# SACRAMENTO CITY UNIFIED SCHOOL DISTRICT
# BOARD OF EDUCATION

Agenda Item 9.1h

**Meeting Date:** July 16, 2015

**Subject:**

SACRAMENTO CITY UNIFIED SCHOOL DISTRICT

BOARD OF EDUCATION APPROVED ON:

Board of Education

Darrel Woo, President Trustee Area 6
Christina Pritchett, 1st Vice President Trustee Area 3
Jay Hansen, 2nd Vice President Trustee Area 1
Ellen Cochrane, Trustee Area 2
Gustavo Arroyo, Trustee Area 4
Diana Rodriguez, Trustee Area 5
Jessie Ryan, Trustee Area 7
Asami Saito, Student Board Member

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José L.Banda, Superintendent
Lisa Allen, Deputy Superintendent
Gerado Castillo,

# COURSE DESCRIPTION

CONSERVATION OF MATTER AND STOICHIOMETRY

3. The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants. As a basis for understanding this concept:

a. Students know how to describe chemical reactions by writing balanced equations.

b. Students know the quantity one mole is set by defining one mole of carbon 12 atoms to have a mass of exactly 12 grams.

c. Students know one mole equals 6.02 x 1023 particles (atoms or molecules).

d. Students know how to determine the molar mass of a molecule from its chemical formula and a table of atomic masses and how to convert the mass of a molecular substance to moles, number of particles, or volume of gas at standard temperature and pressure.

e. Students know how to calculate the masses of reactants and products in a chemical reaction from the mass of one of the reactants or products and the relevant atomic masses.

f.* Students know how to calculate percent yield in a chemical reaction.

g.* Students know how to identify reactions that involve oxidation and reduction and how to balance oxidation–reduction reactions.

GASES AND THEIR PROPERTIES

4. The kinetic molecular theory describes the motion of atoms and molecules and explains the properties of gases. As a basis for understanding this concept:

a. Students know the random motion of molecules and their collisions with a surface create the observable pressure on that surface.

b. Students know the random motion of molecules explains the diffusion of gases.

c. Students know how to apply the gas laws to relate the pressure, temperature, and volume of any amount of an ideal gas or any mixture of ideal gases.

d. Students know the values and meanings of standard temperature and pressure (STP).

e. Students know how to convert between the Celsius and Kelvin temperature scales.

f. Students know there is no temperature lower than 0 Kelvin.

g.*Students know the kinetic theory of gases relates the absolute temperature of a gas to the average kinetic energy of its molecules or atoms.

h.*Students know how to solve problems by using the ideal gas law in the form PV = nRT.

i.* Students know how to apply Dalton's law of partial pressures to describe the composition of gases and Graham's law to predict diffusion of gases.

ACIDS AND BASES

5. Acids, bases, and salts are three classes of compounds that form ions in water solutions. As a basis for understanding this concept:

a. Students know the observable properties of acids, bases, and salt solutions.

b. Students know acids are hydrogen-ion-donating and bases are hydrogen-ion-accepting substances.

c. Students know strong acids and bases fully dissociate and weak acids and bases partially dissociate.

d. Students know how to use the pH scale to characterize acid and base solutions.

e.*Students know the Arrhenius, Brønsted–Lowry, and Lewis acid–base definitions.

f.* Students know how to calculate pH from the hydrogen-ion-concentration.

g.*Students know buffers stabilize pH in acid–base reactions.

SOLUTIONS

6. Solutions are homogenous mixtures of two or more substances. As a basis

e.*Students know the relationship between the molality of a solute in a solution and the solution's depressed freezing point or elevated boiling point.

f. *Students know how molecules in a solution are separated or purified by the methods of chromatography and distillation.

