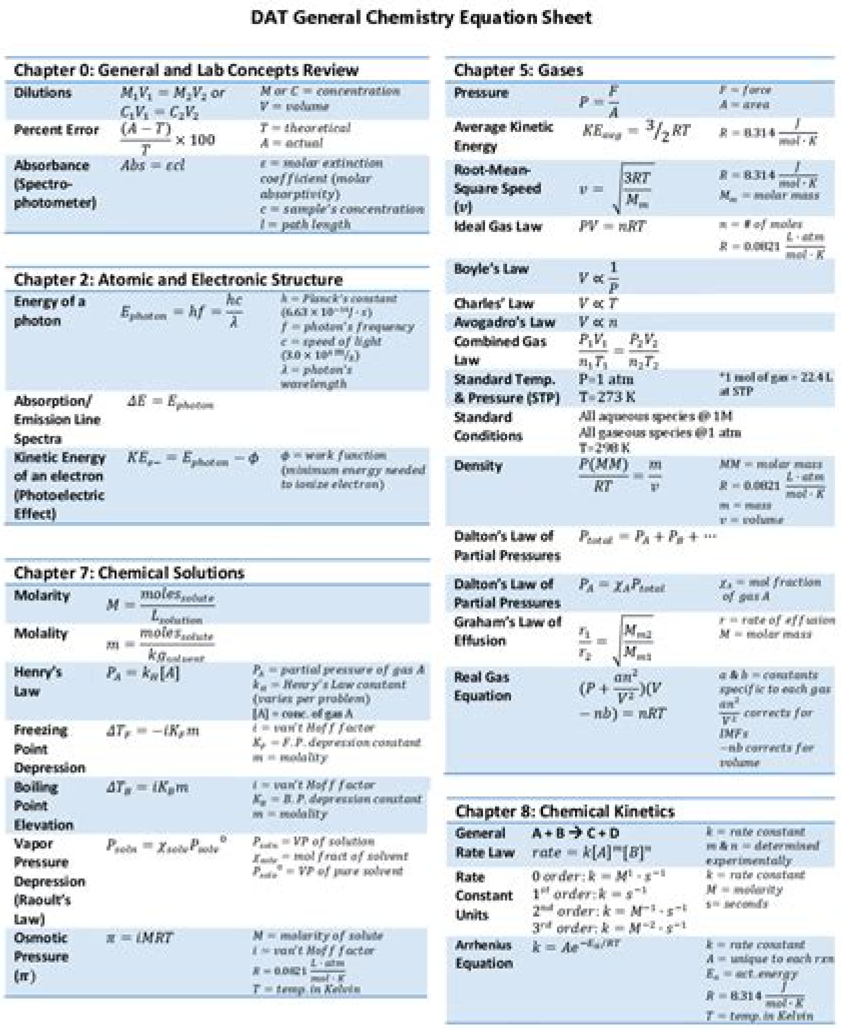
General Chemistry Final Exam Cheat Sheet



DAT General Chemistry Equation Sheet

Chapter 0: General and Lab Concepts Review

Dilutions	$M_1V_1 = M_2V_2$ or $C_1V_1 = C_2V_2$	M or C = concentration V = volume
Percent Error	$\frac{(A-T)}{T} \times 100$	T = theoretical A = actual
Absorbance (Spectro-photometer)	$Abs = \varepsilon c l$	ε = molar extinction coefficient (molar absorptivity) c = sample's concentration l = path length

Chapter 2: Atomic and Electronic Structure

Energy of a photon	$E_{photon} = hf = \frac{hc}{\lambda}$	h = Planck's constant ($6.63 \times 10^{-34} J \cdot s$) f = photon's frequency c = speed of light ($3.0 \times 10^{8}\, m/s$) λ = photon's wavelength
Absorption/ Emission Line Spectra	$\Delta E = E_{photon}$	
Kinetic Energy of an electron (Photoelectric Effect)	$KE_{e^-} = E_{photon} - \phi$	ϕ = work function (minimum energy needed to ionize electron)

Chapter 7: Chemical Solutions

Molarity	$M = \frac{moles_{solute}}{L_{solution}}$	
Molality	$m = \frac{moles_{solute}}{kg_{solvent}}$	
Henry's Law	$P_A = k_H[A]$	P_A = partial pressure of gas A k_H = Henry's Law constant (varies per problem) [A] = conc. of gas A
Freezing Point Depression	$\Delta T_F = -iK_F m$	i = van't Hoff factor K_F = F.P. depression constant m = molality
Boiling Point Elevation	$\Delta T_B = iK_B m$	i = van't Hoff factor K_B = B.P. depression constant m = molality
Vapor Pressure Depression (Raoult's Law)	$P_{soln} = X_{solv}P_{solv}{}^{0}$	P_{soln} = VP of solution X_{solv} = mol fract of solvent $P_{solv}{}^{0}$ = VP of pure solvent
Osmotic Pressure (π)	$\pi = iMRT$	M = molarity of solute i = van't Hoff factor $R = 0.0821 \frac{L \cdot atm}{mol \cdot K}$ T = temp. in Kelvin

