NON-FERROUS METALS SCIENCE AND ENGINEERING
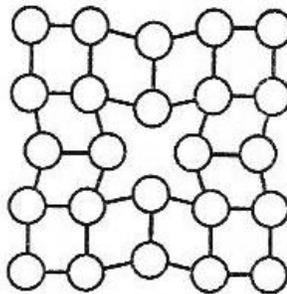
Entrance exam for full-time second cycle studies
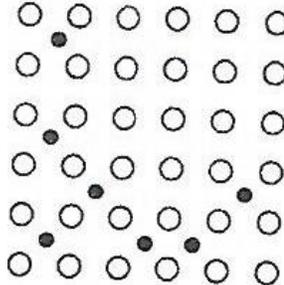
Questions for the 2020/2021 academic year

The cadidates has to answer 50 questions (35 specialist knowledge questions and 15 additional ones) – they can score 2 points for each correct answer.
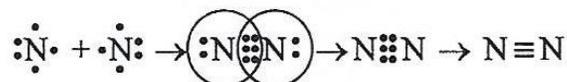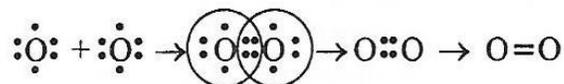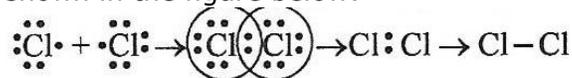
Guiding questions

1. What kind of defect is shown in the figure below:

2. What type of solid solution is presented in the figure below:


3. What is allotropy:
4. The unit of stress is:
5. Hooke's law states that in many materials the strain value is directly proportional to the stress in the case of:
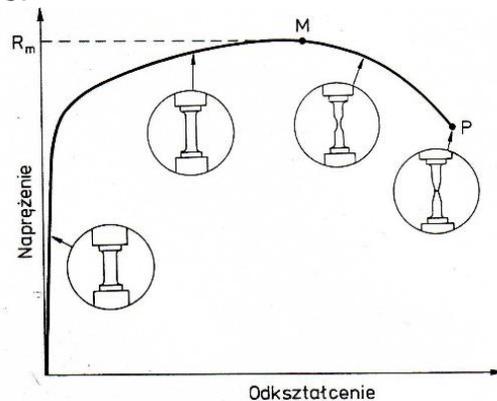6. What type of bond is shown in the figure below:

7. A hardness tester with a pyramid-shaped indenter leaving a square-imprint is a hardness tester using:
8. The creep of a material is:

9. The figure below shows the mechanism of:

b)

1)   2)   3)   4)   5)
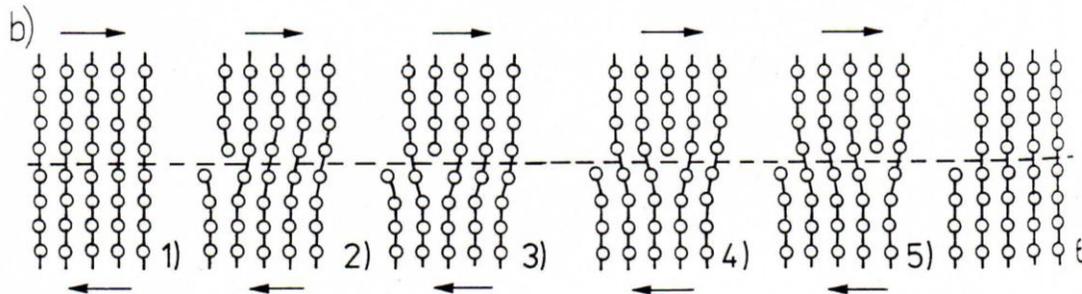
10. The figure below shows:

11. Hydroxides with amphoteric properties dissolve in aqueous solutions of:
12. Copper (II) sulfate (VI) cannot be obtained in the following reaction:
13. Indicate the oxidation/reduction (redox) reaction:
14. The oxidation state of sulfur in sodium thiosulfate (VI) with the formula $Na_2S_2O_3$ is:
15. Isotopes include:
16. In a reaction tank, the state of the chemical equilibrium of the reaction $2HCl_g + I_{2g} \rightleftarrows 2HI_g + Cl_{2g}$ (T - const) has developed. In what direction will the equilibrium state of the reaction move upon increasing the overall pressure of the reaction mixture?
17. The ammonia synthesis $N_{2g} + 3H_{2g} \rightleftarrows 2NH_{3g}$ is an exothermic reaction. An increase in the efficiency of this process can be achieved by:
18. The atomic number of aluminum in the periodic table of elements is 13, whereas the atomic mass of this element is 26.982 u. This means that the number of electrons in an Al atom is:
19. The principal quantum number (n) describes:
20. A polarized covalent bond occurs in:
21. The elementary cell is:
22. The elementary cell of a rhomboid system is described using the following parameters:
23. In crystallography, a set of symmetrically equivalent directions is denoted as:
24. What angle is formed by the following straight lines: [100] and [101]?

25. The indices (hkl) of a plane simultaneously belonging to the strips with the [110] and [001] axes are as follows:

26. The atomic packing factor for a regular wall-centered structure is:

27. Symmetry is:

28. Properties that are particularly defect-prone include:

29. Dislocations are a kind of disruption of the crystalline lattice that has the character of :

30. A low-angle boundary occurs when the misorientation angle between the grains is:

31. A weak AB electrolyte (1:1 type) with the total concentration c and the degree of dissociation a undergoes dissociation in accordance with the general equation $AB \rightleftarrows A^+ + B^-$. What is the concentration of the undissociated molecules in the equilibrium state?

32. If the PH of a solution is 2, the concentration of hydrogen ions is:

33. The process of electrolytic dissociation according to the Brönsted-Lowry theory is described by the following equation:

34. The ionic reaction formula $CO_3^{2-} + H_2O \rightleftarrows H_2CO_3 + OH^-$ corresponds with the process of:

35. An aqueous solution of the following is acidic:

36. The equilibrium constant of the process denoted by the equation $BaSO_4 \downarrow \rightleftarrows Ba^{2+} + SO_4^{2-}$ is:

37. The oxidation state of cobalt in the $[Co(NH_3)_5Br]SO_4$ complex is:

38. During the electrolysis of an aqueous solution, a metal coating was formed on the cathode. The solution contained:

39. What is the SEM value of the $Zn|Zn^{2+} || Ni^{2+}| Ni$ cell if the equilibrium potentials of the electrodes are equal to $E_{o,Zn/Zn2+} = -0,76V$ and $E_{o,Ni/Ni2+} = -0,26V$?

40. During the electrolysis of an aqueous solution of copper (II) sulfate (VI), the following process takes place on a graphite anode:

41. The figure presents a change in the Gibbs free energy of a system in relation to the configuration of the atoms. The arrangement of the atoms in the B configuration means that the system is at:
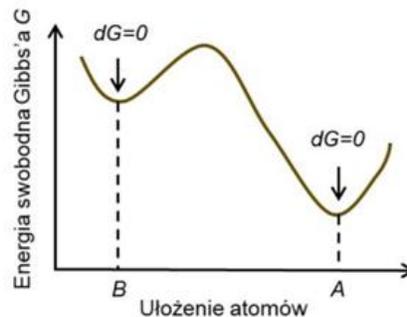
42. For a phase transition to occur:

43. The figure shows the stability regions of the allotropic forms of iron in relation to the temperature and pressure. Based on this figure, it can be concluded that the following form is characterized by the highest density:
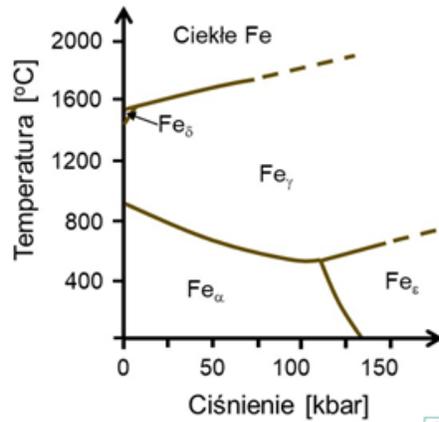
44. The figure presents the dependence of the Gibbs free energy on the composition of the solid phase G^S (the green curve) and the liquid phase G^L (the red curve) of a given system at a constant temperature T_2. Based on this, it can be concluded that for alloys with compositions in the range between points b and c, the stable (equilibrium) phase is:
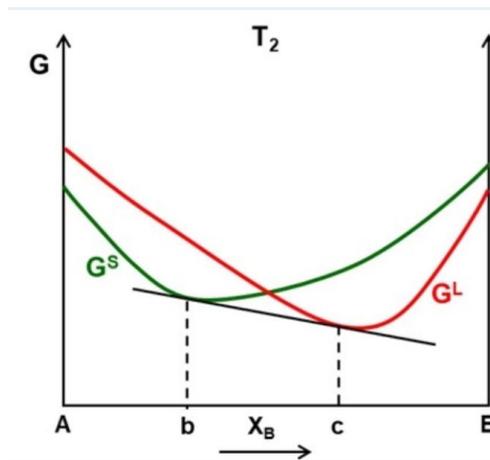
45. At a certain temperature T_x, it is possible to plot a line tangent to each of the curves depicting the dependence of the Gibbs free energy on the chemical composition of the liquid phase G^L (the red curve) and two solid phases G^a and G^b (the green and the brown curve, respectively). This means that T_x is the temperature of the following transformation:

4
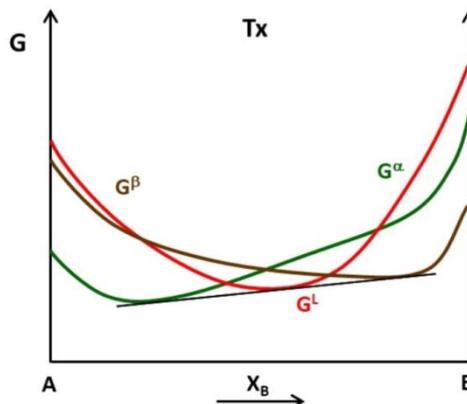
46. In the figure, different interphase boundaries are schematically presented. Which of these boundaries represents a partially coherent (semi-coherent) boundary?

a)

b)

c)

d)
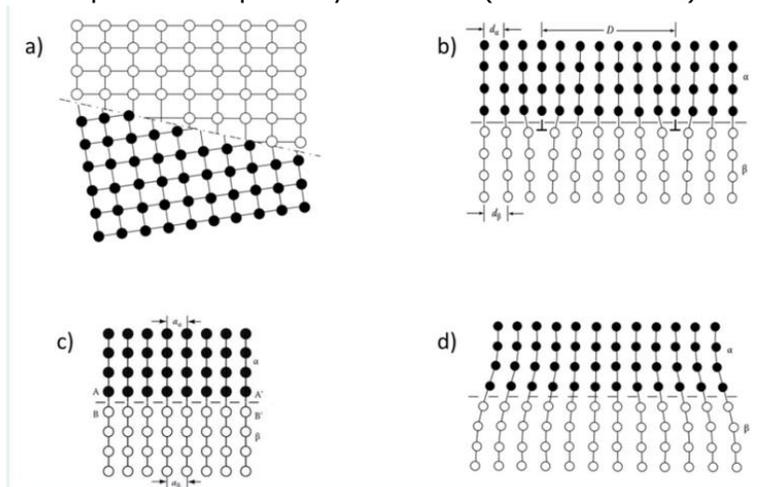
47. The figure below shows (among other things) the dependence of the free energy (the green curve) on the magnitude of the radius of a homogeneously nucleating particle in the spherical shape. During the nucleation, the so-called critical radius is an important parameter, which in the figure can be seen at point:

ΔG

Energia granicy
fazowej $\propto r^2$

a

c
d

0

b

r

ΔG_r

Objętościowa
energia
swobodna $\propto r^3$
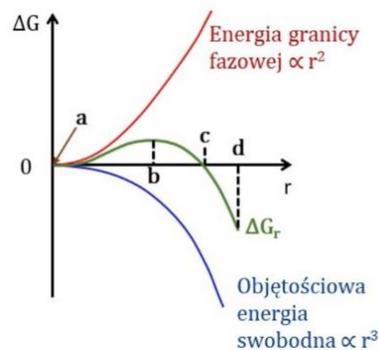
48. The figure below schematically shows the nucleus of the solid phase that is heterogeneously nucleating on the surface of the species. The activation energy of the nucleation will be the lower, the wetting angle θ is:

