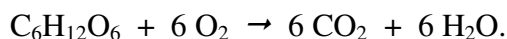


Apollo 13 Homework 2 pts, due start of lecture Friday 11/13/09

Introduction

This problem has three main (somewhat independent) elements. In the first part you should use your understanding of how rate of production of a compound through time can be used to predict how much material is produced through a given time. This is very much like driving at a constant speed for a given period of time and then multiplying by the time to determine how far you have gone. In the second part of the problem you will need to employ the Ideal Gas Law to convert volume to moles. The third part of the problem is in essence, a titration problem. You are titrating the astronauts to their endpoint with the compound present in the CO₂ scrubbers. If you need more help or to refresh your memory about this scene, go to the Chemical Science in Cinema section of Dr. R. Krueger's web page.

a) **(1.4 pt)** Assume that a resting human on a space capsule uses 14.5 L O₂/hr. Assume that all of their O₂ consumption is used in the following rxn.:



What mass of LiOH would be required to purify the air (*i.e.*, quantitatively remove the CO₂ produced by the astronauts) in the space capsule for 4.2 days for 3 (three) humans. Assume that the cabin of the space capsule has pressure of 1.04 atm and a temperature of 6.5°C. (Remember, it was chilly.) *Show all calculations. You must write a balanced chemical equation for the neutralization of CO₂ by LiOH to receive full credit.*

b) **(0.3 pt)** Describe the molecular basis for the toxicity that the astronauts were experiencing. A full credit answer must include at least two chemical reactions.

c) **(0.3 pt)** Briefly (3 sentences or less), describe a human health problem that causes respiratory acidosis. *You must write out this description by hand and use your own words. Do not copy the description verbatim from the source.* This problem should not involve a person being trapped in a confined space such as a space capsule, mine, submarine, etc. That is, it should be something that the average nurse or doctor would be more likely to see in a clinical setting. Use a source other than your text book to find this health problem (web resources are okay), and cite the source. If you do use an internet source, be sure to include the url (Address) as part of the citation.

You will likely need to do your work on a separate piece(s) of paper. Please write your name on the back of those pages and staple those pages to this page.