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| ***Insight into Aluminum*** |

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| 1. What properties of aluminum might cause you concern if you had to use the aluminum tableware that Napoleon employed to impress his guests?   |  |  | | --- | --- | | *ANSWER:* | Al tableware would be very susceptible to rapid oxidation and would have to be polished frequently. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Insight into Al | | *TOPICS:* | Insight into Aluminum | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 2. Use the web to determine the amount of aluminum used in the US in a single year. What is the primary use for this material?   |  |  | | --- | --- | | *ANSWER:* | Utilize a world wide web search engine to acquire the reference. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Insight into Al | | *TOPICS:* | Insight into Aluminum | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 3. Use the web to determine the difference in how much aluminum is recycled in states where there are deposits on aluminum cans versus states where recycling is voluntary? What is the most reliable way to estimate this value? What uncertainty is there in the estimate?   |  |  | | --- | --- | | *ANSWER:* | Utilize a world wide web search engine to acquire the reference. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Insight into Al | | *TOPICS:* | Insight into Aluminum | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| ***The Study of Chemistry*** |

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| 4. Which of the following items are matter and which are not?   |  |  | | --- | --- | | a) | a flashlight | | b) | sunlight | | c) | an echo | | d) | air at sea level | | e) | air at the top of Mount Everest |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *ANSWER:* | |  |  | | --- | --- | | a) | matter | | b) | not matter | | c) | not matter | | d) | matter | | e) | matter | | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | The Study of Chem | | *TOPICS:* | The Study of Chemistry | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 5. How can a liquid be distinguished from a fine powder? What type of experiment or observation might be undertaken?   |  |  | | --- | --- | | *ANSWER:* | Experiments related to the physical properties of the liquid and fine powder would prove useful. These could include properties such as surface tension, flow, and behavior in a high static electricity environment. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | The Study of Chem | | *TOPICS:* | The Study of Chemistry | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 6. Do the terms element and atom mean the same thing? If not how do they differ?   |  |  | | --- | --- | | *ANSWER:* | No, an element is a pure substance, but the natural occurring form of the element may contain two atoms. An example of this is elemental nitrogen (N2). In this case the element has two atoms. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | The Study of Chem | | *TOPICS:* | The Study of Chemistry | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 7. Why do physical properties play a role in chemistry if they do not involve any chemical changes?   |  |  | | --- | --- | | *ANSWER:* | Physical properties can be used to identify substances in qualitative and quantitative analysis and can provide a wide range of useful information. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | The Study of Chem | | *TOPICS:* | The Study of Chemistry | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 8. Identify the physical and chemical properties noted in the following statement: When a piece of iron is exposed to air it corrodes, forming a layer of red-brown powder that flakes off and is denser than the original material.   |  |  | | --- | --- | | *ANSWER:* | Physical properties include the flaking of the powder and density comparison. The chemical properties here is the reaction to form the iron oxide(s). | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | The Study of Chem | | *TOPICS:* | The Study of Chemistry | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 9. All molecules attract each other to some extent, and the attraction decreases as the distance between particles increases. Based on this idea, which state of matter would you expect has the strongest interactions between particles, solids, liquids or gases?   |  |  | | --- | --- | | *ANSWER:* | Intermolecular forces of attraction are greatest in solids as we will learn in further detail in Chapter 8. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | The Study of Chem | | *TOPICS:* | The Study of Chemistry | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| ***Observations and Models*** |