Chapter 5: Gases

Pressure	$P = \frac{F}{A}$	F = force A = area
Average Kinetic Energy	$KE_{avg} = {}^{3}/_{2}RT$	$R = 8.314 \frac{J}{mol \cdot K}$
Root-Mean-Square Speed (v)	$v = \sqrt{\frac{3RT}{M_m}}$	$R = 8.314 \frac{J}{mol \cdot K}$ M_m = molar mass
Ideal Gas Law	$PV = nRT$	n = # of moles $R = 0.0821 \frac{L \cdot atm}{mol \cdot K}$
Boyle's Law	$V \propto \frac{1}{P}$	
Charles' Law	$V \propto T$	
Avogadro's Law	$V \propto n$	
Combined Gas Law	$\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$	
Standard Temp. & Pressure (STP)	P=1 atm T=273 K	*1 mol of gas = 22.4 L at STP
Standard Conditions	All aqueous species @ 1M All gaseous species @1 atm T=298 K	
Density	$\frac{P(MM)}{RT} = \frac{m}{v}$	MM = molar mass $R = 0.0821 \frac{L \cdot atm}{mol \cdot K}$ m = mass v = volume
Dalton's Law of Partial Pressures	$P_{total} = P_A + P_B + \cdots$	
Dalton's Law of Partial Pressures	$P_A = \chi_A P_{total}$	χ_A = mol fraction of gas A
Graham's Law of Effusion	$\frac{r_1}{r_2} = \sqrt{\frac{M_{m2}}{M_{m1}}}$	r = rate of effusion M = molar mass
Real Gas Equation	$(P + \frac{an^2}{V^2})(V - nb) = nRT$	a & b = constants specific to each gas $\frac{an^2}{V^2}$ corrects for IMFs $-nb$ corrects for volume

Chapter 8: Chemical Kinetics

General Rate Law	A + B → C + D $rate = k[A]^m[B]^n$	k = rate constant m & n = determined experimentally
Rate Constant Units	$0\ order: k = M^1 \cdot s^{-1}$ $1^{st}\ order: k = s^{-1}$ $2^{nd}\ order: k = M^{-1} \cdot s^{-1}$ $3^{rd}\ order: k = M^{-2} \cdot s^{-1}$	k = rate constant M = molarity s = seconds
Arrhenius Equation	$k = Ae^{-E_a/RT}$	k = rate constant A = unique to each rxn E_a = act. energy $R = 8.314 \frac{J}{mol \cdot K}$ T = temp. in Kelvin

General Chemistry Final Exam Cheat Sheet

Preparing for a final exam in general chemistry can be overwhelming, given the vast amount of information covered throughout the course. A well-structured cheat sheet can serve as an invaluable tool, helping students consolidate their knowledge and focus on the most important concepts. In this article, we will create a comprehensive cheat sheet that covers essential topics in general chemistry, including key definitions, fundamental principles, and important equations. By having this cheat sheet at hand, students can enhance their study sessions and boost their confidence before the exam day.

Key Concepts and Definitions

Understanding the fundamental concepts and definitions is crucial in chemistry. Here are some of the most important terms to remember:

1. Matter

- Definition: Anything that has mass and occupies space.
- Types:
- Elements: Pure substances made of one type of atom (e.g., oxygen, gold).
- Compounds: Substances formed from two or more elements chemically combined (e.g., water, sodium chloride).
- Mixtures: Combinations of two or more substances where each retains its properties (e.g., air, salad).

2. Atomic Structure

- Atoms: The basic units of matter, consisting of protons, neutrons, and electrons.
- Protons: Positively charged particles found in the nucleus.
- Neutrons: Neutral particles also located in the nucleus.
- Electrons: Negatively charged particles orbiting the nucleus.

3. Moles and Molar Mass

- Mole (mol): A unit for counting particles, equal to Avogadro's number (6.022×10^{23}).
- Molar Mass: The mass of one mole of a substance, expressed in grams per mole (g/mol).

Periodic Table Essentials

The periodic table is a systematic arrangement of the elements. Familiarity with its structure can greatly aid in chemistry exams.

1. Groups and Periods

- Groups: Vertical columns in the periodic table, consisting of elements with similar properties (e.g., alkali metals, halogens).
- Periods: Horizontal rows indicating the number of electron shells.

2. Key Element Categories

- Metals: Good conductors of heat and electricity; malleable and ductile.
- Nonmetals: Poor conductors; diverse in appearance and properties.
- Metalloids: Elements with properties intermediate between metals and nonmetals.

Chemical Bonding

Understanding how atoms bond is essential for grasping chemical reactions.

