

**South Dakota School of Mines and Technology**  
**Department of Materials and Metallurgical Engineering**

MET 321

Calculations Lab #1

01

**2013S**

1. Create a worksheet that computes the total cost savings per month expected by installing a timer switch for the exhaust fan in MI 128B. The user should be able to input the following:

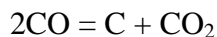
**Assumptions**

Fuel Cost (\$/10<sup>6</sup> BTUs)  
BTU Delivery Efficiency  
ElectricityCost (\$/kWhr)

**User Selected Bases**

Motor, W  
CFM (STP)  
Time on (hr)  
Outside Air T (°F)  
hrs/month

2. Metallic iron is made by reacting magnetite and carbon at 1100 °C in a crucible. The gas evolved from the process is 25 % CO<sub>2</sub> and 75% CO. Calculate the following:
  - a) Carbon needed to produce 1 pound of iron.
  - b) STP volume of produced gas per ton (2000 pounds) of iron produced.
  - c) Volume of gas in part b if the gas is at the operating temperature of 1100 °C and pressure of 740 mmHg.
3. A copper matte smelting furnace charge has the ratios Cu:S:Fe 1:1.2:4. Once melted the matte retains 98% of the Cu and 75% of the S. If the matte is a stoichiometric mixture of Cu<sub>2</sub>S and FeS find
  - a) Matte grade (i.e. %Cu).
  - b) Percent Fe recovered in the matte
4. A gas mixture of equal molar amounts of carbon monoxide and dioxide flowing at 100 ml/min (STP) is passed over carbon at 800 °C. The exit gas composition is 49% CO and 51% CO<sub>2</sub>.



Find the rate of deposition of C in mg/hr.