Competency Performance Recording for Learning (CPR for Learning) Rubrics

Rubrics for the Problem Solving Process in Chemistry

Rubrics serve both as a guide to learning and as a performance assessment tool. CPRL uses rubrics, in this case Problem-solving rubrics, to tell the student exactly what is expected at each point in the problem solving process. If there is difficulty understanding words used in the rubric, the student can easily research the meaning in the context of their usage.

Instructors use these same rubrics, together with the scoring criteria, to assess the student's adherence to the process as outlined. When followed, this approach enhances consistency in scoring.

An Example of a rubric for General Chemistry is in the table below. A detailed listing and measurement scale of the rubrics and how each component is measured on a scale of "meets target" to unacceptable is also included on the following pages.

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5 Rubrics that support Step I: Articulate	1. Articulates thorough understanding of the application of the problem 2. Includes a complete sketch for articulation 3. Includes all of the pertinent data points on the sketch 4. Clearly delineates all of the data that is given (known) in the problem on the sketch 5. Clearly delineates the unknown entity that is requested from the problem on the sketch When done at *target* level, **it is clear that the student has a thorough understanding of how to read with comprehension and can interpret what is read.**
4 Rubrics that support Step II: Analyze and Assess	1. Thorough understanding of the concepts and equations associated with the known & unknown entities 2. Thoroughly identifies all parameters that are needed to solve for the unknown entity. 3. Thorough understanding of how each parameter for solving the "unknown entity" can be correlated with a datum point found within the problem set 4. Thoroughly demonstrates how each parameter can be obtained, and can indicate whether it is obtained directly, indirectly, or is implied When done at *target* level **it is clear that the student has a thorough understanding of all concepts and equations, known's and unknowns, how each parameter is obtained, and how all elements are correlated.**
3 Rubrics that support Step III: Ascertain solution	1. Can thoroughly identify each dimension of measurement addressed in the problem 2. Can thoroughly demonstrate that identical dimensions have been converted into identical units **3.** Can thoroughly solve equation (math or chemical) or assess and correlate data to indicate a conclusion When done at *target* level, **it is clear that the student has a thorough understanding of how to solve equations (math or chemical), assess and correlate data, dimensions, and units, and can draw appropriate conclusions.**

A fourth step, **Application, will** be added to the Rubrics assessment process during the course of this project. Application entails having students develop their own problem that encompasses specific knowledge gained from theory, thus, effectively closing the learning demonstration process.

Triple A's INSTRUCTIONS

STEP ONE _ ARTICULATE.   Articulate the problem in your own words, with a clear interpretation and understanding of the intended application of the problem. **Write something down to aid in the articulation process!** This may include equations (mathematical or chemical), and/or a creative visual sketch of what is occurring in the problem. Make sure that all pertinent information is appropriately assigned in the sketch and is clearly articulated. You must delineate all information that is given in the problem and what "unknown entity" (measurement, structure, graph or data point) the problem is asking for you to determine during articulation.

> **To achieve this feat**; Step one is a very critical step. It is in this step that the "clues" and directions for solving the problem are obtained. <u>You should not attempt to proceed until step one is accomplished. You cannot solve a problem until you clearly know what the problem is.</u> Your mind should focus solely on understanding the correct interpretation and application for the problem and to clearly determine what "unknown entity" the problem is asking you to determine.   The only skill required for step one is "focused" comprehensive reading. Read and reread the problem until a clear mental picture of the intended application of the problem emerges and is internalized. This means that you have a clear picture of the application of the problem and can articulate the problem from a sketch. This usually requires several readings. Make a sketch of the process that is occurring in the problem and make sure that all terms stated in the problem are fully understood. Go to the text book or dictionary if needed. Make sure that all pertinent data is identified and properly labeled in your sketch.

STEP TWO.   ANALYZE & ASSESS. Thoroughly familiarize yourself with the "unknown entity" and identify all parameters that are needed to solve for the "unknown entity".

Students are provided with the following directions:

> **To accomplish this feat;   Assess.** Gather all equations and concepts that have been studied that are associated with the "unknown entity".   Focus on the equation or concept that requires the kind of data for solution that is presented in the problem.   Go to your text book for clarification when needed. Determine and list all parameters that are needed to solve for the "unknown entity".

