**South Dakota School of Mines and Technology**

**Department of Materials and Metallurgical Engineering**

MET 321 Calculations Lab #4 11-13

***2013***

11. A sample of titanium carbide (ZrC) is reacted in an oxygen bomb calorimeter to form solid ZrO2 and CO2. The bomb has a constant volume and starts and is cooled back to 25 °C after the reaction. An iron wire fuse used to start the reaction releases 23 cal of heat. Calculate

a) The total heat released from the reaction per gram of ZrC if the heat of formation of ZrC is -28.39 Kcal/gfw.

b) The temperature rise in °C in the calorimeter if all the heat is used to raise the temperature of the bomb and 1000 g of water. The bomb has a water sensible heat equivalent of 335 grams.

c) The temperature rise in the water for 1 gram of dried pizza if the entire slice of dried pizza weighed 71 grams and Pizza Hut reports there are 525 Calories per slice of this pizza.

1. For a 100-ton heat of liquid copper at 2340 °F

a) How much copper at 77 °F must be added to cool it to 2240 °F?

b) What will be the final temperature if 9 tons of copper are added?

13. Limestone (CaCO3) is calcined to lime (CaO) by heating it using natural gas (assume 100% methane) combusted with dry air. The amount of fuel used per ton of limestone is 8,400 STP ft3. The dry basis exit gas is 3.2% O2 with the balance containing CO2 and N2. Everything enters the furnace at 77 °F. The lime leaves at 1050 °F and the gas leaves at 2040 °F. What is the heat balance (total H) for the process?