

Chapter 4

You Must Be ABLE to...

1. Identify the limiting reactant

PI_3 (MW = 411.69 g mol⁻¹) and water (MW = 18.015 g mol⁻¹) react to form H_3PO_3 (MW = 81.996 g mol⁻¹) and HI (MW = 127.91 g mol⁻¹). If 0.5000 moles of phosphorus triiodide and 2.500 moles of water are used, what is the limiting reactant?

2. Calculate the theoretical yield in limiting reactant problems

PI_3 (MW = 411.69 g mol⁻¹) and water (MW = 18.015 g mol⁻¹) react to form H_3PO_3 (MW = 81.996 g mol⁻¹) and HI (MW = 127.91 g mol⁻¹). If 12 grams of phosphorus triiodide and 8 grams of water are used, what is the theoretical yield (in grams) of hydrogen iodide?

3. understand the concept of Actual, Theoretical and Percent in chemical reactions

PI_3 (MW = 411.69 g mol⁻¹) and water (MW = 18.015 g mol⁻¹) react to form H_3PO_3 (MW = 81.996 g mol⁻¹) and HI (MW = 127.91 g mol⁻¹). If 12 grams of phosphorus triiodide and 8 grams of water are used, how many grams of hydrogen iodide would the student ACTUALLY prepare if the % yield of the chemical reaction is known to be 80%?

4. Know what "Molarity, M" is and how to use it in problems (from simple ones to stoichiometric problems).

What volume of 0.305 M AgNO_3 is required to react exactly with 155.0 mL of 0.274 M Na_2SO_4 solution? Hint: you will want to write a balanced reaction.

5. do Dilution problems ($M_1V_1 = M_2V_2$)...can you?

A 69.3 g sample of oxalic acid, $\text{H}_2\text{C}_2\text{O}_4$, was dissolved in 1.00L of solution. How would you prepare 1.00L of 0.150M $\text{H}_2\text{C}_2\text{O}_4$ from this solution?

6. Know what strong and weak electrolytes are/mean.

7. Know how to predict the products of a precipitation reaction.

8. Know how to predict the products of an acid base reaction.

9. Solve an 'acid base' titration question.

The titration of 25.0 mL of an unknown concentration H_2SO_4 solution requires 83.6 mL

of 0.12 M LiOH solution. What is the concentration of the H₂SO₄ solution (in M)?

10. know to identify strong acids and strong bases

11. know how to name acids and bases.

12. know how to write molecular, ionic and net ionic equations.

13. know how to identify spectator ions.

14. know how to figure out oxidation numbers/states.

What is the oxidation number of the chlorine atom in the HClO₄ molecule?

15, can you identify what elements are being oxidized and reduced in a REDOX reaction? What are the reducing and oxidizing agents.

The ClO₂(g) molecule was involved in a chemical reaction in which it underwent oxidation. Based on the change in oxidation numbers, which one of the products listed below is a possible oxidation product of the ClO₂ molecule?

- a. ClO⁻(aq)
- b. Cl⁻(aq)
- c. ClO₂⁻(aq)
- d. Cl₂(g)
- ! e. ClO₃⁻(aq)

Chapter 5

Can You....

1. use the combined gas law?

A sample of a gas was isolated in a gas containment bulb on a manifold used in this type work. The volume of the bulb was 1.524 liters. The temperature was 28.40 °C, and the manifold pressure was 637.6 torr. What volume, in liters, would this gas sample occupy at STP?

2. show how the combined gas law is a result of the three separate gas laws (Boyle's, Charles', and Gay-Lussac's)?

Well...can you?!!

3. rub your belly and pat yourself on the head simultaneously (just kidding...seeing if you actually read this!)?

Hmmmm...faster now!!!

4. use the ideal gas law ($PV=nRT$) to solve for a missing variable?

A gas sample occupies a volume of 18.86 liters when the temperature is 35.2 °C and the pressure is 735.5 torr. How many moles of gas are there in the sample?

5. use the ideal gas law in stoichiometric problems?

How many liters of pure oxygen gas, measured at 45.2 °C and 104.0 kPa, are required for the complete combustion of 5.60 liters of acetaldehyde gas (C_2H_4O), measured under the same conditions of temperature and pressure?

Hey...RECALL LIMITING REACTANTS ON THIS ONE!

The reaction, $MnO_2(s) + 4 HCl(aq) \rightarrow MnCl_2(aq) + Cl_2(g) + H_2O(l)$ was being studied. 12.2 g of MnO_2 were reacted with 70.0 ml of 2.50 M HCl solution. The chlorine produced was collected in a vessel. The pressure measured 0.971 atm at a temperature of 78.2 °C. Determine the volume of chlorine gas produced if the theoretical yield was obtained.

6. use Dalton's Law of Partial Pressures to find the pressure exerted by one gas in a mixture of gases?

e.g., What is the total pressure exerted by a gaseous mixture that consists of 1.00 g of hydrogen and 8.00 g of neon in a 2.80 liter container maintained at 44.10 °C?

7. calculate mole fractions?

What is the mole fraction of hydrogen in a gaseous mixture that consists of 8.00 g of hydrogen and 12.00 g of neon in a 3.50 liter container maintained at 35.20°C?

8. use the fact that at STP, 1 mol of any gas occupies 22.4 L?

What volume would 11.2 g of a gaseous compound occupy at STP if the molecular weight of the compound is 44.0 g/mole and the substance behaves as an ideal gas?

9. describe effusion and diffusion and use Graham's law of effusion to relate the rates of effusion of 2 gases to the molecular masses of those two masses.

The average speed at which a nitrogen molecule effuses at 30.0 °C is 480 meters per second. The average speed at which a butene molecule (C_4H_8) effuses at this same temperature should then be

10. recite and describe the postulates of the Kinetic Theory of Gases?

Give me a really difficult one!!!

11. differentiate between a real gas and an ideal gas?

Go one, you can do it!

12. convert a given pressure unit into another pressure unit?

A special shipping container for compressed gas is rated at 18.50×10^3 kPa. This rating can be expressed in atm as _____

13. describe the use of a manometer and a barometer?

See your book...you need to read at least one section of it!!

14. explain 'collection over water' (what apparatus is used, what is the total pressure equal to, why use this apparatus in the first place)?

A sample of methane gas (CH_4) was collected by downward displacement of water ("over water") in a gas collection flask. The total pressure in the collection flask was measured as 758.2 torr, the temperature was 25.0°C , and the measured volume of gas in the flask was 526.0 ml. How many grams should the methane weigh? At 25.0°C , the vapor pressure of water is 23.8 torr.