> **ASSESS.** Now that you have listed the specific parameters that are needed to solve for the "unknown entity", you know which parameters must be obtained from information found in the problem set data. The next step is to verify how each desired parameter is obtained from the problem set data.   Identify whether the parameter is obtained from direct, indirect (via equation, etc) or implied information from the problem set data or supplied from previous knowledge.   Go to your text book for clarification when needed.

STEP THREE.   ASCERTAIN SOLUTION. Solve for the "unknown entity". After obtaining all desired parameters from the problem set data, ascertain solution. This may require solving all mathematical or chemical equations or, assessing and correlating data to derive a conclusion.

Assessment Tool for CPRL audio/video Output

Name_____Course_____Date_____

Target (5 points)	Acceptable (4 points)	Marginal (3 points)	Unacceptable (0 Points)	Total
Articulates thorough understanding of the application of the problem	Articulates acceptable understanding of the application of the problem	Articulates marginal understanding of the application of the problem	Articulates unacceptable understanding of the application of the problem	
Includes a complete sketch for articulation	Includes an acceptable sketch for articulation	Includes a marginal sketch for articulation	An unacceptable or no sketch for articulation	
Includes all of the pertinent data points on the sketch	Includes an acceptable number of pertinent data points on the sketch	Includes a marginal number of pertinent data points on the sketch	Includes an unacceptable number of data points on the sketch	
Clearly delineates all of the data that is given in the problem on the sketch	Clearly delineates most of the data that is given in the problem on the sketch	Delineates some of the data that is given in the problem on the sketch	Does not delineate an acceptable number of data points on the sketch	
Clearly delineates the unknown entity that is requested from the problem on the sketch	Acceptably delineates the unknown entity that is requested from the problem on the sketch	Marginally delineates the unknown entity that is requested from the problem on the sketch	Cannot delineate the unknown entity that is requested from the problem on the sketch	
Thorough understanding of the concepts and equations associated with the unknown entity.	Acceptable understanding of the concepts and equations associated with the unknown entity.	Marginal understanding of the concepts and equations associated with the unknown entity.	Unacceptable understanding of the concepts and equations associated with the unknown entity.	
Thoroughly identifies all parameters that are needed to solve for the unknown entity.	Acceptably identifies all parameters that are needed to solve for the unknown entity.	Marginally identifies all parameters that are needed to solve for the unknown entity.	Cannot identify all parameters that are needed to solve for the unknown entity.	
Thorough understanding of how each parameter for solving the "unknown entity" can be correlated with a datum point found within the problem set	Acceptable under-standing of how parameter element for solving the "unknown" can be correlated with a datum point found within the problem set	has a marginal understanding of how each parameter for solving the "unknown entity" can be correlated with a datum point found within the problem set	Has an unacceptable understanding of how each parameter for solving the "unknown entity" can be correlated with a datum point found within the problem set	
Thoroughly demonstrates how each parameter can be obtained, and can indicate whether it is obtained directly,	Acceptably demonstrates how each parameter can be obtained, and can indicate whether it is obtained directly, indirectly, or is implied	Marginally demonstrates how each parameter can be obtained, and can indicate whether it is obtained directly,	Cannot demonstrate how each parameter can be obtained, and cannot indicate whether it is obtained directly, indirectly, or is implied	

| indirectly, or is implied | | indirectly, or is implied | | |

Target (5 points)	Acceptable (4 points)	Marginal (3 points)	Unacceptable (0 Points)	Total
Can thoroughly identify each dimension of measurement addressed in the problem	Can acceptably identify each dimension of measurement addressed in the problem	Can marginally identify each dimension of measurement addressed in the problem	Cannot acceptably identify each dimension of measurement addressed in the problem	
Can thoroughly demonstrate that identical dimensions have been converted into identical units	Can acceptably demonstrate that identical dimensions have been converted into identical units	Can marginally demonstrate that identical dimensions have been converted into identical units	Cannot demonstrate that identical dimensions have been converted into identical units	
Can thoroughly solve equation (math or chemical) or assess and correlate data to indicate a conclusion.	Can acceptably solve equation (mathematical or chemical) or assess and correlate data to indicate a conclusion.	Can marginally solve equation (mathematical or chemical) or assess and correlate data to indicate a conclusion.	Cannot acceptably solve equation (mathematical or chemical) or assess and correlate data to indicate a conclusion.	

Instructor: _____   **Total:** _____

A   45-50 points   **B**   39-45 points   **Below 39**   Unacceptable