

Web Demo and Topics

Chemistry Objective & Essay Questions

1) Which unit is used to express the energy absorbed or released during a chemical reaction?

- 1) Kelvin 2) joule 3) volt 4) torr

2) When 10 grams of a compound was dissolved in 1000 grams of water, the temperature of the water rose from 25 degrees C to 30 degrees C. For each gram of compound dissolved, how many joules of heat were absorbed by the water?

- 1) 21 joules 2) 42 joules 3) 210 joules 4) 420 joules

3) The temperature of a 2.0 liter sample of helium gas at STP is increase to 27 degrees C and the pressure is decreased to 80. kPa. What is the new volume of the helium sample?

- 1) 1.4 L 2) 2.0 L 3) 2.8 L 4) 4.0 L

4) How many moles of a gas will exert a pressure of 151.95 kPa at 373°C and have a volume of 18,600 cm³?

- 1) .53 3) 1.06
2) .26 4) 1.32

5) The carrier of the gravitational force is the

- 1) photon 2) gluon 3) graviton 4) boson

6) The carrier of the strong force is the

- 1) photon 2) gluon 3) graviton 4) boson

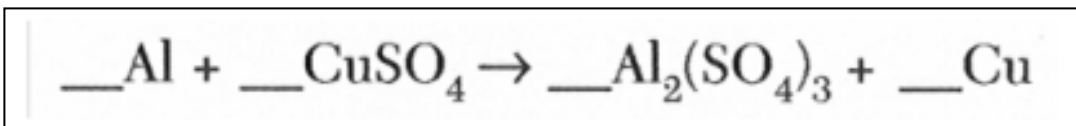
7) The calcium ion has the same electronic configuration as an

- 1) ion of Mg 3) atom of Ar
2) ion of Br 4) atom of K

8) As the elements in Group 1 of the Periodic Table are considered in order from top to bottom, the ionization energy of each successive element decreases. This decrease is due to

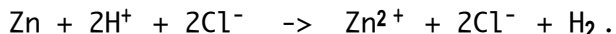
- 1) decreasing radius and decreasing shielding effect
2) decreasing radius and increasing shielding effect
3) increasing radius and decreasing shielding effect
4) increasing radius and increasing shielding effect

9) Given the unbalanced equation:



molecules A, B, and C.

4) Consider the reaction:



Write the correct half-reaction for the oxidation that occurs in the equation above.

5) Which reaction occurs at the negative electrode during the electrolysis of fused (molten) calcium fluoride?

Explain using a complete sentence.

6) The Decaffeinating Tradition

For coffee beans to be labeled "decaffeinated" at least 97% of the caffeine must be removed. There are three primary methods for decaffeination: chemical extraction, the Swiss water process, and superficial fluid extraction.

Although all methods of decaffeinating coffee involve the use of "chemicals," one process has been traditionally referred to as "chemical extraction," probable because it uses organic solvents that are not typically part of our normal environment. The traditional method offers two slightly varied options using dichloromethane or ethyl acetate as solvents. With both solvents, the beans are first soaked in water to soften them and speed the decaffeinating process. The beans are then soaked in one of the two solvents, which dissolves the caffeine in the beans. Once the solvent had removed the caffeine, the coffee beans are treated with steam. This evaporated the organic solvent along with the caffeine.

The process is identical for both solvents, but many coffee companies prefer to use ethyl acetate to decaffeinate their coffee. This allows them to label the beans "naturally decaffeinated," because ethyl acetate occurs naturally in orange rind and many other fruits. Although consumers may prefer this label, it is misleading. The ethyl acetate used is actually synthesized; it is not extracted from fruit because it would be too costly.

Both of these commercial methods have a growing number of detractors, prompting many coffee companies to turn toward other methods. Opposition arises because the solvents used can never be completely removed from the coffee beans. The traces left behind, however, are below the amounts required for the "decaffeinated" labeled. Because of the recognized potential hazards associated with the use of dichloromethane and ethyl acetate, the United States Food and Drug Administration and the United States Department of Agriculture continue to investigate and evaluate any possible dangers that might be associated with the use of these chemicals.

a. Draw the structural formula ethyl acetate.

