3.091

Do yourself a solid.

3.091 Introduction to Solid State Chemistry

Fall Term 2018

Quiz 1 (A)

9/13/2018

1) Consider the combustion of a candle ($C_{25}H_{52}$) with oxygen (O_2) to form carbon dioxide (CO_2) and water (H_2O). A typical candle has 100 g of $C_{25}H_{52}$. Please answer the following questions:

a) (2 pts) Write the balanced reaction for the combustion of a candle (2 points).

b) (2 pts) You are in a closed room with a mole of O_2 molecules. If you light 5 candles, what will be the limiting reagent and how much excess (in grams) of either the O_2 or $C_{25}H_{52}$ will remain?

2) Your student ID is made of a plastic called polyvinyl chloride. The molecular unit in this material is C_2H_3Cl, and for this question you can assume the card is made of only this molecule, with a density of 1.4 grams/cm^3. Please answer the following questions:

a) (1 pt) Use your 3.091 ruler to determine the mass of your student ID card in grams (assume a thickness of 2 mm and that the card is perfectly rectangular).

b) (2 pts) How many moles of C_2H_3Cl are in the ID card?

c) (2 pts) There are only 2 stable isotopes of chlorine, ^{35}Cl and ^{37}Cl. What is their relative abundance?

d) (1 pt) You take all the chlorine out of your card and us it to disinfect a 100,000-gallon swimming pool which requires 1 kg of Cl. How many ID cards do you need to disinfect the pool?

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