**Advanced Chemistry Student Self Assessment of B.V.S.D. Standards**

Dear Parent of ,

The goal of this document is for students to assume responsibility for knowing what they know, and knowing what they do not know. This is called metacognition, and it’s a very important life-long skill. This form documents communication between your student and me, either in exam feedback or in laboratory feedback. This document allows your student to manage his or her own learning. This is part of the college readiness preparation.

You will see this document three times during the school year. You will see it mid-semester in the fall, the end of the fall semester, and mid-semester spring. It will come home at the end of the year with your student. The students will be taught based upon the standards and assessed upon the standards. Grades are based on mastery as determined through student class work, student exam and quiz grades, and labs. Students must meet deadlines to get full credit for work. For more information on the grading policy, please see the course syllabus.

**PLEASE NOTE: Chapters 1-9 are taught in the Fall Semester. Chapter 10-16 (or 17) are taught in the Spring Semester.**

There are a couple of standards that we as a science department may decide not teach, due to time constraints and needs of students.

By signing this, you are communicating that you have seen this document and have discussed it with your student. If you have questions, please email me at [kathleen.packard@bvsd.org](mailto:kathleen.packard@bvsd.org)

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Mid-Semester Fall:

(student signature) (date) (returned date)

(parent signature) (date)

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End-Semester Fall:

(student signature) (date) (returned date)

(parent signature) (date)

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Mid-Semester Spring:

(student signature) (date) (returned date)

(parent signature) (date)

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Thank you for your support as we move slowly to standards based evaluations.

Mrs. Packard

**STUDENT SELF ASSESSMENT**21st Century Learner Outcomes, the Four “C”, communication, collaboration, critical thinking, and creativity will be addressed all year long.

**PLEASE NOTE: Chapters 1-9 are taught in the Fall Semester. Chapter 10-17 are taught in the Spring Semester.**

I.Scientists ask questions and state hypotheses using prior knowledge to help design and guide scientific investigations, using

appropriate technology and safe laboratory practices **ONLINE REVIEW #1**

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| **Standard** | **Chapter in Zumdahl** | **Student Mastery?** |
| a. Formulate testable hypotheses based on observed phenomena and prior knowledge | 1 |  |
| b. Design and conduct an experiment to test a hypothesis, identifying the independent and dependent  variables, and using appropriate equipment and technology to collect data | 1 |  |
| c. Identify and use appropriate safe practices. | 1 |  |
| d. Identify major sources of error or uncertainty and how they can be minimized | 2 |  |
| e. Calculate percent error and report results using correct significant figures | 2 |  |
| f. Write a conclusion linking results to the hypothesis | 1 |  |

II.Scientists use the tools of math to solve problems, analyze data, and evaluate the validity of results **ONLINE REVIEW #1, 2**

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| a. Use dimensional analysis to solve problems | 2 |  |
| b. Calculate quantities (such as density and specific heat) using the correct number of significant figures | 2 |  |
| c. Identify when error has been introduced into a scientific investigation because certain variables are  not controlled or more than one variable is changed | 2 |  |
| d. Distinguish between error, uncertainty, and mistakes | 2 |  |
| e. Calculate percent error | 2 |  |
| f. Differentiate between accuracy and precision | 2 |  |
| g. Use and convert between fundamental metric units | 2 |  |

III.Matter has properties related to its structure that can be measured and used to identify, classify and describe substances or objects **ONLINE REVIEW #3,4,5**

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| a. Compare and contrast physical and chemical changes | 3 |  |
| b. Demonstrate physical and chemical methods used to separate mixtures that are based on the properties of the substances | 3 |  |
| c. Describe the atom’s structure (including electron energy levels, atomic orbitals, and electron configurations) using evidence from the modern atomic theory | 4 |  |
| d. Determine the atomic number and mass number of isotopes | 4 |  |
| e. Calculate the average atomic mass of an element | 4 |  |

IV.Chemical reactions occur all around us and may either release or consume energy. A large number of reactions involve the transfer of either electrons or hydrogen ions **ONLINE REVIEW #6, 7, 8**

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| a. Determine chemical formulas and names of ionic compounds and covalent molecules | 4, 5 |  |
| b. Name substances given IUPAC formulas. | 5 |  |
| c. Describe and predict he products for different types of reactions: synthesis, decomposition, single replacement, double replacement, and combustion | 7 |  |
| d. Represent ionic and molecular species present in chemicals using a chemical equation | 7 |  |
| e. Balance chemical equations to illustrate mole ratios and conservation of mass in a chemical reaction | 7 |  |
| f. Define and compare concepts of acids and bases according to Arrhenius and Bronsted ‐ Lowry models. | 16 |  |
| g. Perform a neutralization reaction between acidic and basic substances | 16 |  |
| h. Assign oxidation numbers to identify what is oxidized and what is reduced in an oxidation-reduction reaction. | 18 |  |
| i. Write oxidation and reduction half-reactions for an oxidation-reduction process. | 18 |  |

V.Matter can neither be created nor destroyed. The mole concept allows chemists to link the atomic world with the macroscopic world through the use of the periodic table. Stoichiometric relationships are used to determine “how much is needed” and “how much can be produced” in chemical reactions **ONLINE REVIEW #9, 10, 11**

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| a. Explain the mole concept | 8 |  |
| b.Use mole ratios in a balanced chemical equation to determine stoichiometric relationships of reactants and products | 8,9,13,  15,16 |  |
| c. Balance chemical equations to illustrate mole ratios and conservation of mass in a chemical reaction | 6 |  |
| d. Calculate the mass and volume relationships of substances with emphasis on the mole concept, including percent composition, empirical formulas, limiting reactants and percent yield | 8-17 |  |
| e. Calculate the empirical formula and molecular formula of a substance from experimental data | 8 |  |
| f. Recognize and apply a variety of empirical methods for determining molar mass | 8 |  |

