

## CHEMISTRY 11 DEMONSTRATIONS

Unit #	Topic	Demonstration Title
Intro1	Introductory demonstration 1	Fire Writing
Intro2	Introductory demonstration 2	Invisible Ink Message
Intro3	Introductory demonstration 3	Pop Bottle Cannon
I.1	The need for safety goggles	A Simulated "Acid in Your Eye" Accident
I.2	Working with dangerous chemicals	Why Worry About Safety? Ira Remsen's 1st
I.3	The need for clean work benches	Indicator Sponge
II.1	Density of water vs alcohol	U-Tube With Unequal Arms
II.2	Density of ice vs water or alcohol	The Mysterious Sunken Ice Cube
II.3	Golf ball in a density gradient	A Densi-Tee
II.4	Accuracy vs precision	Inaccurate Meter Stick
II.5	Different meniscus curves	What's A Meniscus?
II.6	Experimental uncertainty	Consistency
III.1	Hypothesizing	Think Tube
III.2	Density of a vapour	Flaming Vapour Ramp
III.3	Physical properties	Slime: Cross-Linked Glue
III.4	VP of acetone and n-butanol	The Vapour Pressure of Acetone and n-Butanol
III.5	Temperature and vapour pressure	The Effect of Temperature on Vapour Pressure
III.6	Density vs. viscosity	Density Versus Viscosity
III.7	Gas diffusion 1	Diffusion of Ammonia and Hydrogen Chloride
III.8	Gas diffusion 2	Producing Two Gases from Ammonium Chloride
III.9	Temperature versus diffusion rate	Effect of Temperature on Diffusion Rate
III.10	Relationship between P and V	Expansion of Shaving Cream In A Vacuum
III.11	Solutions, colloids and suspensions	Solutions, Colloids and Suspensions
III.12	Elements, mixtures & compounds	Elements, Mixtures and Compounds
III.13	Physical Separation Methods	Odour and Colour Eater
III.14	Immiscibility	Immiscible Liquids in Hero's Fountain
III.15	Distillation	Closed System Distillation Apparatus
III.16	Solvent Extraction	A Simple Separation of Cobalt and Nickel Salts
III.17	Chromatography	Radial Chromatography
III.18	Sublimation of benzoic acid	Hoarfrost in a Glass
III.19	Kinetic energy types	Types of Kinetic Energy

## Chemistry 11 Demonstrations – 2

Unit #	Topic	Demonstration Title
IV.1	Anhydrous copper sulphate	Dehydrating Action of Sulphuric Acid: a Twist
IV.2	Colours of ions	A Chemical Garden
V.1	Law of multiple proportions	Synthesis of Mercury(I) Iodide and Mercury(II) Iodide
V.2	Avogadro's Hypothesis	Equal Volumes of Gases Have Different Masses
V.3	Molar mass	Molar Mass Samples
V.4	Molar mass of air vs CO <sub>2</sub>	Misty Smoke Rings
V.5	Molar volume of CO <sub>2</sub>	A "Mole" of CO <sub>2</sub>
V.6	Molarity	Solutions of Moles
V.7	Parts per million	It's Only One Part Per Million
VI.1	Volumes are not conserved	Nonadditivity of Volumes: $1 + 1 < 2$
VI.2	Synthesis reaction 1	The Aluminum–Iodine Reaction
VI.3	Synthesis reaction 2	The Glowing Test Tube
VI.4	Decomposition reaction	Dehydration of Sucrose
VI.5	Metal ion single replacement	Reaction Between Silver Nitrate and Copper
VI.6	Halogen ion single replacement	Single Replacement of Halogens
VI.7	Double replacement	Reaction Between Silver Nitrate and Sodium Chloride
VI.8	Acid–base neutralization	Nonadditivity of Volumes: $1 + 1 > 2$
VI.9	Combustion	Growling Gummy Bear
VI.10	Combustion of iron	Sparkler In Pure Oxygen
VI.11	Combustion requires gravity	Candles Need Gravity to Burn
VI.12	Combustion of magnesium	Magnesium Burns and Burns
VI.13	Crystallization is exothermic	Bond Formation is an Exothermic Process
VI.14	Endothermic reaction	Chemical Cold Pack — An Endothermic Process
VI.15	Evaporation is endothermic	Evaporation — An Endothermic Process
VI.16	Exothermic reaction	Exothermic Reaction
VII.1	Stoichiometry of hydrogen production	Pennies New and Old
VII.2	Limiting quantities	Limiting Quantities