1. Types of Bonds

- Ionic Bonds: Formed when electrons are transferred from one atom to another, resulting in charged ions.
- Covalent Bonds: Formed when atoms share electrons.
- Metallic Bonds: Bonds formed between metal atoms where electrons are shared in a "sea" of electrons.

2. Molecular Geometry

- VSEPR Theory: Valence Shell Electron Pair Repulsion theory predicts the 3D shape of molecules based on electron pair repulsion.
- Common Shapes:
- Linear
- Trigonal planar
- Tetrahedral

Chemical Reactions

Chemical reactions involve the transformation of reactants into products.

1. Types of Reactions

- Synthesis: Two or more reactants combine to form a single product ($A + B \rightarrow AB$).
- Decomposition: A single compound breaks down into two or more products ($AB \rightarrow A + B$).
- Single Replacement: An element replaces another in a compound ($A + BC \rightarrow AC + B$).
- Double Replacement: Exchange of ions between two compounds ($AB + CD \rightarrow AD + CB$).
- Combustion: A substance reacts with oxygen, producing energy, carbon dioxide, and water (e.g., hydrocarbon + $O_2 \rightarrow CO_2 + H_2O$).

2. Balancing Chemical Equations

- Ensure that the number of atoms of each element is equal on both sides of the equation.
- Use coefficients to adjust the quantities of reactants and products.

Stoichiometry

Stoichiometry is the calculation of reactants and products in chemical reactions.

1. Mole Ratios

- Derived from the coefficients of the balanced equation.
- Used to convert between moles of reactants and products.

2. Limiting Reactants and Yield

- Limiting Reactant: The reactant that is consumed first, limiting the amount of product formed.
- Theoretical Yield: The maximum amount of product calculated based on stoichiometry.
- Actual Yield: The amount of product actually obtained from a reaction.
- Percent Yield: Calculated as (Actual Yield / Theoretical Yield) x 100%.

Thermochemistry

Thermochemistry deals with the heat energy associated with chemical reactions.

1. Key Definitions

- Enthalpy (H): The total heat content of a system.
- Exothermic Reactions: Reactions that release heat ($\Delta H < 0$).
- Endothermic Reactions: Reactions that absorb heat ($\Delta H > 0$).

2. Specific Heat Capacity

- The amount of heat required to raise the temperature of one gram of a substance by one degree Celsius.
- Formula: $q = mc\Delta T$
- Where:
- q = heat energy (in joules)

- m = mass (in grams)
- c = specific heat capacity (in J/g°C)
- ΔT = change in temperature (in °C)

Acids and Bases

Understanding acids and bases is fundamental in chemistry.

1. Definitions

- Acids: Substances that donate protons (H^+) (e.g., HCl, H_2SO_4).
- Bases: Substances that accept protons or donate hydroxide ions (OH^-) (e.g., NaOH, NH_3).

2. pH Scale

- A measure of the acidity or basicity of a solution.
- Scale ranges from 0 (strong acids) to 14 (strong bases), with 7 being neutral.

3. Neutralization Reactions

- The reaction between an acid and a base to produce water and a salt.
- General reaction: $HA + BOH \rightarrow BA + H_2O$

Conclusion

This comprehensive cheat sheet serves as a valuable resource for students preparing for their general chemistry final exams. By consolidating key concepts, definitions, and formulas, students can efficiently study and review the material. When using this cheat sheet, it’s essential to complement it with practice problems and additional study resources to ensure a thorough understanding of the subject. With diligent preparation and the right tools at hand, students can approach their final exams with confidence and achieve success in their chemistry courses.

Frequently Asked Questions

What topics should be included in a general

chemistry final exam cheat sheet?

Key topics should include stoichiometry, atomic structure, periodic trends, chemical bonding, thermodynamics, equilibrium, acid-base reactions, and basic organic chemistry.

How can I effectively organize my cheat sheet for the final exam?

Organize your cheat sheet by grouping related topics together, using headings and bullet points for clarity, and including formulas, key concepts, and important reactions for quick reference.

Are there any specific formulas that I should memorize for the exam?

Yes, focus on memorizing formulas for molarity, pH calculations, gas laws (like PV=nRT), and the ideal gas law, as well as common reaction equations.

Can I use a cheat sheet during my final exam?

This depends on your instructor's policy. Many allow a one-page cheat sheet, while others may not permit any aids, so be sure to confirm the rules before the exam.

What is the best way to use a cheat sheet during an exam?

Use your cheat sheet as a quick reference to jog your memory on formulas and concepts, rather than trying to read everything at once. Familiarize yourself with its layout beforehand.

How can I create a cheat sheet that maximizes my study efficiency?

Create your cheat sheet while studying, summarizing concepts in your own words. Use color coding, diagrams, and mnemonics to enhance memory retention and make it visually appealing.

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