VI.Temperature of a sample is related to the kinetic energy of the particles in the sample. Heat flows from a warmer object to a cooler object, heat loss by a system equals heat gain by the surroundings (and vice versa) **ONLINE REVIEW #12, 13, 14**

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| a. Identify and describe different forms of energy and their transformations | Full year |  |
| b. Explain what it means when scientists say “the energy of the universe is constant “(First Law of  Thermodynamics) | 10 |  |
| c. Use kinetic molecular theory to describe the motion of molecules and its relationship to temperature and kinetic energy | 10, 13, 17 |  |
| d. Use calorimetry to calculate the specific heat of a substance and the amount of heat change in a chemical reaction | 10 |  |
| e. Classify reactions and phase changes as endothermic or exothermic | 10. 14 |  |
| f. Calculate the amount of heat lost or gained due to a phase change of a substance | 10, 14 |  |
| g. Determine the direction and amount of heat change for phase changes and chemical reactions | 10, 14 |  |
| h. Explain how all spontaneous processes are accompanied by an increase in the entropy of the universe (Second Law of Thermodynamics) | 10 |  |
| i. Calculate enthalpy change in a chemical reaction using Hess’s Law | 10 |  |
| j. Calculate the heat of reaction using bond energies and heats of formation | 10 |  |

VII. Observed properties such as light emission and absorption and chemical reactivity can be related to electron configuration and nuclear charge **ONLINE REVIEW #15, 16, 17**

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| a. Explain what atomic phenomena cause light emission and absorption | 11 |  |
| b. Describe the evidence for the existence of atomic orbitals, electron configuration and electron energy levels | 11 |  |
| c. Describe the periodic relationships of elements based on the following properties: atomic radii, ionization energies, electronegativity, and oxidation states | 4,11 |  |
| d. Describe the key regions of electromagnetic radiation and how their properties arise from frequency  and wavelength of the radiation | 11 |  |
| e. Explain why light can be thought of as a wave or as a particle | 11 |  |
| f. Use the relationship c = λν to calculate wavelength and frequency | 11 |  |
| g. Use the relationship E = hν | 11 |  |

VIII. The nature of chemical bonding in a substance determines its physical and chemical properties **ONLINE #18, 19, 20**

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| a.Discriminate between ionic compounds and covalently bonded molecules based on the electronegativity differences between the atoms in the compound. | 12 |  |
| b. Describe bonding in metals | 4, 14 |  |
| c. Understand the continuum between purely non‐polar covalent, polar covalent, and ionic substances | 4, 12 |  |
| d. Describe the nature of intermolecular attractive forces: hydrogen bonding, dipole‐dipole, and London/Dispersion (aka Van der Vaals) | 14 |  |
| e. Distinguish between a chemical bond and an intermolecular attractive force | 14 |  |
| f. Explain observations of chemical and physical properties according to the nature of bonding within the substance | 4, 14 |  |
| g. Use models to represent relationships of atoms in substances and represent positions of electrons in compounds using Lewis structures | 12 |  |
| h. Use VSEPR (Valence Shell Electron Pair Repulsion) Theory to represent the three‐dimensional geometry of atoms in covalently bonded substances | 12 |  |
| i.Represent resonance structures of molecules | 12 |  |

IX.The effects of temperature, pressure and volume on a quantity of gas can be predicted and measured experimentally, and can

be explained by the Kinetic Molecular Theory **ONLINE REVIEW #21, 22**

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| a. Use the gas laws, including the ideal gas law, to calculate the volume, pressure, temperature, or the molar mass of a gas | 13 |  |
| b. Explain and use Dalton’s Law of Partial Pressures. | 13 |  |
| c. Compare the properties of real and ideal gases | 13 |  |
| d. Qualitatively describe how the Kinetic Molecular Theory describes the macroscopic properties of temperature and pressure | 13 |  |

X. Solutions need to be clearly described according to the substances and their amounts, including the interactions of the substances in a solution **ONLINE REVIEW #23, 24**

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| a. Describe types of solutions and factors affecting solubility of solutes in solvents | 7, 15 |  |
| b. Calculate the concentration of solutions using the concept of molarity | 15 |  |
| c. Describe and show calculations for the preparation of a molar solution from a solid solute | 15 |  |
| d. Describe and show calculations for the preparation of a molar solution by dilution of a more concentrated stock solution | 15 |  |
| e. Describe and show calculations for determining the mass percent of a substance in solution | 15 |  |
| f. Describe the nature of the pH scale, relating the values to acidic, basic, and neutral solutions | 16 |  |
| g. Perform calculations with pH and [H+] | 16 |  |
| h. Explain how a buffer solution resists changes in pH | 16 |  |

XI.The rate (speed) of a reaction depends on a variety of factors. Equilibrium is a dynamic process in which the forward rate of a reaction is the same as the reverse rate of a reaction, and the concentrations of reactants and products no longer change **#25, 26, 27**

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| a. Explain the concept of “rate of reaction” and the factors that affect the rate | 17 |  |
| b. Define the energy of activation and use it to explain the role of catalysts in a chemical reaction | 17 |  |
| c. Explain the concept of dynamic equilibrium in both physical and chemical systems | 17 |  |
| d. Write the equilibrium expression for a given reaction and solve for concentrations of substances  and/or the equilibrium constant | 17 |  |
| e. Use Le Chatelier’s Principle to predict shifts in the concentrations of substances when a system at  equilibrium is disturbed, and perform experiments testing these predictions | 17 |  |