

Unit 7 - Week 5

Course outline
How does an NPTEL online course work?
Week 0
Week 1
Week 2
Week 3
Week 4
Week 5
<ul style="list-style-type: none"> Lecture 21 - Burden Distribution Lecture 22 - Blast Furnace products and their utilization Lecture 23 - Blast Furnace Productivity Lecture 24 - Modeling of Blast Furnace Lecture 25 - New Potential Technologies for Blast Furnace Week 5 Lecture Material Quiz : Assignment 5 Week 5 Feedback Form
Week 6
Week 7
Week 8
Week 9
Week 10
Week 11
Week 12
Download Videos
Assignment Solution
Live Interactive session
Text Transcripts

Assignment 5

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2020-10-21, 23:59 IST.

1) Features of V stock profile are: 2 points

(a) Ore/coke ratio increases towards the center
 (b) predominant central flow
 (c) Unsmooth burden descent
 (d) Chances of scab formation at the wall

a)
 b)
 c)
 d)

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 a)
 b)
 c)
 d)

2) Which of the following charging sequence is recommended for charge containing large amount fines 2 points

(a) OOLCC
 (b) CCOOL
 (c) OOL/CCC
 (d) OCOLC/CLCOC

a)
 b)
 c)
 d)

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 a)
 b)
 c)
 d)

3) With reference to blast furnace products, pick out the wrong statement(s). 2 points

(a) About 90% of Sulphur from coke and ore is removed through slag
 (b) Mn in hot metal becomes high, if sinter containing BOF slag is used
 (c) Almost all phosphorous from blast furnace burden reports to hot metal
 (d) Silicon content of hot metal decreases with increase in hot metal temperature

a)
 b)
 c)
 d)

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 a)
 b)
 c)
 d)

4) In blast furnace, silicon becomes maximum in iron at 2 points

(a) Shaft level
 (b) Tuyere level
 (c) hearth level
 (d) belly region

a)
 b)
 c)
 d)

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 a)
 b)
 c)
 d)

5) Blast furnace productivity can be increased by 2 points

(a) Oil injection through tuyeres
 (b) Increasing direct reduction
 (c) Using humidified blast
 (d) Increasing blast volume

a.
 b.
 c.
 d.

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 a.
 c.
 d.

6) Performance of blast furnace may be improve by 2 points

(a) Increasing isothermal zone temperature.
 (b) Enhancing sinter reactivity.
 (c) Enhancing coke reactivity.
 (d) Use of binder assisted strong iron ore-carbon composite pellets.

a)
 b)
 c)
 d)

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 b)
 c)
 d)

7) Feature(s) of ULCOS top gas recycling blast furnace is/are 2 points

(a) Pure oxygen at room temperature is used in place of hot air blast.
 (b) Top gas is recycled back after separation of CO₂
 (c) Coal is used in place of coke
 (d) CO₂ emission is greater than conventional blast furnace

a)
 b)
 c)
 d)

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 a)
 b)

8) With reference to the evolution of blast furnace slag, Select the correct statement(s) 2 points

(a) High FeO is present in the primary slag of blast furnace.
 (b) Low alumina makes the primary slag more viscous.
 (c) Majority of lime dissolution takes place in the bosh slag.
 (d) Hearth slag forms after absorbing coke ash.

a)
 b)
 c)
 d)

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 a)
 c)
 d)

9) Predictive nature of thermodynamic model in blast furnace suffers due to: 2 points

(a) Blast furnace hardly attains equilibrium
 (b) Reactions are non-isothermal
 (c) Reactions follows heterogeneous kinetics
 (d) Temperature changes progressively from top to bottom

a)
 b)
 c)
 d)

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 a)

10) With reference to modeling of blast furnace, identify the incorrect sentence: 2 points

(a) Thermodynamic models cannot predict the inside happening in blast furnace
 (b) CFD-DEM model can predict the transient evolution of cohesive zone
 (c) Two fluid continuum model can predict the transient evolution of temperature profile inside the blast furnace
 (d) Estimation of hearth refractory wear can be done based on reverse modeling

a)
 b)
 c)
 d)

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 c)

11) Iron ore containing 64% Fe and 5.5% of SiO₂ is being charge into blast furnace with 600 kg/THM of coke (90% carbon). Coke ash contain 45% of SiO₂. 20% of the ash silica releases above the tuyere. Final slag basicity (defined as the weight ratio of CaO to SiO₂) is 1.1. Assume 93% Fe in hot metal. Calculate the bosh slag basicity. 3 points

(a) 1.645
 (b) 1.534
 (c) 1.254
 (d) 1.378

a)
 b)
 c)
 d)

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 d)

Common data for questions 12 and 13
 For the Mn partitioning reaction $MnO + [C] \leftrightarrow Mn + CO(g)$ between slag and hot metal in the blast furnace, the equilibrium constant is given by

$$\log_{10} K_{16} = -\frac{15090}{T} + 10.97$$

For the Si partitioning $SiO_2 + 2[C] \leftrightarrow [Si] + 2CO(g)$ between slag and hot metal in the blast furnace, the equilibrium constant is given by

$$\log_{10} K_{17} = -\frac{30935}{T} + 20.455$$

Solutes in the molten iron obey henry's law.

12) Estimate the factor by which the Mn content in hot metal will change when hot metal temperature is raised from 1300 °C to 1350 °C. (Assume that MnO activity in slag and partial pressure of CO (g) are not affected by the temperature change.) 3 points

(a) 0.37
 (b) 0.51
 (c) 1.97
 (d) 2.69

a)
 b)
 c)
 d)

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 c)

13) The correct expression for equilibrium constant for the combined Mn-Si partitioning in terms of log₁₀ K_{eq,Si} is: 3 points

(a) $-\frac{61115}{T} + 42.395$
 (b) $\frac{755}{T} + 1.485$
 (c) $\frac{61115}{T} + 1.485$
 (d) $\frac{755}{T} - 42.395$

a)
 b)
 c)
 d)

No, the answer is incorrect.
 Score: 0
 Accepted Answers:
 b)