Chemistry 2 Instructional Materials Scoring Rubric

Gateway: The publisher must provide a Tennessee standards alignment guide as a part of the scope and sequence for the material. If this gateway is not met, the materials will not be scored. All Tennessee standards must be addressed within the material. If this is not met, the material will not pass review by the Tennessee Textbook and Instructional Materials Quality Commission.

Introduction:

The following Instructional Materials Scoring Rubric for Science is designed to score materials in the following categories:

- Instructional Focus
- Attending to Multiple Dimensions of Science Instruction
- Accessibility Features
- Alignment of Content

Scoring:

Each section is to be scored using a 0, 1, or 2. Use the following scoring guideline.

Tables 1-2:

- Adhere to the provided rubric statements for scoring.

Tables 3-4:

- 0: The standard is not present within the material.
- 1: The standard is present within the material. The intent and/or frequency component of the standard is not fully met.
- 2: A rating of 2 indicates the standard is present and all aspects of the standard are fully met.

Table 1: Instructional Focus					
Directions: **Adhere to the provided rubric statements for scoring.**					
Indicator	**0**	**1**	**2**	**Score**	**Evidence**
Central Phenomenon	Unit has **no phenomenon, or only a "hook"** to capture student interest at the beginning of the unit.	All units include one or more **smaller phenomenon or design challenge(s) and/or not all lessons connect to the phenomenon** or design challenge.	All units have a central phenomenon or design challenge that **develops throughout every lesson** of the unit.		
Activity Purpose	Material contains hands-on activities **do not serve** to grade-level scientific ideas	Hands-on activities **reinforce** scientific ideas aligned with grade-level standards.	All hands-on activities serve to **uncover** scientific ideas aligned with grade level standards.		
Use of Science Engineering Practices (SEPs)	Some units **do not provide students opportunities** to use the SEPs.	SEPs are present in all units, but **loosely or not connected to central phenomenon**.	In every unit, the **primary use** of the SEPs ties directly to explaining the central phenomenon or solving the design challenge.		
Student Engagement	**Neither of the given features** are present.	**One of the given features** is present.	Materials give students opportunities to: • expressly connect the DCI content from each lesson to		

Table 1: Instructional Focus **Directions:** **Adhere to the provided rubric statements for scoring.**					
			relevant crosscutting concepts. • practice with the SEP that is relevant to that day's lesson.		
Concepts before vocabulary.	Materials **pre-teach vocabulary.**	In **some instances**, materials develop conceptual meaning first.	In **all instances**, materials provide experiences (e.g., investigations, data analysis, discussions) where students develop conceptual meaning of a scientific idea before introducing technical vocabulary.		
Connections across component ideas.	Materials **describe** connections for students, or connections are absent.	Some units include **standalone questions** in place of activities, where students communicate their understanding of connections between component ideas.	All units include **activities** where students communicate their understanding of connections between science ideas from *two or more component ideas* within the grade (e.g., LS1.A and LS2.C, ESS2.A and PS1.A).		
Connections across disciplines.	Materials **describe** connections for students,	Some units include **standalone questions** in place of activities, where	All units include activities where students communicate their		

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	or connections are absent.	students communicate their understanding of connections between component ideas.	understanding of connections between science ideas from *two or more disciplines* within the grade (e.g., LS and PS).		
Review opportunities	End of unit review is **not anchored to a phenomenon**.	End of unit review assesses learning of the **central phenomenon for the unit** only.	Materials provide opportunities for students to transfer new learning to **analogous phenomenon** in a review at the end of every unit.		
			Total		

Table 2: Attending to Multiple Dimensions of Science Learning					
Directions: **Adhere to the provided rubric statements for scoring.**					
Indicator	**0**	**1**	**2**	**Score**	**Evidence**
Distribution of SEPs as required by the standards	Materials **do not include** a focal SEP for one or more units.	One or more SEPs are **disproportionately** featured as the focal SEP.	Materials identify one or more focal science and engineering practices (SEPs) for every unit(s) with a **balanced** distribution of all SEPs as a focal SEP throughout the units.		

Table 2: Attending to Multiple Dimensions of Science Learning

Directions:
Adhere to the provided rubric statements for scoring.

Support for a focal SEP	**No** student facing or teacher facing supports for the SEPs.	Relevant **support strategies are absent** from teacher materials.	Every unit contains a focal SEP is featured in **student-facing materials and teacher materials** including instructional strategies for the particular unit and focal SEP.		
Connections across to crosscutting concepts as required by the standards.	Materials **describe connections with CCCs** or do not specifically address CCCs.	In every unit students make connection between the CCCs and **either** the SEPs or DCIs.	In every unit, students make connections between the crosscutting concepts (CCCs) and **both** the SEPs and disciplinary core ideas (DCIs).		
Developing crosscutting concepts (CCCs)	Materials **provide examples** of other instances of the CCCs or CCCs absent.	Students make connections between CCCs and **content not addressed in other units.**	In every unit, the materials lead students to **make connections between the CCCs in that unit and appearances of the CCCs in other units**.		
			Total		

Table 3: Accessibility Features				
Directions: • **0: The standard is not present within the material.** • **1: The standard is present within the material. The intent and/or frequency component of the standard is not fully met.** • **2: A rating of 2 indicates the standard is present and all aspects of the standard are fully met.**				
Digital Materials	**0**	**1**	**2**	**Evidence**
All lessons within the materials are available in digital form and include a printable option.				
In every lesson, materials include recommended supports, accommodations, and modifications for Students with Disabilities and English language learners that will support their regular and active participation in accessing on grade level material (e.g., modifying vocabulary words within word problems, sentence starters, etc.).				
			Total	

Table 4: Alignment of Content				
Directions: • **0: The standard is not present within the material.** • **1: The standard is present within the material. The intent and/or frequency component of the standard is not fully met.** • **2: A rating of 2 indicates the standard is present and all aspects of the standard are fully met.**				
Conceptual Understanding: The materials support the intentional development of students' conceptual understanding of key science ideas, practice, and concepts.	**0**	**1**	**2**	**Evidence**
Chem2.PS1.1) Illustrate and explain the arrangement of electrons surrounding atoms and ions (electron configurations and orbital notation of a specific electron in an element) and relate the arrangement of electrons with observed periodic trends.				
Chem2.PS1.2) Gather evidence and perform calculations to determine the composition of a compound.				

