SLO 1: Critical Thinking

Students will demonstrate critical thinking skills by applying fundamental physical principles to real world examples. A quiz consisting of several (4) parts will be given to the students as part of their normal quiz grade. The quiz will require both an understanding of fundamental concepts (C. T.), as well as a calculation requiring a command of the basic mathematics of problems solving (Q. T.). The quiz will then be assessed for each student with a rubric for Critical Thinking. Some physical properties of Silver and Gold are listed in the table on the next page. You have 10 grams of each metal initially at . (a) Which of the quantities on the table are required in order to determine the heat required to melt each metal completely? Explain why each quantity is required. (b) Which metal will require more heat to raise the temperature to its melting point? Why? (c) Which metal requires more heat to raise to the melting point (starting from ) and then melt completely? Justify your answer. (d) Does the metal with the highest melting point or boiling point require the most heat to melt? Explain your answer. Table of Thermal Properties Silver Gold Specific Heat Capacity ( ) 0.0924 0.0560 Melting Point ( ) 961 1063 Latent Heat of Fusion ( ) 21.1 15.4 Boiling Point ( ) 2193 2660 Latent Heat of Vapor. ( ) 557 377 Rubric: We will use the following AACU rubric for Critical Thinking to assess the quiz problem: Critical Thinking VALUE Rubric for more information, please contact value@aacu.org

Relevant Associations:

- Standard Associations
  - New Core Component Areas
    - Life & Physical Science (L & PS)
  - New Core Objectives
    - Critical Thinking (CT)

Related Measures

- M 1: Critical Thinking Measure

Critical Thinking Measure. Students will demonstrate critical thinking skills by applying fundamental physical principles to real world examples. A quiz consisting of several (4) parts will be given to the students as part of their normal quiz grade. The quiz will require both an understanding of fundamental concepts (C. T.), as well as a calculation requiring a command of the basic mathematics of problems solving (Q. T.). The quiz will then be assessed for each student with a rubric for Critical Thinking. Some physical properties of Silver and Gold are listed in the table on the next page. You have 10 grams of each metal initially at . (a) Which of the quantities on the table are required in order to determine the heat required to melt each metal completely? Explain why each quantity is required. (b) Which metal will require more heat to raise the temperature to its melting point? Why? (c) Which metal requires more heat to raise to the melting point (starting from ) and then melt completely? Justify your answer. (d) Does the metal with the highest melting point or boiling point require the most heat to melt? Explain your answer. Table of Thermal Properties Silver Gold Specific Heat Capacity ( ) 0.0924 0.0560 Melting Point ( ) 961 1063 Latent Heat of Fusion ( ) 21.1 15.4 Boiling Point ( ) 2193 2660 Latent Heat of Vapor. ( ) 557 377 Rubric: We will use the following AACU rubric for Critical Thinking to assess the quiz problem: Critical Thinking VALUE Rubric for more information, please contact value@aacu.org

Source of Evidence: Writing exam to assure certain proficiency level

Target:

We expect students to obtain at least 75% of the points obtainable from the Rubric.

SLO 2: Quantitative Analysis

Students will demonstrate quantitative thinking skills by applying basic mathematical principles to the solution of real world examples. A quiz consisting of several (4) parts will be given to the students as part of their normal quiz grade. The quiz will require both an understanding of fundamental concepts (C. T.), as well as a calculation requiring a command of the basic mathematics of problems solving (Q. T.). The quiz will then be assessed for each student with a rubric for Quantitative Thinking skills. Some physical properties of Silver and Gold are listed in the table on the next page. You have 10 grams of each metal initially at . (a) Which of the quantities on the table are required in order to determine the heat required to melt each metal completely? Explain why each quantity is required. (b) Which metal will require more heat to raise the temperature to its melting point? Why? (c) Which metal requires more heat to raise to the melting point (starting from ) and then melt completely? Justify your answer. (d) Does the metal with the highest melting point or boiling point require the most heat to melt? Explain your answer. Table of Thermal Properties Silver Gold Specific Heat Capacity ( ) 0.0924 0.0560 Melting Point ( ) 961 1063 Latent Heat of Fusion ( ) 21.1 15.4 Boiling Point ( ) 2193 2660 Latent Heat of Vapor. ( ) 557 377 Rubric: We will use the following rubric from AACU for Quantitative Thinking to assess the quiz problem: Quantitative Literacy VALUE Rubric for more information, please contact value@aacu.org

Relevant Associations:

- Standard Associations
  - New Core Component Areas
    - Life & Physical Science (L & PS)
  - New Core Objectives
    - Empirical & Quantitative Skills (EQS)

Related Measures

- M 2: Quantitative Analysis Measure

Quantitative Analysis Measure.
Quantitative Thinking Measure. Students will demonstrate critical thinking skills by applying fundamental physical principles to real world examples. A quiz consisting of several (4) parts will be given to the students as part of their normal quiz grade. The quiz will require both an understanding of fundamental concepts (C. T.), as well as a calculation requiring a command of the basic mathematics of problems solving (Q. T.). The quiz will then be assessed for each student with a rubric for Quantitative Thinking. Some physical properties of Silver and Gold are listed in the table on the next page. You have 10 grams of each metal initially at (a) Which of the quantities on the table are required in order to determine the heat required to melt each metal completely? Explain why each quantity is required. (b) Which metal will require more heat to raise the temperature to its melting point? Why? (c) Which metal requires more heat to raise to the melting point (starting from ) and then melt completely? Justify your answer. (d) Does the metal with the highest melting point or boiling point require the most heat to melt? Explain your answer.

Table of Thermal Properties Silver Gold Specific Heat Capacity (J/g°C) 0.0924 0.0560 Melting Point (°C) 961 1063 Latent Heat of Fusion (J/g) 21.1 15.4 Boiling Point (°C) 2193 2660 Latent Heat of Vapor (J/g) 557 377 Rubric: We will use the following AACU rubric for Quantitative Thinking to assess the quiz problem: Quantitative Thinking VALUE Rubric for more information, please contact value@aacu.org

Source of Evidence: Writing exam to assure certain proficiency level

**Target:**
We expect students to obtain at least 75% of the points obtainable from the Rubric.

**SLO 3: Teamwork**
Students will demonstrate the ability to work with others in a common effort to achieve an outcome through cooperation and teamwork in a group exercise.

**Relevant Associations:**
- Standard Associations
  - New Core Component Areas
    - Life & Physical Science (L & PS)
  - New Core Objectives
    - Teamwork (TW)

**Related Measures**

**M 3: Teamwork Measure**
Teamwork Measure.

Source of Evidence: Project, either individual or group

**Target:**
We expect students to obtain at least 75% of the points obtainable from the Rubric.

**SLO 4: Communication**
Students will demonstrate communication skills by reporting the process and results of laboratory exercise in a written laboratory report.

**Relevant Associations:**
- Standard Associations
  - New Core Component Areas
    - Life & Physical Science (L & PS)
  - New Core Objectives
    - Communication (COM)

**Related Measures**

**M 4: Communication Measure**
Communication Measure,

A Project exercise will be given to the students as part of their normal grade. The project will require both teamwork, as well as communication through a written report. The Project report will then be assessed for each student with an AACU rubrics for both Teamwork and Communication.

Source of Evidence: Written assignment(s), usually scored by a rubric

**Target:**
We expect students to obtain at least 75% of the points obtainable from the Rubric.