## Chemistry 11 Demonstrations – 3

Unit #	Topic	Demonstration Title
VIII.1	Isotope of Hydrogen	Calculating the Molar Mass of the Isotope Deuterium
VIII.2	Emission spectrum of neon	Neon Light
VIII.3	Plasma sphere	Plasma Tubes and Spheres
VIII.4	Absorption spectra of solutions	Absorption Spectra On The Overhead Projector
VIII.5	Trends in atomic properties	Electronegativity, Atomic Diameter, Melting
VIII.6	Reactions between halogens	Periodicity of Chlorine
IX.1	Reactions in solid vs. aqueous state	Ions Need to Get Together
IX.2	Solubility	Glass is Soluble in Water
IX.3	Saturated solutions	Multiply-Saturated Solution
IX.4	Supersaturated solution	Supersaturated Solution
IX.5	Conduction in ionic solutions	Ionic Crescendo
IX.6	Solid ionic solutions don't conduct	Do Frozen Solutions Conduct Electricity?
IX.7	Hydrogen bonding 1	Hydrogen Bonding
IX.8	Hydrogen bonding 2	The Uphill Bubble
IX.9	Hydrogen bonding 3	The Methane Mamba
IX.10	Polar / nonpolar liquids 1	Polar / Nonpolar Liquids
IX.11	Immiscible liquids	Immiscible Liquids
IX.12	Immiscibility	Salting Out — Making liquids Immiscible
IX.13	Like dissolves like	How To Dissolve Polystyrene Foam
IX.14	Polar / nonpolar liquids 2	Polar / Nonpolar Disks
X.1	Hydrocarbon polymer	Latex Polymer
X.2	Alkyl halides	Teflon Tape
X.3	Reactions of double bonds	Double Bonding
X.4	Chlorination of acetylene	Underwater Fireworks
X.5	"Polyamide" polymers	Nylon Formation
X.6	Developing fingerprints with ninhydrin	Fingerprint Detective
X.7	Ester formation	Esters As Natural Perfumes

## CHEMISTRY 12 DEMONSTRATIONS

Unit #	Topic	Demonstration Title
I.1	Measuring reaction rates	Reacting an Alka Seltzer Tablet
I.2	Effect of concentration on reaction rate	An Egg–Splosive Demonstration
I.3	Nature of reactants	The Effect of “The Nature of the Reactants”
I.4	Effect of surface area on reaction rate	Lycopodium exploder
I.5	Effect of surface area on reaction rate	Starch Explosion
I.6	Reaction rate between solids	Metathesis Reaction Between Two Solids
I.7	Catalysis 1	Decomposition of Hydrogen Peroxide by MnO <sub>2</sub>
I.8	Catalysis 2	Hydrogen Gas Production — A Catalyzing Experience
I.9	Catalysis 3	An Oscillating Platinum Wire
I.10	Catalysis 4	Catalytic Oxidation of Acetone
I.11	Autocatalysis	Autocatalysis
I.12	Reaction inhibitor	Inhibition of Hydrogen Peroxide
I.13	Exothermic reaction	Chemiluminescence — The Firefly Reaction
I.14	Activation energy	Racquet Ball
I.15	Activated complex	Activated Complex
I.16	Rate analogy	The Rate of Funnels
I.17	Effect of catalyst on reaction	Thorium Oxide as a Catalyst
I.18	Doubling the reaction rate	The Chemist’s “Rule of Thumb”
II.1	Equilibrium analogy	Equilibrium Is Not Fair
II.2	Spontaneous movement of gases 1	The Automatic Water Fountain: Helium Effusion
II.3	Spontaneous movement of gases 2	Shrinking Suds
II.4	Entropy–driven reaction	Endothermic Rx Between Ba(OH) <sub>2</sub> •8H <sub>2</sub> O and NH <sub>4</sub> SCN
II.5	Le Chatelier’s Principle 1	Equilibrium on an Overhead
II.6	Le Chatelier’s Principle 2	The Effect of Pressure Changes on an Equilibrium I
II.7	Le Chatelier’s Principle 3	The Effect of Pressure Changes on an Equilibrium II
II.8	Effect of temperature on gas solubility	Gases Have It Backwards
II.9	The Haber and Ostwald reactions	Ostwald Oxidation of Ammonia
III.1	Crystallization reactions	A Golden Rain of Lead (II) Iodide Crystals
III.2	Solubility diagrams	Fractional Crystallization
III.3	Solubility exception 1	Solubility of Calcium Acetate
III.4	Solubility exception 2	The Effect of Temperature on Solubility
III.5	Precipitation equations	Name that Precipitate
III.6	Will a precipitate form?	Solubility Product Constant, K <sub>sp</sub>