ciecz

γ_{SL}

γ_{ML}

θ

c. stałe

γ_{SM}

r

forma
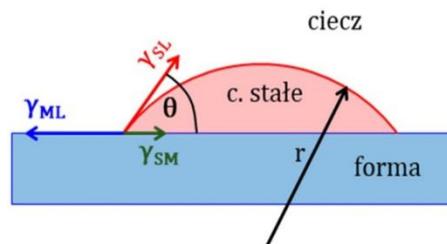
49. The figure shows the dependence of the Gibbs free energy G, enthalpy H and specific heat C_p on the temperature T. Based on these graphs, it can be concluded that the phase transition at the temperature T_c is:
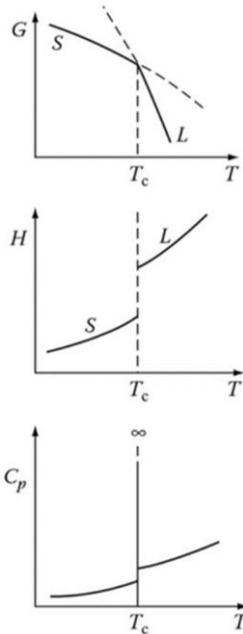
50. In polycrystalline single-phase materials, there are grain boundaries. The figure schematically shows a grain boundary for which the axis of rotation is parallel to the boundary plane. Such a boundary is called:

Oś obrotu
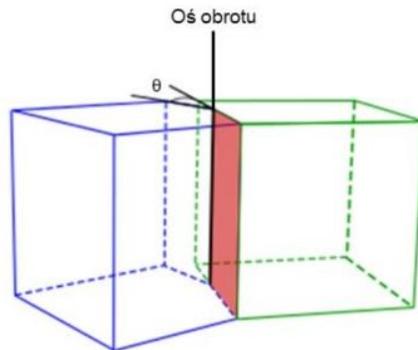
51. Indicate the false relationship between the elastic constants:
52. The symmetricity of the stress tensor is due to:
53. Which of the following stress tensors is not physically equivalent (has different principal stresses) with the other two tensors?
54. Which of the following equations of the equilibrium of forces with respect to the axis x_1 is incorrect?
55. The principal strain values $\varepsilon_1 = -1$, $\varepsilon_2 = 2$ and $\varepsilon_3 = 8$ are given. Indicate the correct form of the pure strain deviator tensor?
56. Which of the following strain tensors represents a uniaxial deformation state?
57. The principal strain values $\varepsilon_1 = -1$, $\varepsilon_2 = 2$ and $\varepsilon_3 = 7$ are given. Indicate the correct form of the strain tensor in the maximum tangent deformations system.
58. Which of the following elastic strain energy density equations is the correct one?
59. Which of the following Hooke's relationships for an isotropic body is incorrect?
60. Which of the following pairs has the same number of independent elastic constants:

61. An isotropic material with a yield strength of σ_{pl} = 100 MPa is subjected to a combined load so that the principal stresses are: σ_1 = 50 MPa, σ_2 = 20 MPa, σ_3 = -50 MPa. Which of the following answers is incorrect?

62. An isotropic material is at the critical transition state from the elastic to the plastic zone. Indicate the load under which the material will pass into the plastic state, according to the Huber hypothesis, assuming the lowest possible stored mechanical energy.

63. An isotropic material is subjected to mechanical loads. Indicate the case in which the Tresca and Huber hypotheses predict the transition of a material to the plastic state for different values of the deviator component of mechanical energy?

64. In accordance with the atomic rigid sphere model, the efficiency of space-filling of the planes in a crystalline lattice can be determined. Indicate in which of the following sequences of crystallographic planes the efficiency of space-filling will increase.

65. A metallic lattice can be built with sequences of orientations of particular crystallographic planes. Which of the following sequences of crystallographic planes orientation is incorrect?

66. Which of the following crystallographic directions of a regular lattice is inclined at an angle of less than n/2 with respect to the indicated crystallographic plane:

67. A regular crystallographic space-centered lattice has been subjected to a simple shear of $\sqrt{6}$ in the slip system (110)[1-11]. Which form of the deformation matrix is correct?

68. A regular wall-centered lattice has undergone a simple shear of $\sqrt{3}/\sqrt{2}$ in the slip system (111)[0-11]. Which of the following lattice vectors will not retain its length and crystallographic direction?

69. A cubic crystal of copper with edges of x_1 = [011] and x_2 = [0-11] is subjected to compression along the x_3 axis. Which of the following slip systems is the least compressed?