- b. To what class of organic compounds does ethyl acetate belong?
- c. Draw the structural formula for dichloromethane
- d. To what class of organic compounds does dichloromethane belong?
- e. Which do you think is better, ethyl acetate or dichloromethane, as a decaffeinating agent for coffee? Explain your choice from the information in the article.
- f. Indicate whether you think the caffeine molecule is polar or nonpolar, then explain your answer in terms of the solubility of the caffeine molecule.

7) Draw the structural formula and write the name of the alcohol that contains three hydroxyl groups per molecule.

8) Draw the structural formulas for the isomers for propanol.

9) How many moles of a gas will exert a pressure of 151.95 kPa at 373 degrees Celsius and have a volume of 18,600 cm³? Show your work and cancel units.

10) How many grams of silver can be obtained from a silver nitrate solution if three Faradays of electricity were passed through the solution? Show all work.

CHEMISTRY TOPICS

Advanced Topic: Graham's Law Problems
 Advanced Topic: Ideal Gas Law Problems
 Advanced Topic: Specific Heat Problems
 Avogadro's Hypothesis
 Boiling Point
 Boyle's Law
 Calorimetry
 Celsius & Kelvin
 Change of State - General
 Charles' law
 Chemical Properties
 Combined Gas Law
 Dalton's Law of Vapor Pressure
 Determine the Volume of a Mole of Gas
 Deviation - Gas Laws
 Elements & Compounds
 Endothermic & Exothermic
 Forms of Energy
 Freezing Point
 Gay Lussac's Law
 Heat of Fusion
 Heat of Vaporization
 Homogeneous & Heterogeneous Substances
 Ideal Gas Equation Problems
 Ideal Gas Law Behavior
 Kinetic Theory
 Mole Relationships
 Phases of Matter

Atomic Radii
 Boron Group
 Carbon Group
 Chemistry of a Group
 Chemistry of a Period
 Chemistry of Metals
 Chemistry of Nonmetals
 Combustion of Hydrocarbons
 Electron Affinities
 Electronegativity
 Elements 93 - 109
 Halogen Group
 Ionic Radii
 Ionization Energy
 Metalloids & Semimetals
 Metals - Ionization Energy
 Nitrogen Group
 Noble Group
 Nonmetals - Ionization Energy
 Oxygen Group
 Periodic Table
 Semiconductors - Conduction in N-Type
 Semiconductors - Conduction in P-Type
 Semiconductors - Conduction in Solids
 Semiconductors - General
 Semiconductors - Pure
 Types of Elements
 Transition Elements

Physical Properties
 Scientific Process
 Significant Figures
 Significant Figures - Add
 Significant Figures - Division
 Significant Figures - Multiplication
 Significant Figures - SUBTRACT
 Standard Temperature - Pressure
 Sublimation
 Temperature & Heat Flow
 Thermometry & Energy Flow
 Triple Point
 Vapor Pressure
 Accelerators
 Advanced Topic: Four Quantum Numbers
 Advanced Topic: Mass Defect
 Alpha Decay
 Antiparticles
 Artificial Transmutation
 Atom Particles
 Atomic Mass Number
 Atomic Mass Unit Standard
 Atomic Number
 Beta Decay
 Binding Energy & Mass Defect
 Conservation of Mass - Energy
 Determining the Number of Neutrons
 Electron Configuration
 Energy Levels
 Fission
 Force Carriers
 Fractional Atomic Masses
 Fundamental Forces
 Fundamental Particles
 Fusion
 Ground State & Excited State
 Half Life
 Hydrogen Isotopes
 Isoelectronic Structures
 Isotopes
 Natural Radioactivity
 Nuclear Charge
 Nuclear Equations
 Nuclear Reactors
 Nucleons
 Principal Energy Levels
 Principal Quantum Number
 Radiation Detection Devices
 Radiation Penetrating Power
 Radioactive Dating
 Radioactive Particles
 Radioactive Wastes
 Rutherford's Gold Foil Experiment
 Separating Nuclear Emanations
 Spectrum
 Sublevels & Orbitals
 Uses of Radioactive Isotopes