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| 10. Complete the following statement: Data that have a small random error may be (accurate, precise, both, or neither).   |  |  | | --- | --- | | *ANSWER:* | These data are precise and may be accurate. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Observations and Models | | *TOPICS:* | Observations and Models | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 11. Two golfers are practicing shots around a putting green. Each golfer takes 20 shots. Golfer 1 has 7 shots within 1 meter of the hole, and the other 13 shots are scattered around the green. Golfer 2 has 17 shots go into a small sand trap near the green and three just on the green near the trap. Which golfer is more precise? Which is more accurate?   |  |  | | --- | --- | | *ANSWER:* | Golfer 2 is more precise because his efforts are grouped more tightly about a central point (mean) even if it's not the intended spot. Golfer 1 is more accurate as there are more shots very close to the accepted "value" (the hole). | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Observations and Models | | *TOPICS:* | Observations and Models | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 12. Suppose you are waiting at a corner for a bus. Three different routes pass this particular corner. You see a bus pass by from the two routes you are not interested in taking. When you say to yourself, "My bus must be next," what type of reasoning (deductive or inductive) are you using? Explain your answer.   |  |  | | --- | --- | | *ANSWER:* | Deductive reasoning is being applied in this case. The first two buses represent pieces of information that are processed and lead to the conclusion that the "desired" bus must be next. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Observations and Models | | *TOPICS:* | Observations and Models | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 13. What is the difference between a hypothesis and a question?   |  |  | | --- | --- | | *ANSWER:* | A hypothesis is a statement related to observation(s). The hypothesis is either accepted or rejected based upon experimentation. A question is simply posed. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Observations and Models | | *TOPICS:* | Observations and Models | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 14. What is a law of nature? Are all scientific laws examples of a law of nature?   |  |  | | --- | --- | | *ANSWER:* | A law of nature is an irrefutable, self-evident fact. Not all scientific laws are examples of laws of nature. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Observations and Models | | *TOPICS:* | Observations and Models | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| ***Numbers and Measurements*** |

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| 15. What is the difference between a qualitative and a quantitative measurement?   |  |  | | --- | --- | | *ANSWER:* | A quantitative measurement provides information as to *how much* analyte is present. A qualitative measurement answers the question, 'is the analyte present?' | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Numbers and Measurements | | *TOPICS:* | Numbers and Measurements | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 16. What is a "derived" unit?   |  |  | | --- | --- | | *ANSWER:* | A derived unit is a unit that is made up of two or more units itself. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Numbers and Measurements | | *TOPICS:* | Numbers and Measurements | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 17. The largest computers now include disk storage space measured in terabytes. How many bytes are in a terabyte? (Recall that in computer terminology, the prefix is only "close" to the value it designates in the metric system.)   |  |  | | --- | --- | | *ANSWER:* | 1 terabyte = 1,000,000,000,000 bytes | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Numbers and Measurements | | *TOPICS:* | Numbers and Measurements | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 18. Use the web to determine how the btu unit was initially established. For the engineering applications where this unit is still used today, why is it a sensible unit?   |  |  | | --- | --- | | *ANSWER:* | Utilize a world wide web search engine to acquire the reference. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Numbers and Measurements | | *TOPICS:* | Numbers and Measurements | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 19. Convert the value 38.4 ppm into ppb.   |  |  | | --- | --- | | *ANSWER:* | 3.84 × 104 ppm | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Numbers and Measurements | | *TOPICS:* | Numbers and Measurements | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 20. Oxygen boils at −186°C. What is this temperature in Kelvin?   |  |  | | --- | --- | | *ANSWER:* | 87 K | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Numbers and Measurements | | *TOPICS:* | Numbers and Measurements | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 21. Express each of the following temperatures in °C.   |  |  | | --- | --- | | a) | 177 K | | b) | 298 K | | c) | 4 K | | d) | 1500 K |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *ANSWER:* | |  |  | | --- | --- | | a) | −96°C | | b) | 25°C | | c) | −269°C | | d) | 1227°C | | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Numbers and Measurements | | *TOPICS:* | Numbers and Measurements | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 22. How many significant figures are present in each of the following experimental measurements?   |  |  | | --- | --- | | a) | 0.003 m | | b) | 6030 kg | | c) | 400.3 s | | d) | 0.000701 L | | e) | 31.624 km |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *ANSWER:* | |  |  | | --- | --- | | a) | one | | b) | three\* | | c) | four | | d) | three | | e) | five |   \*according to the information in this text. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Numbers and Measurements | | *TOPICS:* | Numbers and Measurements | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 23. Assuming the numbers given are measurements, carry out the indicated arithmetic operations and give the answer with the correct number of significant figures.   |  |  | | --- | --- | | a) | 7.132 / 6 | | b) | 3.65 × 102 + 8.1 × 103 | | c) | 18.13 − 1.3 | | d) | 9 × 10−6 × 1.33 × 10−3 |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *ANSWER:* | |  |  | | --- | --- | | a) | 1.189 | | b) | 8.5 × 103 | | c) | 16.8 | | d) | 1 × 10−8 | | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Numbers and Measurements | | *TOPICS:* | Numbers and Measurements | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 24. In an attempt to determine the velocity of a person on a bicycle, an observer uses a stopwatch and times the length of time it takes to cover 25 "squares" on a sidewalk. A measurement of one of the squares shows it to be 1.13 m long. The bicycle takes 4.82 seconds to travel this far. What velocity, in m/sec, should the observer report?   |  |  | | --- | --- | | *ANSWER:* | 5.87 m/s | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Numbers and Measurements | | *TOPICS:* | Numbers and Measurements | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 25. Measurements indicate that 23.6% of the residents of a city with a population of 531,314 are college graduates. Considering significant figures, how many college graduates are estimated to reside in this city.   |  |  | | --- | --- | | *ANSWER:* | 1.25 × 105 | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Numbers and Measurements | | *TOPICS:* | Numbers and Measurements | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 26. A rock is placed on a balance and its mass is determined to be 22.410 g. When the rock is then placed in a graduated cylinder that originally contains 11.34 mL of water the new volume is 17.82 mL. What should the density of the rock be reported as?   |  |  | | --- | --- | | *ANSWER:* | 3.46 g/mL | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Numbers and Measurements | | *TOPICS:* | Numbers and Measurements | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| ***Problem Solving in Chemistry and Engineering*** |

