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Unit 6 - Iron Making - Week 4

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Assignment 4

The due date for submitting this assignment has passed. **Due on 2018-03-07, 23:59 IST.**

Submitted assignment

1) Questions 1 to 4: True or False: As the burden descends in the blast furnace, the layer thickness decreases.   **0.25 points**

⚪ True
⚪ False

No, the answer is incorrect.
Score: 0

Accepted Answers:
True

2) Dynamic holdup of liquid is the amount of liquid that remains in the bed after the liquid flow is stopped and the bed is drained.   **0.25 points**

⚪ True
⚪ False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

3) Refractory wear is higher for wall working furnace as compared to central working furnace.   **0.25 points**

⚪ True
⚪ False

No, the answer is incorrect.
Score: 0

Accepted Answers:
True

4) Liquid flow in metallurgical system is mostly wetting in nature.   **0.25 points**

⚪ True
⚪ False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

5) Which of the following is in correct order for the angle of repose?   **0.5 points**

    ○ Sinter<Pellets<Coke
    ○ Pellets<Coke<Sinter
    ○ Coke<Sinter<Pellets
    ○ Pellets<Sinter<Coke

No, the answer is incorrect.
Score: 0

Accepted Answers:
Pellets<Sinter<Coke

6) In a countercurrent gas-liquid flow in a packed bed, the pressure drop is: ***0.5 points***

    ○ Higher than the gas flow only
    ○ Lower than the liquid flow only
    ○ Lower than the gas flow only
    ○ None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Higher than the gas flow only

7) Total slag holdup in the dropping zone of a blast furnace is: ***0.5 points***

    ○ Higher than the total metal holdup
    ○ Lower than the total metal holdup
    ○ Same as the total metal holdup
    ○ None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Higher than the total metal holdup

8)   ***1 point***

Data for questions 8 and 9:
Void fraction of coke bed=0.51
Void fraction of pellets=0.35
Shape factor of coke particles=0.63
Shape factor of pellets=0.87
Gas viscosity=3×10^{-5}kg/m.s
Gas velocity=2m/s
Gas consists of 60%N_2, 20%CO and 20%CO_2 at 500K.

The relation between pressure drop per unit length for coke particles having an average diameter of
50mm and that for iron ore pellets having average diameter of 15mm in the blast furnace stack can be
given as:

    ○ $(\Delta P/L)_{Coke} \approx 10\ (\Delta P/L)_{Pellets}$
    ○ $(\Delta P/L)_{Pellets} \approx 10\ (\Delta P/L)_{Coke}$
    ○ $(\Delta P/L)_{Coke} \approx (\Delta P/L)_{Pellets}$
    ○ $(\Delta P/L)_{Coke} \approx 2\ (\Delta P/L)_{Pellets}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$(\Delta P/L)_{Pellets} \approx 10\ (\Delta P/L)_{Coke}$

9) Based on your layer above, which of the following would help make the pressure drop across ***1 point***
coke and pellets in the blast furnace stack closer to each other?

    ○ $L_{Pellets} < L_{Coke}$
    ○ $L_{Coke} < L_{Pellets}$

- ○ $L_{Pellets}=L_{Coke}$
- ○ None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
$L_{Pellets}<L_{Coke}$

10)   *1.5 points*

Data for questions 10 to 13:
Following are the conditions in the dropping zone of the blast furnace:
Belly diameter=12m

Temperature=1400^0C
Gas composition: 40%CO + 60%N_2

Viscosity of the gas: $5.4x10^{-5}$Pa.s

Liquid metal density=6800 kg/m^3
Shape factor of coke particles=0.65
Coke particles size=40mm
Voidage of coke bed=0.45

Density of coke particles=900kg/m^3

Liquid metal contact angle with coke=90^0
Liquid metal viscosity=0.005Pa.s
Liquid metal superficial velocity=0.1mm/s
Surface tension=1.1N/m

Total liquid holdup in presence of gas flow=$1.92x10^{-2}$m^3/m^3
Liquid metal effective diameter=2mm
Take Ergun constants k1=190 and k2=1.7

The value of total holdup in the absence of gas flow is:

- ○ slightly smaller than the holdup in presence of gas flow
- ○ much smaller than the holdup in presence of gas flow
- ○ much greater than the holdup in presence of gas flow
- ○ slightly greater than the holdup in presence of gas flow

No, the answer is incorrect.
Score: 0

Accepted Answers:
slightly smaller than the holdup in presence of gas flow

11) Estimate the velocity of the gas (in m/s) in the dropping zone.   *1.5 points*

- ○ <1
- ○ $1<v_g<2$
- ○ >2

No, the answer is incorrect.
Score: 0

Accepted Answers:
>2

12) Will the coke bed be fluidized at this gas velocity?   *1 point*

- ○ yes
- ○ no

No, the answer is incorrect.
Score: 0

Accepted Answers:
no

13) Does flooding occur for these conditions?   *1.5 points*

○ No

○ Yes

No, the answer is incorrect.
Score: 0

Accepted Answers:
No

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