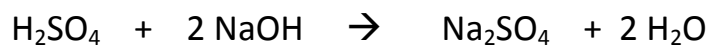
- (A) How many moles of NaHCO_3 would be needed to react completely with 150.0 g of H_2SO_4 ?

_____ =

- (B) How many grams of water would form in the reaction above (part A)?

_____ =

29. Sulfuric acid reacts with sodium hydroxide according to the following:



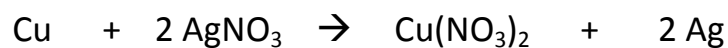
(A) What mass of H_2SO_4 would be required to react with 0.75 mol of NaOH ?

| | | |
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| _____ | _____ | = |
|-------|-------|---|

(B) What mass of Na_2SO_4 is formed in this reaction?

| | | |
|-------|-------|---|
| _____ | _____ | = |
|-------|-------|---|

30. Copper reacts with silver(I) nitrate through single replacement.



(A) If 2.25g of silver are produced from the reaction, how many moles of copper(II) nitrate are also produced?

| | | |
|-------|-------|---|
| _____ | _____ | = |
|-------|-------|---|

(B) How many moles of copper are required for this reaction?

| | | |
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| _____ | _____ | = |
|-------|-------|---|

31. Aspirin, $C_9H_8O_4$, is produced through the following reaction of salicylic acid, $C_7H_6O_3$, and acetic anhydride, $C_4H_6O_3$:



(A) What mass of Aspirin could be produced from 15.5 mole of salicylic acid?

_____ =

(B) What mass of acetic anhydride would be required?

_____ =

(C) Acetic acid is the other product. How many grams of acetic acid are produced if you start with 150.0 grams of salicylic acid?

_____ =

Adapted from chapter 9 sample problems, practice exercises, and chapter review problems in *Holt: Modern Chemistry*