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| 27. If the cost to fill a gasoline tank is $78.42 and gasoline costs $3.66/gal, how many gallons does the tank hold? How many L of gasoline could be purchased for $50.00?   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | *ANSWER:* | |  |  | | --- | --- | | a) | 21.4 gallons | | b) | 51.9 L | | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Problem Solving Chem&Eng | | *TOPICS:* | Problem Solving in Chemistry and Engineering | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 28. The distance between two atoms in a molecule is 148 pm. What is this distance in meters?   |  |  | | --- | --- | | *ANSWER:* | 1.48 × 10−10 m | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Problem Solving Chem&Eng | | *TOPICS:* | Problem Solving in Chemistry and Engineering | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 29. Carry out the following unit conversions.   |  |  | | --- | --- | | a) | 82 *μ*g to mg | | b) | 6.73 × 10−4 mm to nm | | c) | 1.37 × 106 nA to Ma | | d) | 4.8 × 1018 mW to GW |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *ANSWER:* | |  |  | | --- | --- | | a) | 8.2 × 10−2 mg | | b) | 6.73 × 102 nm | | c) | 1.37 mA | | d) | 4.8 × 106 GW | | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Problem Solving Chem&Eng | | *TOPICS:* | Problem Solving in Chemistry and Engineering | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 30. If a particle is traveling at 98% of the speed of light in a vacuum (2.998 x 108 m/s), what is its velocity in miles per hour? 1.00 miles = 1.61 km.   |  |  | | --- | --- | | *ANSWER:* | 6.57 x 108 mi/hr | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Problem Solving Chem&Eng | | *TOPICS:* | Problem Solving in Chemistry and Engineering | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 31. A metallic cylinder displaces 91.0 mL and has a mass of 245.7 g. What is the density of the metal?   |  |  | | --- | --- | | *ANSWER:* | 2.70 g/mL | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Problem Solving Chem&Eng | | *TOPICS:* | Problem Solving in Chemistry and Engineering | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 32. Mercury has a density of 13.6 g/mL. What is the mass of 4.72 L of mercury?   |  |  | | --- | --- | | *ANSWER:* | 6.42 × 104 g | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Problem Solving Chem&Eng | | *TOPICS:* | Problem Solving in Chemistry and Engineering | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 33. Draw a molecular scale picture to show how a crystal differs from a liquid.   |  |  | | --- | --- | | *ANSWER:* | The drawing should represent the increase in intermolecular forces in the solid that give rise to the crystal. This means a sketch that shows each atom interacting with its neighbors. This interaction would not be all encompassing in a liquid leaving the structure free to assume the volume of a container for example. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Problem Solving Chem&Eng | | *TOPICS:* | Problem Solving in Chemistry and Engineering | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 34. In the description of the refining of aluminum the molecular scale depiction of precipitation was not included. Use the web to determine what chemicals are involved in the precipitation process and draw a molecular scale drawing of this reaction.   |  |  | | --- | --- | | *ANSWER:* | Utilize a world wide web search engine to acquire the reference. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Problem Solving Chem&Eng | | *TOPICS:* | Problem Solving in Chemistry and Engineering | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| ***Insight into Materials Selection and Bicycle Frames*** |

