March 26, 2012

Students
UPTesting, Inc.
5000 N. Willamette Blvd.
Portland, OR 97203

Dear Students,

You have conducted tests on numerous samples this semester. However, all of that data was taken at room temperature. I am requesting you conduct tests to determine the effect of test temperature on the toughness of four different alloys (2024-T351, AISI 108CF, 1045CF, 1045HR).

No letter is required, however, please complete the worksheet on the backside of this letter and submit during the next lab meeting. If you have any questions, please do not hesitate to contact me at 503-943-7432 or lulay@up.edu.

Sincerely,

(electronic)

Ken Lulay
CEO, Titanic Metallurgy

1. (10 pts) Create an appropriate and complete data sheet for next week’s strain gage lab. Bring this to class next week on its own sheet of paper. See course web page details.

2. (15 pts) Create a high quality graph of the data from this week’s lab as if it were going in a letter. Attach it to this worksheet.

3. (5 pts) What do you conclude about the results (interpret them for me – how is the information important?).

4. (2 pts) Why do most metal alloys experience ductile to brittle transition (why do they become brittle at cold temperatures)?

5. (2 pts) If a piece of AISI 1045HR steel was immersed in liquid nitrogen and then warmed to room temperature, what would you expect its toughness to be if it was then tested at room temperature? Would its toughness be affected by having been cooled?

6. (2 pts) Describe microstructural changes that occur in AISI 1045HR steel when being immersed in liquid nitrogen, if any.

7. (2 pts) What is the basic difference between aluminum and steel that allows aluminum to not experience ductile-to-brittle transition?

8. (2 pts) What happens to the ductile to brittle transition of steel as carbon content is increased?

9. (2 pts) What happens to the toughness of steel as carbon content is increased?

10. (2 pts) What effect does cold working have on the toughness of steel?

11. (2 pts) In general, what is the correlation between strength and hardness of an alloy? In other words, as strength increases (by cold working, heat treating or composition changes) what happens to the hardness? In general, what is the correlation between strength and ductility of an alloy?