70. A cuboid Fe-a crystal with edges of x_1 = [011] and x_2 = [0-11] is subjected to compression along the x_2 axis with the compressive stress σ and extended along the x_3 edge with the compressive force σ. According to the Schmid-Boas Law , what should the magnitude of the compressive stress σ be at the initial moment of the slip (1-10)[111] if its critical compressive stress is 100 MPa?

71. The vector of the dislocation line **l** and the Burgers vector of the total dislocation **b** in a regular wall-centered lattice are at an angle of n/3 to each other. Give the correct length of the edge component of the Burgers vector of this dislocation, where **a** is the lattice parameter.

72. The vector of the edge dislocation line is parallel to the x_3 axis, whereas the Burgers vector is parallel to the x_1 axis of the Cartesian coordinate system of reference. If G is the shear modulus (modulus of rigidity) and v – the Poisson's ratio of a material, indicate which of the following equations correctly describes the magnitude of the σ_{12} component of the stress tensor at the point lying in the normal plane with respect to the x_2 axis and distant from the dislocation line along the x_1 axis by the equivalent of 50 lengths of the Burgers vector.

73. Which of the following reactions between dislocations does not occur spontaneously?

74. Which of the following sentences is not true?
   a. If the Frank-Reed source has the character of an edge dislocation, then the annihilating segments of the forming dislocation loop will have the nature of an edge dislocation
   b. If the Frank-Reed source has the character of a mixed dislocation, then the annihilating segments of the forming dislocation loop will have the nature of a mixed dislocation
   c. If the Frank-Reed source has the character of a screw dislocation, then the annihilating segments of the forming dislocation loop will have the nature of an edge dislocation
75. Which of the reactions describing the formation of a Lomer-Cotrell dislocation in materials with a regular wall-centered lattice is incorrect?
76. Which of the following sequences of metals correctly reflects the increasing probability of the occurrence of stacking faults associated with the occurrence of a Shockley dislocation?
77. The dislocation of a regular space-centered lattice with the Burgers vector a/2[111] is performing the cross-sectional slip. Which of the following sequences of the slip planes is incorrect, i.e. does not satisfy the Mott condition?
78. In which of the following deformation systems of the RSC lattice (K_1 – the twinning plane, η_1 – the twinning direction) mechanical twinning will not occur due to the polarization property?
79. Twinning in RSC crystals occurs within the system $K_1\eta_1 \equiv$ (111)[-211]. Which form of the following corresponding matrices is correct if the twinning orientation was described by the rotation by the angle п around the normal line with respect to the plane K_1.
80. Which of the following deformation systems of crystals with a tight hexagonal lattice is not a twinning system?
81. Determine the positive value σ_1 of the stress state knowing that the yield point of a material is 200 MPa ($\sigma_{pl} = 200\ MPa$) so that it will reach the plastic state in accordance with the HMH criterion.

$$\begin{vmatrix} \sigma_1 & 100 & 0 \\ -100 & 100 & 0 \\ 0 & 0 & 100 \end{vmatrix} MPa$$

82. A material with a yield point $\sigma_{pl} = 400\ MPa$ was subjected to a flat stress state: $\sigma_1 = 300$ MPa and the stress σ_3. Determine what the value of σ_3 should be for a material to pass into the plastic state in accordance with the Tresca criterion.
83. The relative deformation of a sample during the tensile process is $\varepsilon = \frac{\Delta l}{l_0} = 0,2$. What is the value of the elongation factor λ?
84. A round bar was subjected to the circular-symmetrical drawing process in three successive transitions with the unit deformation values of $\varphi_{j1} = \varphi_{j2} = \varphi_{j3} = 0,2$. What is the value of the total deformation φ_{ic}?
85. In which of the following processes a force is applied to the tool?
86. How many different stress schemes are possible?
87. The total elongation A_{200} in a tensile stress test means that:
88. The work-hardening curve is the dependence of:

89. For which of the following stress states the HMH criterion is equivalent to the Tresca criterion:

90. Which group of properties includes the yield point:

91. In a tensile (or compressive) strength test, it is possible to determine the Young's modulus on the basis of the following characteristic:

92. Performing a temperature measurement with a pyrometer, care should be taken to set correctly one of the following coefficients that is dependent on the kind of tested material, that is:

93. With the Matthiessen rule in mind, select those characteristics that affect the resistivity of the tested material:

94. Materials hardness testing can be performed using:

95. In the Vickers hardness test, the indenter is:

96. During a Charpy impact test, a hammer arm is raised to a certain height h. How does the form of energy change at the moment the hammer is lowered in order to break the sample?

