X

Unit 5 - Iron Making - Week 3

Assignment 3

The due date for submitting this assignment has passed. **Due on 2018-02-28, 23:59 IST.**

Submitted assignment

1) *1 point*

The difference between direct and indirect reduction of iron oxide is:

- Direct reduction uses C and indirect reduction can use CO or H_2 or both
- Direct reduction occurs at high temperature and indirect reduction occurs in a range of temperatures
- Direct reduction uses CO or H_2 or both and indirect reduction uses C
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Direct reduction uses C and indirect reduction can use CO or H_2 or both

2) *1 point*

Consider the reduction of iron oxide (hematite) to form iron in a blast furnace. Calculate the approximate equilibrium constant for the reduction of hematite to magnetite by CO at 900^0C given that it attains equilibrium having ΔG=-110.5 kJ.

- 1.01
- 83000
- 3.5
- 88000

No, the answer is incorrect.
Score: 0

Accepted Answers:
83000

3) *1 point*

Calculate the required ratio of CO/CO_2 in the reduction of magnetite to wustite by CO at 900^0C given the equilibrium constant K=5

- 0.2
- 0.4
- 0.6
- 0.8

No, the answer is incorrect.
Score: 0

Accepted Answers:

Interactive Session with Students

0.2

4) ***1 point***

Determine the CO utilization for reactions in questions 2 and 3.

- 100%, 83%
- 29%, 83%
- 90%, 73%
- 19%, 45%

No, the answer is incorrect.
Score: 0

Accepted Answers:
100%, 83%

5) ***3 points***

Consider an indirect reduction of hematite to iron at 900^0C in a co-current manner with CO in the blast furnace. Carry out a mass balance and find out how many moles of CO are required for producing 2 moles of Fe.
For $Fe_2O_3 \rightarrow Fe_3O_4$, CO/CO_2=0.0,
For $Fe_3O_4 \rightarrow FeO$, CO/CO_2=0.2, and
For $FeO \rightarrow Fe$, CO/CO_2=2.5

- 1.0 moles of CO
- 3.0 moles of CO
- 5.5 moles of CO
- 10.5 moles of CO

No, the answer is incorrect.
Score: 0

Accepted Answers:
10.5 moles of CO

6) ***1 point***

Calculate the pressure drop (approximate;y) for a laboratory scale packed bed through which air is passed, for the following conditions:
Column diameter=0.2m
Column height=2.0m
Particle diamter=0.01m
Shape factor=0.8
Void fraction=0.4
Volumetric gas flow rate=$0.04m^3/s$
Viscosity of air=$1.85*10^{-5}$kg/m-s
Density of air=$1.21kg/m^3$

- $7.6*10^3N/m^3$
- $8.6*10^3N/m^3$
- $9.6*10^3N/m^3$
- $6.6*10^3N/m^3$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$8.6*10^3N/m^3$

7) ***2 points***

Estimate the minimum fluidization velocity for hematite particles 150microns in diameter, in hydrogen at 900^0C and at 1atm pressure. Also estimate the elutriation velocity for the same.
Data:
$\rho_s=5.25*10^3kg/m^3$

$\mu_g=2.2*10^{-5}kg/m\text{-}s$

$\rho_g=2.05*10^{-2}kg/m^3$

- 0.01m/s, 1.5m/s
- 0.02m/s, 2.0m/s
- 0.03m/s, 3.0m/s
- 0.04m/s, 2.5m/s

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.03m/s, 3.0m/s

Previous Page End