

## INTRODUCTION TO COMPOSITES -- MFG 555

Fall 2010 – Exam 1

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Name: \_\_\_\_\_

All problems have the same value, although some problems may have several parts.

1. Assume that you have been hired by NASA to assist in making a signal reception station that will be located in orbit around the moon and placed there by the next lunar mission. Your job is to specify the resin that is to be used in the outer casing of the station. The physical-weight requirements suggest that the material must be a fiber reinforced composite. The threats that NASA is most concerned with are: UV degradation, thermal fluctuations, and impact from small meteors. Indicate the general type of resin you would select and defend your choice. Then, go into detail about the chemical nature of that resin and the additives and reinforcements that you would include, be as specific as you can, and discuss the choices available and defend the choices you make. You might, for example, discuss the amount of aromaticity and the amount of crosslinking, etc.

2. Illustrate the steps (mechanism with drawings) in the crosslinking of a generic unsaturated polyester.

3. Discuss the properties of the crosslinked unsaturated polyester that would likely result from the following situations during curing and give your reasoning:  
a) too much inhibitor

b) too much heat

c) too much styrene

4. Two companies are competing to make bullet proof vests. One company uses Kevlar and the other uses Spectra (UHMWPE). Give the advantages and disadvantages that each of the products might have in this application. Then, discuss any differences that might be present if the products were used for a rigid armor for a door panel in a military vehicle.