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| 35. Rank aluminum, steel and titanium in order of increasing stiffness.   |  |  | | --- | --- | | *ANSWER:* | Al < titanium << steel (see Table 1.3 Chapter 1) | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Insight into Materials | | *TOPICS:* | Insight into Materials Selection and Bicycle Frames | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 36. Aluminum is not as strong as steel. What other factor should be considered when comparing the desirability of aluminum versus steel if strength is an important consideration for a design?   |  |  | | --- | --- | | *ANSWER:* | Density (and hence mass) of material. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Insight into Materials | | *TOPICS:* | Insight into Materials Selection and Bicycle Frames | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 37. Use the web to research the elastic modulus and yield strength of carbon fiber composites. How do these materials compare to aluminum, steel and titanium?   |  |  | | --- | --- | | *ANSWER:* | Utilize a world wide web search engine to acquire the reference. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Insight into Materials | | *TOPICS:* | Insight into Materials Selection and Bicycle Frames | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| ***Focus on Problem Solving Exercises*** |

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| 38. A student was given two metal cubes that looked similar. One was 1.05 cm on an edge and had a mass of 14.32 grams; the other was 2.66 cm on a side and had a mass of 215.3 grams. How can the student determine if these two cubes of metal are the same material using only the data given?   |  |  | | --- | --- | | *ANSWER:* | Determine the density of each cube. If the densities vary significantly, the cubes are not the same material. If the densities are similar, the student can suggest that the materials "appear" to be similar but can not say that they are the same without doubt. In this particular case, the first cube has a density of 12.4 g/cm3 and the second has a density of 11.4 g/cm3. This difference suggests that the two materials are not the same. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Focus on Prob Solving Ex | | *TOPICS:* | Focus on Problem Solving Exercises | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 39. Battery acid has a density of 1.285 g/mL and contains 38.0% sulfuric acid by mass. Describe how you would determine the mass of pure sulfuric acid in a car battery, noting what item(s) you would have to measure or look up.   |  |  | | --- | --- | | *ANSWER:* | Measuring the volume of battery acid and using the density value provided would give you a mass of battery acid. From there, the % sulfuric acid would provide a reliable measure of the mass of pure sulfuric acid | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Focus on Prob Solving Ex | | *TOPICS:* | Focus on Problem Solving Exercises | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 40. A solution of ethanol in water has a volume of 54.2 mL and a mass of 49.6 g. What information would you need to look up and how would you determine the percentage of ethanol in this solution?   |  |  | | --- | --- | | *ANSWER:* | To determine the % of ethanol one would have to know the density of ethyl alcohol. Make the assumption that the primary components are water and ethanol. Set "x" equal to the percentage of ethanol in the sample, and "1-x" is the percentage of water. Multiple "x" by the density of ethanol and to this quantity add "1-x" multiplied by the density of water. The sum of these two components should equal the overall density found by mass/volume. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Focus on Prob Solving Ex | | *TOPICS:* | Focus on Problem Solving Exercises | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 41. If corn is traded by the "bushel" and an acre of crop land yields an average of 240 bushels of corn per acre, how would you determine the volume of corn in L is produced by a 160 acre field? What would you have to look up to solve the problem?   |  |  | | --- | --- | | *ANSWER:* | One would need to look up the volume of corn in one bushel (35.24 L). From there, the problem is solved by calculating the total bushels produced on the plot and converting this product to “L”. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Focus on Prob Solving Ex | | *TOPICS:* | Focus on Problem Solving Exercises | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |

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| 42. Imagine you place a cork measuring 1.30 cm × 4.50 cm × 3.00 cm in a pan of water. On top of this cork you place a small cube of lead measuring 1.15 cm on a side. Describe how you would determine if the combination of the cork and lead cube will still float in the water. Note any information you would need to look up to answer the question.   |  |  | | --- | --- | | *ANSWER:* | Find the mass of the cork and that of the lead. The sum of masses can be divided by the sum of volumes (19.1 cm3) to find an average density for the pair. If this is less than 1 g/cm3, the pair is expected to float. | | *POINTS:* | 1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Focus on Prob Solving Ex | | *TOPICS:* | Focus on Problem Solving Exercises | | *DATE CREATED:* | 12/23/2013 1:59 PM | | *DATE MODIFIED:* | 12/23/2013 1:59 PM | |