**MATERIALS FOR ENTRANCE EXAMINATIONS IN THE DOCTORATE SCHOOL**

**FOR EDUCATIONAL PROGRAM 8D07201 - METALLURGY**

**FOR THE 2024-2025 ACADEMIC YEAR**

Field of education:

**8D07 Engineering, manufacturing and construction industries**

Code and classification of areas of training:

**8D072 Manufacturing and processing industries**

Group of educational programs:

**D117 Metallurgical Engineering**

**Ticket questions**

***Questions of the first block -***

***50 - for GOP natural-technical direction***

###001 (question number)

State diagrams of ternary systems of non-ferrous alloys. General information.

{Block}=1

{Source}= Smagulov D.U. Metallography. Almaty: KazNTU, 2007. - 376 p.

###002 (question number)

Describe the basic principles of chemical substitution reactions

{Block}=1

{Source}= G. G. Mineev. Theory of metallurgical processes: a textbook for students of higher educational institutions. - Irkutsk: Publishing House of the Irkutsk State. Technical University 2010. - 522 p.

###003 (question number)

Describe the main transformations and states in iron-carbon alloys

{Block}=1

{Source}= Smagulov D.U. Metallography. Almaty: KazNTU, 2007. - 376 p.

###004 (question number)

Describe the mechanisms of occurrence of defects in the crystal lattice in the transition states of metallic materials

{Block}=1

{Source}= Smagulov D.U. Metallography. Almaty: KazNTU, 2007. - 376 p.

###005 (question number)

Describe the main mechanisms of diffusion interaction between metal, slag and gas phases

{Block}=1

{Source}= Kudrin V.A. Theory and technology of steel production: a textbook for universities. - M. : Mir, AST Publishing House LLC, 2003. - 528 p.

###006 (question number)

Describe the mechanism of pearlite formation

{Block}=1

{Source}= Gulyaev A.P. Metal science - M.: Metallurgy, 1978. - 648 p.

###007 (question number)

Describe the mechanism of ferrite formation

{Block}=1

{Source}= Gulyaev A.P. Metal science - M.: Metallurgy, 1978. - 648 p.

###008 (question number)

Describe the main structural elements of oxygen converters

{Block}=1

{Source}= Kudrin V.A. Theory and technology of steel production: a textbook for universities. - M. : Mir, AST Publishing House LLC, 2003. - 528 p.

###009 (question number)

Describe the main chemical reactions that occur during the refining of aluminum with fluoride fluxes

{Block}=1

{Source}= Ibragimov A.T., Pak R.V. Aluminum electrometallurgy. Kazakhstan electrolysis plant. - Pavlodar: Press House, 2009. - 262 p.

###010 (question number)

Describe the main characteristics of alumina added during electrolysis

{Block}=1

{Source}= Ibragimov A.T., Pak R.V. Aluminum electrometallurgy. Kazakhstan electrolysis plant. - Pavlodar: Press House, 2009. - 262 p.

###011 (question number)

Describe the mechanism of occurrence of the anode effect in aluminum electrolyzers

{Block}=1

{Source}= Ibragimov A.T., Pak R.V. Aluminum electrometallurgy. Kazakhstan electrolysis plant. - Pavlodar: Press House, 2009. - 262 p.

###012 (question number)

Describe the main causes of contamination of aluminum melts with intermetallic compounds in electrolyzers

{Block}=1

{Source}= Kurdyumov A.V., Inkin S.V., Chulkov V.S., Grafas N.I. Flux treatment and filtration of aluminum melts. - M. : Metallurgy, 1980. - 196 p.

###013 (question number)

Describe the main causes of contamination of aluminum melts with gases

{Block}=1

{Source}= Kurdyumov A.V., Inkin S.V., Chulkov V.S., Grafas N.I. Flux treatment and filtration of aluminum melts. - M. : Metallurgy, 1980. - 196 p.

###014 (question number)

Name the know-how in aluminum cleaning (world experience)

{Block}=1

{Source}= Kurdyumov A.V., Inkin S.V., Chulkov V.S., Grafas N.I. Flux treatment and filtration of aluminum melts. - M. : Metallurgy, 1980. - 196 p.

###015 (question number)

Describe the main reactions that occur during the refining of aluminum with argon

{Block}=1

{Source}= Kurdyumov A.V., Inkin S.V., Chulkov V.S., Grafas N.I. Flux treatment and filtration of aluminum melts. - M. : Metallurgy, 1980. - 196 p.

###016 (question number)

Interaction of aluminum melts with fluxes

{Block}=1

{Source}= Kurdyumov A.V., Inkin S.V., Chulkov V.S., Grafas N.I. Flux treatment and filtration of aluminum melts. - M. : Metallurgy, 1980. - 196 p.

### 017 (question number)

Influence of impurities on the properties of aluminum alloys

{Block} = 1

{Source} = Kurdyumov A.V., Inkin S.V., Chulkov V.S., Grafas N.I. Flux treatment and filtration of aluminum melts. - M.: Metallurgy, 1980 .-- 196 p.

