



# Viziscience®

## Catalog 2021/22

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**This catalog outlines the modules and units currently available in Viziscience.**

Key chemistry topics are contained in Unit 1 through Unit 9. Each topic is divided into modules that can be easily integrated into any lesson plan.

**Each module is self contained and the activities do not require students to refer to other resources (eg. the internet, textbooks, etc.) in order to complete the exercises. Each unit will take students somewhere between 1 to 3 hours to complete depending on their speed.**



## **Math Review: Important Math Skills**

Exponents and Scientific Notation  
Significant Figures - Quick Review  
Calculator & Exponents  
Logarithm & pH  
Mental Math - Tips and Tricks

## **UNIT 1: Atomic Structure and Properties**

1.1 Atoms, Isotopes, Atomic Weight  
1.2 Mole & Molar Mass  
1.3 The Periodic Table  
1.4 Empirical Formulas & Percent Composition  
1.5 (i) Naming Compounds (Covalent)  
1.5 (ii) Naming Compounds (Ionic)  
1.5 (iii) Naming Compounds (Polyatomic Ions)  
1.6 Electron Configurations  
1.7 The Order of Electron Filling  
1.8 Photoelectron Spectroscopy (PES)  
1.9 Periodic Trends

## **UNIT 2: Molecular and Ionic Compound**

2.1 Lewis Structure (Ionic Compounds)  
2.2 Lewis Structure (Covalent Compounds)  
2.3 Formal Charges, Polyatomic & Resonance  
2.4 Structure of Metals and Alloys  
2.5 VSEPR (PhET)  
2.6 Bond Hybridization



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### **UNIT 3: Intermolecular Forces and Properties**

- 3.1 Intermolecular Forces
- 3.2 Electromagnetic Radiation
- 3.3 Beer-Lambert Law
- 3.4 Avogadro's Law & Dalton's Law
- 3.5 Kinetic Molecular Theory
- 3.6 Ideal Gas Law & Deviation

### **UNIT 4: Chemical Reactions**

- 4.1 Stoichiometry
- 4.2 Balancing Equations
- 4.3 Balancing Complex Equations
- 4.4 Limiting Reactant & Percent Yield
- 4.5 Solutions & Dilutions
- 4.6 Acids and Bases - Introduction
- 4.7 Redox Reaction
- 4.8 Oxidation Number
- 4.9 Half-Reactions
- 4.10 Acidic/Basic Half-Reactions

### **UNIT 5: Kinetics**

- 5.1 Collision Theory
- 5.2 Reaction Rates & Rate Law
- 5.3 Concentration vs Time
- 5.4 Reaction Mechanism & Rate Law



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### **UNIT 6: Thermodynamics**

- 6.1 Bond Energy
- 6.2 Bond Length & Bond Order
- 6.3 Enthalpy & Calorimetry
- 6.4 Energy of Phase Changes
- 6.5 Hess's Law

### **UNIT 7: Equilibrium**

- 7.1 Le Chatelier's Principle
- 7.2 ICE table ( $K_c$  &  $K_p$ )
- 7.3 Solubility Equilibria ( $K_{sp}$ )

### **UNIT 8: Acids and Bases**

- 8.1 Strong and Weak Acids and Bases
- 8.2 pH, pOH,  $K_a$ ,  $K_b$ ,  $K_w$
- 8.3 Neutralization & Net Ionic Equations
- 8.4 Buffers & Buffer Capacity
- 8.5 Titration - Strong Acid Strong Base
- 8.6 Titration - Weak Acid Strong Base
- 8.7 Henderson-Hasselbalch Equation
- 8.8 Polyprotic Acids

### **UNIT 9: Applications of Thermodynamics**

- 9.1 Laws of Thermodynamics
- 9.2 Absolute Entropy and Entropy Change
- 9.3 Gibbs Free Energy
- 9.4 Thermodynamic and Kinetic Control



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- 9.5 Free Energy & Equilibrium
- 9.6 Coupled Reactions
- 9.7 Electrochemical Cells
- 9.8 Standard Cell Potentials
- 9.9 Non-Standard Cell Potentials
- 9.10 Electrolysis & Faraday's Law



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The following lists the current interactive online labs available on Viziscience. Each lab follows the general format of outlining the objectives of the experiment, real world applications, chemical theory, safety rules, materials and procedures before conducting the experiment where students will collect data by watching a video simulation.

Students can then check their data on the system to ensure they have observed and recorded them correctly. A set of correct data will then be given to students to perform analysis and calculations by answering questions. A post lab section will be provided for error analysis.

Unless specified, all our labs are self contained so students are not required to refer to other resources to learn these labs.

We have two examples of labs with details of what is covered explained here, feel free to download them.

## General Labs

1. Ionic & Covalent Compound Lab
2. Flame Test Lab
3. Paper Chromatography
4. Molar Mass of a Gas
5. Thin Layer Chromatography
6. Single Displacement
7. Gravimetric Analysis
8. Strong Acid-Strong Base Titration
9. Kinetics Theory
10. Calorimetry Lab
11. Beer's Law LabCourse



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## Equilibrium Labs

1. Le Chatelier's Principle & The Haber Process
2. KEQ Lab
  - a) KEQ: Experiment & data
  - b) KEQ: Calculations & Post Lab
3. Solubility & KSP