Valence Electrons
 Acids
 Chemical Equations
 Chemical Formulas
 Common Chemical Names
 Common Molecular Equations - Analysis
 Coordinate Covalent Bond
 Degree of Ionic Character
 Double Replacement Reactions
 Energy Changes in Bonding
 Energy Released in Bond Formation
 Hydrogen Bonding
 Ionic Bonding
 Ionic Substances
 London Forces
 Metallic Bond
 Molecular Equations - Acid Reactions
 Molecules
 Multiple Covalent Bonds
 Network Substances
 Nomenclature
 Nonpolar Covalent Bond
 Nonpolar Molecular Substances
 Polar Covalent Bond
 Polar Molecular Substances
 Resonance
 Shapes of Molecules
 Types of Compounds
 Van der Waals Force
 VSEPR

Adv. Topics - Molal - Boiling Point Problems
 Adv. Topics - Molal - Freezing Point Problems
 Adv. Topics - Mole Fraction Problems
 Adv. Topics - Osmotic Pressure
 Adv. Topics - Osmotic Pressure - Molecular Weight
 Colloids
 Density -> Molecular Weight
 Density of an Object

Empirical Formulas
 Equations: Liter - Liter
 Equations: Mass - Mass
 Equations: Mass - Moles
 Equations: Mass - Volume
 Equations: Mole - Liter
 Equations: Mole - Mole
 Equations: Molecule - Molecule
 Gram - Atomic Mass
 Gram -> Liter Conversions
 Gram -> Mole Conversions
 Gram -> Particle Conversions
 Gram MOLECULAR MASS
 Henry's Law
 How Things Dissolve
 Interpreting Solubility Data Lab
 Liter -> Mole conversions
 Molal Boiling Point Elevation

Valence Electrons
Actinoid & Lanthanoid Series
Alkali Group
Alkaline Earth Group

Molal Freezing Point Depression
Molar & Molal
Molar Dilution Problems
Molar Solution Problems

Mole -> Gram Conversions
Mole -> Particle Conversions
Mole
Molecular Formulas
Particle -> Mole -> Liter Conversions
Particles -> Mole Conversions
Percent Error
Percentage Composition
Percentage Concentrations

$[H^+] \leftrightarrow [OH^-]$
pH -> []
[] --> pH
Active Metals & Water
Advanced Topic: Auto-oxidation
Advanced Topic: Balancing Equation - acid
Advanced Topic: Balancing Equation - base
Advanced Topic: Electrochemistry Problems

Saturated - Unsaturated - Supersaturated
Solubility - Gases
Solubility - Solutions
Using Solubility Charts
Weight of an Atom
Activation Energy
Advanced Topic - Enthalpy Problems
Advanced Topic - Entropy Problems
Advanced Topic - Free energy
Advanced Topic - Heat of Reaction
Advanced Topic - Keq Problems
Advanced Topic - Kh - Hydrolysis
Advanced Topic - Ksp Problems
Advanced Topic - Rate Law

Advanced Topic: Disproportion
Advanced Topic: Nernst Equation
Balancing Redox Equations
Change in Oxidation Number
Corrosion
Electrochemical cell(Voltaic Cell)
Electrolysis of Brine
Electrolysis of Water
Electrolysis Problems
Electrolytic Cell
Electroplating
Ion Electron Equations - Oxidation
Ion Electron Equations - Reduction
Lead Acid Battery
Nickel-Cadmium Battery
Oxidation Numbers - Formulas
Oxidation Numbers - Radicals
Oxidation
Oxidizing Agents
Redox Identification
Reducing Agent
Reduction of Metals
Reduction
Standard E Zero
Total E Zero Values

CATALYST
Compound Stability
Contact Process
Enthalpy
Entropy
Equations - Kilojoules
Equilibrium Expressions
Equilibrium
Factors Affecting Reaction Rates
Gibb's Free Energy
Haber Process
Heat & Chemical Change Problems
Heat of Formation
Heat of Reactions
Interpreting K Values
Interpreting Ksp Values
Keq Curves
Keq Problems
Ksp Problems
Le Chatelier's Principle - Add
Le Chatelier's Principle - Catalyst
Le Chatelier's Principle - Common Ion Effect
Le Chatelier's Principle - Pressure
Le Chatelier's Principle - Remove
Le Chatelier's Principle - Temperature
Nature of the Reactants
Reaction Rates - Gases
Acid Nomenclature
Acid Rain

Using Standard Electrode Potential Tables
Addition Polymers
Addition Reactions
Aldehydes
Alkadienes
Alkanes
Alkenes
Alkyl Halides
Alkynes
Amino Acids
Benzene Series
Combustion of Hydrocarbons
Condensation Polymer
Cracking Process
Dihydroxy Alcohols
Esterfication
Ethers
Fermentation