Chemistry 12 Demonstrations – 2

Unit #	Topic	Demonstration Title
III.7	Water hardness	Concentration Dependence of a Reaction
III.8	Common ion effect 1	Common Ion Effect
III.9	Common ion effect 2	Common Ion Effect Revisited
IV.1	Amphiprotic ions	The Amphiprotic Behaviour of $\text{Al}(\text{OH})_3$
IV.2	Strong vs weak acids	Relative Acid Strength
IV.3	Weak acids and bases 1	Conductivity of a Mixture of $\text{NH}_3$ and $\text{CH}_3\text{COOH}$
IV.4	Weak acids and bases 2	Etching Glass with HF
IV.5	Effect of temperature on $K_b$	Effect of temperature on the $\text{NH}_3 / \text{NH}_4^+$ equilibrium
IV.6	The pH scale	pH Rainbow Tube
IV.7	Hydrolysis	Acidic and Basic Salts
IV.8	Acidity of $\text{CO}_2(\text{aq})$	Preparation And Properties Of Carbon Dioxide
IV.9	Acid-base titrations	Titration of $\text{Ba}(\text{OH})_2$ with $\text{H}_2\text{SO}_4$
IV.10	Indicators 1	Goldenrod Messages
IV.11	Indicator s 2	Indicator Boxes
IV.12	Indicators 3	Indicator Colour Changes
IV.13	Indicators 4	Producing An Acid–Base Indicator Paper
IV.14	Buffers 1	Diluting a Buffer Has No Effect on its pH
IV.15	Buffers 2	Common Ion Effect II
IV.16	Buffers 3	$K_{sp}$ Balance Revisited
IV.17	Buffers in biological systems	The Effect of a Change in $[\text{CO}_2]$ on Blood pH
IV.18	Basic anhydride	Basic Anhydride
IV.19	Acid rain 1	Acid Rain
IV.20	Acid rain 2	Instant Smog
V.1	Redox reactions	The Silver Nitrate / Copper Reaction Revisited
V.2	Reduced iron	Reduced Iron in Cereal
V.3	Oxidation numbers	The Many Colours of Vanadium
V.4	Applied Electrochemistry	The Breathalyser
V.5	Corrosion	How to Turn Aluminum into Hoarfrost
V.6	Electrolysis 1	Electrolysis of Water
V.7	Electrolysis 2	Electrolysis of Copper(II) Chromate
V.8	Electrolytic vs electrochemical cells	Electrolytic and Electrochemical Cells
V.9	Electrolysis 3	Petri Dish Electrolysis and Liquid Motors

## GENERAL DEMONSTRATIONS

#	Topic	Demonstration Title
1	Electrostatic attraction	The Electrostatic Bubble
2	Electrostatic repulsion	The Bubble Trampoline
3	Guncotton	Combustion Of Cellulose Nitrate (Guncotton)
4	Burning lighter fluid on water	Burning Water
5	Electrostatic attraction of water	Bending A Stream Of Water
6	Fireworks flame tests	Coloured H <sub>2</sub> Balloon Explosions
7	Flames in O <sub>2</sub> and CO <sub>2</sub>	The Jumping Flame
8	Green boric acid flame	Saint Patrick's Day Demo
9	Ammonia fountain balloon in a flask	The Balloon In The Flask — A New Approach
10	Vaporizing ethanol into a flame	Dragon's Breath
11	Redissolving mercury complexes	Disappearing Orangeade
12	Reduction of silver by dextrose	Silver Mirror
13	Ammonia–hydrochloric acid smoke	Smoke Cannon
14	Rapid oxidation of zinc	Instant Fire
15	Hydrophobic powder	Dry Hands In Wet Water
16	Old Nassau clock reaction	The Black Witch Eats The Great Pumpkin
17	Sodium polyacrylate gel	Disappearing Water
18	Combustion of methane in bubbles	Methane Bubbles
19	Sublimation of CO <sub>2</sub> in a balloon	Self-Inflating Balloon
20	Catalytic oxidation of ammonia	Fireflies
21	Dissolving styrofoam in acetone	Melting Styrofoam Cup
22	Oscillating reaction	Malonic Acid and KIO <sub>3</sub> : Oscillating Yellow And Blue
23	Universal indicator	A Colourful Tornado
24	Refractive index of pyrex in baby oil	The Disappearing Glass Rod
25	Observing silver crystal growth	Growing Silver Crystals Under A Microscope
26	Polyvinyl alcohol–borax gel	Slime
27	Magnesium–orange juice battery	Orange Juice Clock
28	Oxidation of sugar–chlorate mixture	The Self-Lighting Candle
29	Simultaneous clock reactions	Simultaneous Multi-Coloured Clock Reactions
30	Reduction of H <sub>2</sub> O <sub>2</sub> by KI	Elephant's Toothpaste
31	Acetylene explosion	Calcium Carbide In Balloon
32	Density of CO <sub>2</sub> vs. air	Floating Bubbles in CO <sub>2</sub>
33	Combustion of methane bubbles	Ripple Tank Fireball

### General Demonstrations – 2

#	Topic	Demonstration Title
34	Hydrogen–air explosion	Hydrogen In A Bottle
35	Flash paper	Flash paper
36	Explosive methane mixture	Paint Can Explosion
37	Oxidation of methylene blue	The Methylene Blue Traffic Light
38	Fluorescence of quinine	Glowing Tonic Water
39	Hydrophobic solid	Magic Sand
40	Salt water oscillator	Salt Water Oscillator