CHEMICAL THERMODYNAMICS

7. Energy is exchanged or transformed in all chemical reactions and physical changes of matter. As a basis for understanding this concept:

a. Students know how to describe temperature and heat flow in terms of the motion of molecules (or atoms).

b. Students know chemical processes can either release (exothermic) or absorb (endothermic) thermal energy.

c. Students know energy is released when a material condenses or freezes and is absorbed

Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.] [Assessment Boundary: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.]

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is related to the change in energy of the field.] [Assessment Boundary: Assessment is limited to systems containing two objects.]

HS-PS4 Waves and Their Applications in Technologies for Information Transfer
Students who demonstrate understanding can:

HS-PS4-1: Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. [Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.]

HS-PS4-2: Evaluate questions about the advantages of using a digital transmission and storage of information. [Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.]

HS-PS4-3: Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is

8. Evaluate the hypotheses, data, analysis, and

Integration of Knowledge and Ideas

7. Conduct short as well as more sustained research projects to answer a question (including a self-generated

# SECTION TWO COURSE UNITS

## Suggested Activities

- Core Lab: Treating Symptoms with the Rite Aid®: Demystifying Over the-Counter Pharmaceuticals
- Explore Your World Nutrition Units
- Case Study Cell Phone Use and Cancer
- Case Study Does a One-Size Drug Dose Fit All
- Case Study Is Guaiacum sanctum Effective Against Arthritis
- Case Study Kermit to Kermette
- Case Study Sometimes Less is Better: Treatment of Venous Thrombolism

## Suggested Assessment

- Questions and Problems Chemistry & Chemicals
- Questions and Problems Scientific Method
- Questions and Problems Units of Measurements
- Questions and Problems Scientific Notation
- Questions and Problems Significant Figures
- Questions and Problems Significant Figures in Calculations
- Questions and Problems Prefixes and Equalities
- Questions and Problems Writing Conversion Factors
- Questions and Problems

## Standards Addressed

CA Content Standards for Chemistry: CH 8a, CH 8 a–c, and CH 9 a–b.
NGSS: HS-PS1-2, HS-PS1-4, HS-PS1-5, HS-PS1-6, HS-PS1-7
CCSS-Science – R1, R2, R3, R4, R8, R9, W1, W3, W4, W7, W9, W10

## Instructional Objectives

- Students know how to describe chemical reactions by writing balanced equations.
- Students know the quantity one mole is set by defining one mole of carbon 12 atoms to have a mass of exactly 12 grams.
- Students know one mole equals $6.02 \times 10^{23}$ particles (atoms or molecules).
- Students know how to determine the molar mass of a molecule from its chemical formula and a table of atomic masses and how to convert the mass of a molecular substance to moles, number of particles, or volume of gas at standard temperature and pressure.
- Students know how to calculate the masses of reactants and products in a chemical reaction from the mass of one of the reactants or products and the relevant atomic masses.
- Students know how to use Le Chatelier's principle to predict the effect of changes in concentration, temperature, and pressure.
- Students know equilibrium is established when forward and reverse reaction rates are equal.
- Students know the rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time.
- Students know how reaction rates depend on such factors as concentration, temperature, and pressure.
- Students know the role a catalyst plays in increasing the reaction rate.

## Suggested Activities

- Core lab: Lab Aids* Identification of Chemical Reactions
- Core lab: Synthesis of Aspirin
- Core lab: Chemical Reactions for Living Systems
- Explore Your World Calculating Moles in the Kitchen p.169
- *Explore Your World Oxidation of Fruits and Vegetables p.186
- Case Study Avogadro Goes to Court
- Case Study Get the Lead Out
- Lab: Biobridge – Sensible Smell
- Core lab: Understanding Enzymes
- Biobridge Lab Enzymes and Pharmacy
- Lab: The Effects of pH and Temperature on the Catalase Enzyme in Potatoes
- Case study Sometimes Less is Better Treatment of Venous Thrombolism
- Core lab: Buffering Capacity of Blood
- Core lab: The Effectiveness of Antacids

