



Mastercourse
Metallurgical Engineering
(Ferrous Process Metallurgy)
2011-08-16

Last name, first name:

Matrikel-Nr.:

Signature:

Task	Points (max.)	Points	Signature	Approval	Final points (total)
1	5				
2	5				
3	5				
4	5				
5	5				
6	5				
7	5				
8	5				
9	5				
10	5				
Total:		Total after approval:			

**For each correct partial answer: 0.5 points till the maximum reachable
number of points**

Mastercourse

Metallurgical Engineering

Univ.-Prof. Dr.-Ing. Dieter Senk

2011-08-16

1. Task: Pelletizing und Sintering

5 points

- a) At the formation of greenpellets, water is given to the ore, to bind the ore-particles. Describe the 6 different formation steps between water and ore-particles.

3.0 points

- b) In which processes briquettes, pellets and sinter of iron ore are employed? Name for each material (briquettes, pellets, sinter) one process in the iron- and steel industry!

2.0 points

2. Task: Metallurgical Coke

5 points

a) Name three different fossil fuels!

1.5 points

b) Write down five chemical elements of coals, which play an important role in the Iron- and Steelmaking process.

2.5 points

c) How long does the coking process take and what is the criteria when it is finished?

1.0 points

3. Task: Blast Furnace

5 points

- a) Draw a material flow chart of the blast furnace including all input- and output media!

5.0 points

4. Task: Thermodynamics

5 points

- a) Give a definition of reduction devices. Name two elements, which can be used as reduction device in the metallurgy.

2.0 points

- b) Give the equation of the activity in the thermodynamic and name the Parameter.

1.5 points

- c) Give the equation of the Boudouard Reaction and name in what temperature range the reaction takes place in which reaction.

1.5 points

5. Task: Steel converter

5 points

- a) What is refining? Name the aims, benefits and characteristics. (At least two nominations each for the aims, benefits and characteristics)

3.5 points

b) During the refining process, some parts of the refractory material of the BOF get advanced abrasion. Sketch a BOF, name and mark two zones of advanced abrasion.

1.5 points

6. the products (at least two answers)

7. the production capacity

7. Task: Electric Steelmaking

5 points

a) Name two requirements for the selection of scrap as feed material in electric arc furnaces.

1.0 points

b) Name four working steps during the steelmaking process in an EAF.

2.0 points

c) A 90 t EAF-Melt has 0.4 wt.-% Si. By Oxygen injection the Si is totally oxidised. How much slag is produced, if the final value for SiO₂ is 30 wt.-%?

2.0 points

	Si	O ₂
M in g/Mol	28	32

8. Task: Secondary Metallurgy: **5 points**

- a) Draw a Richardson-Jeffes-Diagram of oxides, name the axes und sketch the graphs for Fe-II, Mn, Si and Al.

3.0 points

- b) What is the meaning of the Vacher-Hamilton equilibrium? Give the thermodynamical equilibrium equation and the value of the equilibrium constant at 1600°C.

1.5 points

c) For which reactions is the RH-Degasser especially dedicated for?

0.5 points

9. Task: Continuous Casting

5 points

- a) Name the parameters, which take influence on the casted product of a continuous casting machine. (at least 6 answers)

3.0 points

- b) Give two sources for unwanted oxidic-inclusions in steel.

1.0 points

- c) What is micro segregation? What is the reason for micro segregation?

1.0 points

10. Task: Protection of Environment, Recycling

5 points

a) Give a definition for sustainable development.

1.0 points

b) Name 4 potentials for reducing the energy consumption in the iron and steel industry in an integrated steelwork.

2.0 points

c) Following analysis for dust from a filter is given: 50 wt.-% Fe_2O_3 , 10 wt.-% Fe_3O_4 , 35 wt.-% C, 5 wt.-% rest. Name two ways for usage in the iron and steel industry in order to prevent landfilling.

1.0 points

d) Name two advantages for a company recycling such materials.

1.0 points