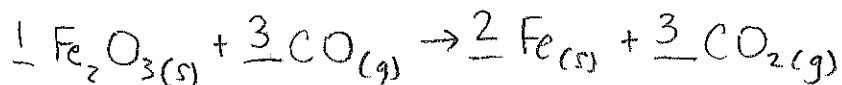


Unit 2: AP Quiz Free Response Practice [2003 Form B #2, modified, 6 points]

1. Solid iron (III) oxide can be reduced with gaseous carbon monoxide, producing solid iron and carbon dioxide gas.
- a. In an experiment, a student combines a 16.2 L sample of CO(g) at 1.50 atm and 200.°C with 15.39 g of Fe₂O₃(s).
- i. What is the balanced chemical equation for this reaction? [2 points]



- ii. How many moles of CO(g) are available for the reaction? [1 point]

$$n = \frac{PV}{RT} = \frac{(1.50 \text{ atm})(16.2 \text{ L})}{(0.08206 \frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}})(200. + 273)} = 0.626 \text{ mol CO}$$

- iii. What is the limiting reactant for the reaction? Justify your answer with calculations. [2 points]

$$15.39 \text{ g Fe}_2\text{O}_3 \times \frac{1 \text{ mol}}{159.7 \text{ g}} = 0.09637 \text{ mol} \times \frac{1 \text{ mol rxn}}{1 \text{ mol Fe}_2\text{O}_3} = 0.09637 \text{ mol rxn}$$

smaller!

$$0.626 \text{ mol CO} \times \frac{1 \text{ mol rxn}}{3 \text{ mol CO}} = 0.209 \text{ mol rxn}$$

⇒ Fe₂O₃ is limiting

- iv. How many moles of Fe(s) are formed in the reaction? [1 point]

$$0.09637 \text{ mol Fe}_2\text{O}_3 \times \frac{2 \text{ mol Fe}}{1 \text{ mol Fe}_2\text{O}_3} = 0.1927 \text{ mol Fe}$$