### 018 (question number)

Classification of alumina production methods

{Block} = 1

{Source} = Ibragimov A.T., Budon S.V. Development of technology for the production of alumina from bauxite in Kazakhstan. - Pavlodar: House of the press, 2010 .-- 302 p.

### 019 (question number)

Alumina production by the Bayer process

{Block} = 1

{Source} = Ibragimov A.T., Budon S.V. Development of technology for the production of alumina from bauxite in Kazakhstan. - Pavlodar: House of the press, 2010 .-- 302 p.

### 020 (question number)

Alumina production by sintering

{Block} = 1

{Source} = Ibragimov A.T., Budon S.V. Development of technology for the production of alumina from bauxite in Kazakhstan. - Pavlodar: House of the press, 2010 .-- 302 p.

### 021 (question number)

Combined alkaline processes for alumina production

{Block} = 1

{Source} = Ibragimov A.T., Budon S.V. Development of technology for the production of alumina from bauxite in Kazakhstan. - Pavlodar: House of the press, 2010 .-- 302 p.

### 022 (question number)

Complex recycling of alumina production red mud mixed with aluminosilicates

{Block} = 1

{Source} = Abzhapparov A. Integrated use of low-quality alumina-containing raw materials in Kazakhstan. - Almaty: Gylym, 1998 .-- 178 p.

### 023 (question number)

Thermodynamics of the processes of reduction of metals from oxides. Reduction of iron oxides

{Block} = 1

{Source} = S.I. Popel The theory of metallurgical processes. - M .: Metallurgy, 1986 .-- 468 p.

### 024 (question number)

Thermal dissociation of carbonates

{Block} = 1

{Source} = G. G. Mineev. The theory of metallurgical processes: a textbook for students of higher educational institutions. - Irkutsk: Publishing house of the Irkutsk state. Technical University 2010. - 522 p.

### 025 (question number)

Sulfides. Sulfide behavior during smelting

{Block} = 1

{Source} = G. G. Mineev. The theory of metallurgical processes: a textbook for students of higher educational institutions. - Irkutsk: Publishing house of the Irkutsk state. Technical University 2010. - 522 p.

### 026 (question number)

Analysis of the state diagrams of the slag system. Slag melt properties

{Block} = 1

{Source} = G. G. Mineev. The theory of metallurgical processes: a textbook for students of higher educational institutions. - Irkutsk: Publishing house of the Irkutsk state. Technical University 2010. - 522 p.

### 027 (question number)

Thermodynamic analysis of the interaction of deoxidizing elements with oxygen. Deoxidation of alloy steels with complex deoxidizers

{Block} = 1

{Source} = G. G. Mineev. The theory of metallurgical processes: a textbook for students of higher educational institutions. - Irkutsk: Publishing house of the Irkutsk state. Technical University 2010. - 522 p.

### 028 (question number)

Chemical properties of slags

{Block} = 1

{Source} = Ryzhonkov D.I. and other Theory of metallurgical processes. M., Metallurgy, 1989.

### 029 (question number)

Mechanism and kinetics of heterogeneous reactions

{Block} = 1

{Source} = Ryzhonkov D.I. and other Theory of metallurgical processes. M., Metallurgy, 1989.

### 030 (question number)

Kinetics of crystallization of molten metals

{Block} = 1

{Source} = Ryzhonkov D.I. and other Theory of metallurgical processes. M., Metallurgy, 1989.

### 031 (question number)

The process of nucleation of gas bubbles and the conditions for their removal from the metal melt

{Block} = 1

{Source} = Ryzhonkov D.I. and other Theory of metallurgical processes. M., Metallurgy, 1989.

### 032 (question number)

The physical meaning of the Pilling-Bedwards criterion in the leaching process

{Block} = 1

{Source} = A. N. Zelikman, G. M. Voldman, L. V. Belyaevskaya. Theory of hydrometallurgical processes. M., Metallurgy, 1983.

### 033 (question number)

Solid-liquid separation processes in hydrometallurgy

{Block} = 1

{Source} = A. N. Zelikman, G. M. Voldman, L. V. Belyaevskaya. Theory of hydrometallurgical processes. M., Metallurgy, 1983.

### 034 (question number)

Regularities of the course of the leaching process in the external diffusion area

{Block} = 1

{Source} = A. N. Zelikman, G. M. Voldman, L. V. Belyaevskaya. Theory of hydrometallurgical processes. M., Metallurgy, 1983.

### 035 (question number)

Liquidation methods for refining metals

{Block} = 1

{Source} = A. N. Zelikman, G. M. Voldman, L. V. Belyaevskaya. Theory of hydrometallurgical processes. M., Metallurgy, 1983.