- Case study A Better Yield

- Explore Your World Forming a Gas p.213
- Case study A Killer Lake
- Case study Gas Cylinders and Safety

## Suggested Assessment

- Questions and Problems Properties of Gases
- Questions and Problems Gas Pressure
- Questions and Problems Pressure and Volume

## Suggested Assessment

- Questions and Problems Acids and Bases
- Questions and Problems Strengths of Acids and Bases
- Questions and Problems Ionization of Water
- Questions and Problems The pH Scale
- Questions and Problems Reactions of Acids and Bases
- Questions and Problems Buffers

# UNIT VII: Solutions

Solutions are homogenous mixtures of two or more substances. As a basis for understanding this concept:

## Standards Addressed

CA Content Standards for Chemistry: 6a–d.
NGSS: HS-PS1-1, HS-PS1-2, HS-PS1-3, HS-PS1-4, HS-PS1-5, HS-PS1-6, HS-PS1-7
CCSS-Science – R1, R2, R3, R4, R8, R9, W1, W3, W4, W7, W9, W10

## Instructional Objectives

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Suggested Assessment

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# UNIT IX Organic Chemistry and Biochemistry

The bonding characteristics of carbon allow the formation of many different organic molecules of varied

## Suggested Assessment

- Questions and Problems Functional Groups
- Questions and Problems Polymers of Alkenes
- Questions and Problems Carbohydrates
- Questions and Problems Lipids
- Questions and Problems Components of Nucleic Acids
- Questions and Problems DNA Double Helix

# UNIT X: Nuclear Chemistry

Nuclear processes are those in which an atomic nucleus changes, including radioactive decay of naturally occurring and human-made isotopes, nuclear fission, and nuclear fusion.

## Standards Addressed

CA Content Standards for Chemistry: 1d, 1e.
NGSS: HS-PS1-1, HS-PS1-2, HS-PS4-1, HS-PS4-2, HS-PS4-3, HS-PS4-4, HS-PS4-5
CCSS – Science – R1, R2, R3, R4, R8, R9, W1, W3, W4, W7, W9, W10

## Instructional Objectives

- Students know protons and neutrons in the nucleus are held together by nuclear forces that overcome the electromagnetic repulsion between the protons.
- Students know the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions. The change in mass (calculated by $E = mc^2$) is small but significant in nuclear reactions.
- Students know some naturally occurring isotopes of elements are radioactive, as are isotopes formed in nuclear reactions.
- Students know the three most common forms of radioactive decay (alpha, beta, and gamma) and know how the nucleus changes in each type of decay.
- Students know alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations.

## Suggested Activities

- Core lab: Daily Dosage of Radiation
- Core lab: Unraveling the Mystery of Expiration Dates on Pharmaceutical Medication
- Core lab: The Use of Scanning in Diagnosing Patients
- Explore Your World Modeling Half-Lives
- Case study Irradiation – Is It Consumer Friendly
- Case study Not Just Another Day at the Beach

- Case study The Benign Hamburger

Suggested Assessment

- Green Chemistry Note Radon in Our Homes
- Health Note Beta Emitters in Medicine
- Health Note Radiation and Food
- Health Note Brachytherapy
- Health Note Radiation Doses in Diagnostic and Therapeutic Procedures
- Health Note Other Imaging Methods
- Green Chemistry Note Nuclear Power Plants
- Questions and Problems Nuclear Fission and Fusion

# AppendixA: HPHS Learning Outcomes for Medical Chemistry

All students will achieve the following PRIDE skills in Chemistry by:

Powerfully Prepared for College and Career (by)

- Demonstrating proficiency in Chemistry on state standards
- Taking and passing practice SAT exams on Chemi Stry
- Researching, developing and writing a report on a current controversial health topic
- Understanding the process of investigation and experimentation

Responsible Citizen (by):

- Teaching underclassmen and community members about a nutritional topic
- Maintaining organization of papers and assignments
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