Amphoprotic Species	Fractional Distillation
Amphoteric Hydroxides	Fullerines
Anhydrides	Geoisomer Isomers
Arrhenius Acid-Base	Homologous Series
Adv. Topic: Antilogs	Hydrocarbon Compounds
Adv. Topic: Buffer Problems	Hydrocarbon Isomers
Adv. Topic: Buffers	Hydrogenation
Adv. Topic: Equivalence Point	Ketones
Adv. Topic: Ionization - Di/Tri Protic Acids	NonHydrocarbon Isomers
Adv. Topic: Ka & pH	Organic Acids
Adv. Topic: Ki Problems	Organic Compound Properties
Adv. Topic: Percent Ionization Problems	Petroleum Production
Adv. Topic: Titration Problems	Polymerization
Adv. Topic: pH - Logs	Primary Alcohols
Common Ion effect	Saponification
Conjugate Acid & Base Strength	Secondary Alcohols
Conjugate Acid - Base Pairs	Substitution Reactions
Electrolytes	Tertiary Alcohols
End Point - pH	Trihydroxy Alcohols
Factors Affecting Boiling Points	Bunsen Flame
Factors Affecting Freezing Points	Experimental Observation
Hydrolysis & pH	Filtration
Hydrolysis - Acid Salts	Gases - Water Displacement
Hydrolysis - Basic Salts	Gases - Downward Displacement of Air
Hydrolysis - Neutral Salts	Gases - Upward Displacement of Air
Indicators	General Rules of Solubility
Interpreting Ka	Heat of Solution - Experimental Data
Ionization of Diprotic Acids	Hydrogen Sulfide Test
Ka Problems	Identification - Negative Ions
Kw	Identification - Positive Ions
Molarity -> pH	Laboratory - Distillation
Neutralization	Laboratory Equipment - Safety
Nonelectrolytes	Laboratory Equipment - Use
Percent Dissociation of Acids	Laboratory Test for an Unknown
Reactions Going to Completion	Meniscus
Titration - Equivalent Method	Recognition of Some Gases
Titration - Mole Method	Volume Measurements & Accuracy

CHEMISTRY ESSAY TOPICS

Advanced topic: Graham's Law Problems	Advanced Topic: Enthalpy Problems
Advanced Topic: Ideal Gas Law Problems	Advanced Topic: Entropy Problems
Advanced Topic: Specific Heat Problems	Advanced Topic: Free energy
Boiling Point	Advanced Topic: Heat of Reaction
Boyle's Law	Advanced Topic: Keq Problems
Calorimetry	Advanced Topic: Kh - Hydrolysis
Charles' Law	Advanced Topic: Ksp Problems
Combined Gas Law	Advanced Topic: Rate Law
Conversion - Kelvin <-> Celsius	Potential Energy Diagrams
Dalton's Law of Vapor Pressure	Entropy
Determine the Volume of a Mole of Gas	Heat of Reaction
Gas & Liquid Model	Heat & Chemical Change Problems
Heat of Fusion	Keq Problems
Heat of Vaporization	Gibb's Free Energy
Ideal Gas Equation Problems	Ksp Problems