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Chem2.PS1.3) Compare and contrast crystalline and amorphous solids with respect to particle arrangement, strength of bonds, melting and boiling points, bulk density, and conductivity; provide examples of each type.				
Chem2.PS1.4) Investigate and use mathematical representations to support Dalton's law of partial pressures and to compare and contrast diffusion and effusion.				
Chem2.PS1.5) Obtain data and solve combined and ideal gas law problems and stoichiometry problems at STP and non STP conditions to quantitatively explain the behavior of gases.				
Chem2.PS1.6) Use the Van der Waal's equation to support explanations of how real gases deviate from the ideal gas law.				
Chem2.PS1.7) Investigate, describe, and mathematically determine the effect of solute concentration on vapor pressure using Raoult's Law and of the solute's van 't Hoff factor on freezing point depression and boiling point elevation.				
Chem2.PS1.8) Develop models to show how different types of polymers, such as proteins, nucleic acids, and starches, are formed by repetitive combinations of simple subunits by condensation and addition reactions and to show the diverse bonding characteristics of carbon.				
Chem2.PS1.9) Evaluate different organic molecules by naming and drawing the ten simplest linear hydrocarbons and isomers that contain single, double, and/or triple bonds and by identifying and explaining the properties of functional groups.				

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Chem2.PS1.10) Obtain, evaluate, and communicate information about how carbon's structure and function are used and have influenced society.				
Chem2.PS1.11) Conduct a qualitative analysis lab to determine the solubility rules. Use solubility rules to identify spectator ions and write net ionic equations for precipitation reactions.				
Chem2.PS1.12) Analyze oxidation and reduction reactions to identify the substances gaining and losing electrons, distinguish between the cathode and anode, predict reactions, and balance oxidation-reduction reactions in acidic or basic solutions.				
Chem2.PS1.13) Investigate models and explore uses of electrochemistry (batteries and electrochemical cells).				
Chem2.PS1.14) Conduct titrations with standard solutions (monoprotic and diprotic) and an appropriate indicator and/or a pH probe to determine the concentration of an unknown acid or base, and with a weak acid or weak base to determine the Ka or Kb and the pH at the equivalence point.				
Chem2.PS1.15) Explain common chemical reactions, including those found in biological systems, using qualitative and quantitative information.				
Chem2.PS1.16) Create a model of the atomic substructure including electrons, protons, neutrons, quarks, and gluons.				
Chem2.PS2.1) Plan and conduct an investigation to compare the properties of the different types of intermolecular forces in pure substances and in components of a mixture.				

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Chem2.PS2.2) Make predictions regarding the relative magnitudes of the forces acting within collections of interacting molecules based on the distribution of electrons within the molecules and types of intermolecular forces through which the molecules interact.				
Chem2.PS2.3) Investigate and use mathematical evidence to support that rates of chemical reactions are determined by details of the molecular collisions.				
Chem2.PS2.4) Analyze data and mathematically determine rate equations.				
Chem2.PS2.5) Investigate the parameters of chemical equilibria in the laboratory by A) writing and calculating equilibrium expressions (Kc, Kp, Ksp, Ka, Kb); B) calculating Q and determining the direction the reaction will proceed; and, C) calculating equilibrium concentrations given an equilibrium constant and starting amounts.				
Chem2.PS2.6) Compare and contrast the strength and dissociation of strong and weak acids and bases by calculating the pH and percent ionization of a solution.				
Chem2.PS2.7) Research, investigate, and mathematically explain buffer systems (characteristics and capacities using the Henderson-Hasselbalch equation), including those found in biological systems and polyprotic acids.				
Chem2.PS3.1) Mathematically determine the enthalpy change for a given reaction using Hess's Law, standard enthalpies of formation, or a given mass of a reactant.				

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Chem2.PS3.2) Apply scientific principles and mathematical representations to predict if a chemical reaction is spontaneous using Gibb's Free Energy, $\Delta G = \Delta H - T\Delta S$.				
Chem2.PS3.3) Apply scientific and engineering ideas to build, evaluate, and refine a fuel cell model (e.g., graphical representation or as a project) with specific design constraints.				
Chem2.PS3.4) Collect and use data from the synthesis or decomposition of a compound to confirm the conservation of matter and the law of definite proportions.				
Chem2.PS3.5) Use Coulomb's law and patterns of valence electron configurations to explain trends in ionization energies and reactivity of pure elements.				
Chem2.PS3.6) Explain the relationships between potential energy, distance between approaching atoms, bond length, and bond energy using graphical representations.				
Chem2.PS3.7) Investigate and explain the energy changes in biological systems (such as the combustion of sugar and photosynthesis) both qualitatively and quantitatively.				
Chem2.PS3.8) Research pyrotechnics and use concepts in thermodynamics, stoichiometry, oxidation reduction, and kinetics to design and create a low intensity sparkler.				
Chem2.PS4.1) Investigate and contrast the mechanism of energy changes and the appearance of absorption and emission spectra.				

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Chem2.PS4.2) Apply scientific principles and mathematical representations ($C=\lambda v$ and $E=hv$) to explain that spectral lines are the result of and correspond to transitions between energy levels.				
Total				