### 036 (question number)

The structure of solid and liquid ferroalloys and slags

{Block} = 1

{Source} = Gasik M.I. Theory and technology of electrometallurgy of ferroalloys: Textbook for universities / M.I. Gasik, N.P. Lyakishev. - M .: SP Intermet Engineering, 1999 .-- 764 p.

### 037 (question number)

Thermodynamic strength of oxides and carbonates

{Block} = 1

{Source} = Gasik M.I. Theory and technology of electrometallurgy of ferroalloys: Textbook for universities / M.I. Gasik, N.P. Lyakishev. - M .: SP Intermet Engineering, 1999 .-- 764 p.

### 038 (question number)

Thermokinetics of ferroalloy processes

{Block} = 1

{Source} = Gasik M.I. Theory and technology of electrometallurgy of ferroalloys: Textbook for universities / M.I. Gasik, N.P. Lyakishev. - M .: SP Intermet Engineering, 1999 .-- 764 p.

### 039 (question number)

Phase equilibrium diagrams in metallic and oxide ferroalloy systems

{Block} = 1

{Source} = Gasik M.I. Theory and technology of electrometallurgy of ferroalloys: Textbook for universities / M.I. Gasik, N.P. Lyakishev. - M .: SP Intermet Engineering, 1999 .-- 764 p.

### 040 (question number)

Theoretical foundations of the reduction of silicon with carbon in the preparation of silicon alloys

{Block} = 1

{Source} = Lyakishev N.P., Gasik M.I., Dashevsky V.Ya. Metallurgy of ferroalloys. Part 1. Metallurgy of silicon, manganese and chromium alloys: Textbook. Benefit. - M .: MISiS, 2006 .-- 117 p.

### 041 (question number)

Theoretical Foundations of Manganese Reduction by Carbon in the Production of Manganese Alloys

{Block} = 1

{Source} = Lyakishev N.P., Gasik M.I., Dashevsky V.Ya. Metallurgy of ferroalloys. Part 1. Metallurgy of silicon, manganese and chromium alloys: Textbook. Benefit. - M .: MISiS, 2006 .-- 117 p.

### 042 (question number)

Theoretical Foundations of Chromium Reduction by Carbon in the Production of Chromium Alloys

{Block} = 1

{Source} = Lyakishev N.P., Gasik M.I., Dashevsky V.Ya. Metallurgy of ferroalloys. Part 1. Metallurgy of silicon, manganese and chromium alloys: Textbook. Benefit. - M .: MISiS, 2006 .-- 117 p.

### 043 (question number)

Electrothermy of crystalline silicon and silicon carbide

{Block} = 1

{Source} = Gasik M.I. Theory and technology of electrometallurgy of ferroalloys: Textbook for universities / M.I. Gasik, N.P. Lyakishev. - M .: SP Intermet Engineering, 1999 .-- 764 p.

### 044 (question number)

Theoretical foundations of distillation processes.

{Block} = 1

{Source} = G. G. Mineev. The theory of metallurgical processes: a textbook for students of higher educational institutions. - Irkutsk: Publishing house of the Irkutsk state. Technical University 2010. - 522 p.

### 045 (question number)

Theoretical foundations of rectification processes.

{Block} = 1

{Source} = G. G. Mineev. The theory of metallurgical processes: a textbook for students of higher educational institutions. - Irkutsk: Publishing house of the Irkutsk state. Technical University 2010. - 522 p.

### 046 (question number)

Mechanism and kinetics of the cementation process in hydrometallurgy.

{Block} = 1

{Source} = G. G. Mineev. The theory of metallurgical processes: a textbook for students of higher educational institutions. - Irkutsk: Publishing house of the Irkutsk state. Technical University 2010. - 522 p.

### 047 (question number)

Theoretical foundations of ion exchange processes.

{Block} = 1

{Source} = G. G. Mineev. The theory of metallurgical processes: a textbook for students of higher educational institutions. - Irkutsk: Publishing house of the Irkutsk state. Technical University 2010. - 522 p.

### 048 (question number)

Features of manganese ores of the "Tur" deposit. Methods of processing and production of ferroalloys.

{Block} = 1

{Source} = Zhunusov AK, Tolymbekova LB Metallurgical processing of manganese ores from the Tur and Western Kamys deposits. - Monograph. Pavlodar: Kereku. 2016.

### 049 (question number)

Thermocycle hardening of long products

{Block} = 1

{Source} = Serzhanov R.I., Bogomolov A.V., Bykov P.O., Yksan Zh.M. Improving the quality of continuously cast billets and heat-strengthened long products / monograph edited by R.I. Serzhanov. - Pavlodar: Kereku, 2011 .-- 258 p.

### 050 (question number)

Increasing the uniformity of the structure of continuously cast steel billets due to complex effects on the crystallization process

{Block} = 1

{Source} = Serzhanov R.I., Bogomolov A.V., Bykov P.O., Yksan Zh.M. Improving the quality of continuously cast billets and heat-strengthened long products / monograph edited by R.I. Serzhanov. - Pavlodar: Kereku, 2011 .-- 258 p.