Mixture Separation	Law of Conservation of Energy
Phase Changes	Le Chatelier's Principle
Periodic Table History	Nature of the Reactants
States of Matter	Factors Affecting Reaction Rates
Vapor Pressure	SI Unit EQUATIONS - KILOJOULES
Advanced Topic: Mass Defect	Advanced Topic: Antilogs
Accelerators	Advanced Topic: Buffer Problems
Alpha Decay	Advanced Topic: Ionization of Di & Tri Protic Acids
Atomic Particles	Advanced Topic: Ka & pH
Atomic Mass Number	Advanced Topic: Ki Problems
Calculating the Atomic Mass Number	Advanced Topic: Percent Ionization Problems
Atomic Mass Unit Standard	Advanced Topic: Titration Problems
Atomic Number	Advanced Topic: pH - Logs
Beta Decay	End Point - pH
Electron Dot Structures	Environmental Safety
$E = MC^2$	Hydrolysis & pH
Fission	Ka Problems
Fractional Atomic Masses	Kw Problems
Fusion	Reading problems - Acid-Base
Ground State & Excited State	Lab - Acid - Base
Half Life	Lab - Safety
Isotopes	Lab Solutions
Nuclear Power & Radiation	Lab Solution Equilibrium
Nuclear Reactions	Molarity -> pH
Nuclear Waste	Titration - Equivalent Method
Principal Energy Levels	Titration - Mole Method
Radioactive Dating	$[H^+] \leftrightarrow [OH^-]$
Radioactive Decay	pH -> []
Rutherford's Gold Foil Experiment	Advanced Topic: Balancing Equation - acid
Modern Model of the Atom	Advanced Topic: Balancing Equation - base
Separating Nuclear Emanations	Advanced Topic: Electrochemistry Problems
Subatomic Particles	Advanced Topic: Nernst Equation
Sublevels & Orbitals	Electrochemical Cell
Actinoid & Lanthanoid Series	Electrolysis of Brine
Alkali Group	Electrolysis of Water
Alkaline Earth Group	Electrolysis Problems
Atomic Radii	Electrolytes
Electron Affinities	Electrolytic Cell
Electronegativity	Electroplating
Electronegativity - Comparison	Oxidation Numbers
Ionic Radii	Redox Reactions
Ionization Energy	Ion Electron Equations - Oxidation
Spectrum	Ion Electron Equations - Reduction
Transition Elements	Addition Reactions
Valence Electrons	Aldehydes
Acids	Alkadienes
Chemical Equations	Alkanes
Chemical Formula	Alkenes
Common Molecular Equations- Analysis	Alkyl Halides
Coordinate Covalent Bond	Alkynes
Degree of Ionic Character	Benzene Series
Double Replacement Reactions	Combustion of Hydrocarbons
Energy Changes in Bonding	Condensation Polymers
Essay Readings	Cracking Process
Hydrogen Bonding	Dihydroxy Alcohols
Ionis Bonding	Esterfication
Ionic Substances	

Metallic Bond	Ethers
Molecular Equations - Acid Reactions	Experimental Observations
Molecules	Fermentation
Multiple Covalent Bonds	Fractional Distillation
Network Substances	Equations: Mass - Volume
Nomenclature	Graphing Techniques
Nonpolar Covalent Bond	Graphing
Nonpolar Molecular Substances	Fullerenes
Molecules - Diagram	Geoisomers
Properties of Nonmetals	Heat of Solution - Experimental Data
Polar Covalent Bond	Homogenous Series
Resonance	Hydrocarbon Isomers
Shapes of Molecules	Hydrogenation
Types of Bonds	Ketones
Types of Compounds	Nonhydrocarbon Isomers
London Dispersion Forces	Organic Acids
Van der Waals Force	Polymerization
VSEPR	PRIMARY ALCOHOLS
Advanced Topics - Molal - Boiling Point Problems	Interpreting Reading
Advanced Topics - Molal - Freezing Point Problems	Interpreting Tables
Advanced Topics - Mole Fraction Problems	Saturated & Unsaturated Molecules
Advanced Topics - Osmotic Pressure	Secondary Alcohols
Advanced Topics - Osmotic Pressure - Molecular Weight	Substitution Reactions
Density	Structural - Molecular Equations - Hydrocarbons - Oxygen
Density -> Molecular Weight	Structural - Molecular Equations - Hydrocarbons
Empirical Formulas	Structural - Molecular Formulas - Hydrocarbons
Equations: Liter - Liter	Structural - Molecular Formulas - Hydrocarbons-Oxygen
Equations: Mass - Mass	Structural - Molecular Formulas - Polymers
Equations: Mole - Liter	Tertiary Alcohols
Equations: Mole - Mole	Trihydroxy Alcohols
Gram - Atomic Mass	
Gram -> Liter Conversions	
Gram -> Mole Conversions	
Gram Molecular Mass	
Gram -> Particle Conversions	
Henry's Law	
Liter -> Mole Conversions	
Mole	
Molal Freezing Point Depression	
Molar Dilution Problems	
Molar & Molal	
Molar Solution Problems	
Mole -> Gram Conversions	
Mole -> Particle Conversions	
Molecular Formulas	
Particles -> Mole Conversions	
Particles -> Mole -> Liter Conversions	
Percentage Composition	
Percent Error	Solubility of Gases
Wright of an Atom	Significant Figures