97. The measuring base length of the standardized sample prepared for a tensile strength test is calculated from the equation:

98. The temperature measurement using a thermocouple is based on the Seebeck effect, involving the measurement of the electromotive force at the ends of cables made of different materials A and B at the contact points at different temperatures, T_1 and T_2, as shown in the figure below.
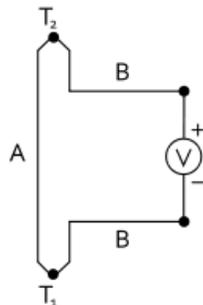
If these contact points have different temperatures, then the potential difference between them is expressed by the equation:

99. In order to construct a thermocouple, the following have to be used:

100. The piezoelectric effect consists in:

101. The ability of electrons to penetrate matter depends on:

102. When making preparations for TEM analyses, using the ionic polishing method, the sample is :

103. Do observations in polarized light enable examining the chemical composition?

104. The EDS method enables:

105. Secondary electrons (SE)

106. Microhardness is

107. Using the Poldi hammer for establishing hardness, the obtained result is given in:

108. The limit of the resolving power of a microscope:

109. A Scanning Tunelling Microscope can work in :

110. When making preparations for TEM analyses, using the electrolytic polishing method, the sample is:

111. The blade of the ice axe is made of:
112. Tension springs are made of:
113. Teflon seals can work properly in the temperature range of:
114. The material used to make springs should exhibit:
115. The material suitable for manufacturing climbing equipment is aluminum alloys from the series:
116. A radiator is a component or an assembly that should be characterized by :
117. A smooth surface reflecting light is:
118. A material that is often used for making pistons is an alloy of aluminum and:
119. Today, in photovoltaics, the most commonly used material is:
120. Pistons in combustion engines are most frequently:
121. Forming involves:
122. The term "thermo-plastic treatment", according to the norms, is understood as:
123. The structure of a semi-finished product that enables further processing using the processes of plastic cold working is usually:
124. For the manufacturing of the drawing charge in the form of a copper rod or aluminum rod, the commonly used system is:
125. The industrial speed range for manufacturing copper wires with diameters of below 100 micrometers is:
126. The most advantageous tolerance of geometric dimensions of the products is obtained in the process of:
127. The most effective methods for minimizing the inhomogeneity of the chemical composition and structure across the entire volume of cast ingots include the processes of:
128. In order to obtain products characterized by a high tensile strength and also by a high electrical conductivity, it is necessary to apply the processes of :
129. The annealing of the charge at a temperature high enough to relieve the stresses, with subsequent slow cooling to remove or reduce the residual stress, without any significant changes in the structure and properties obtained by previous processing - this is the definition of:
130. The correct sequence of stages in the production process of aluminum packaging is
131. The process of inverted extrusion takes place:
132. The press forming of coating products from aluminum alloys (e.g. a beverage tin) is carried out using the process of:
133. The recrystallization of the previously deformation-strengthened metal results from:
134. As a result of the extrusion process the following is obtained:
135. During the process of drawing a charge with a length of 1m and a total elongation factor $\lambda c = 2$, the obtained product will have a length of:
136. Which of the elements listed below has a melting point of 1083°C:
137. The density of aluminum is:
138. An example of an interstitial solid solution is:
139. Which of the following equations expresses the Gibbs phase rule under a constant pressure:
140. What does the eutectic transformation in cooling consist in?
141. What is the difference between an ore and a concentrate?
142. Floatation is the process of:

143. Metal oxide reduction processes require the use of a reducing agent that:
144. Which of the following reactions describes the reversible reaction of the thermal decomposition of carbonate (calcination):
145. Copper matte, obtained from smelting copper sulfide concentrates, is:
146. The process of electrolytic refining of copper is described by the following reactions:
147. Zinc and lead are obtained, inter alia, in the Imperial Smelting Process. In this process, zinc is reduced in a shaft furnace and then:
148. Aluminum is obtained in the process of aluminum electrolysis in molten cryolite. The temperature of this process is:
149. During the process of producing aluminum by molten salt electrolysis:
    a. as a result of the flow of electric current through the electrolyte, Joule's heat is generated;
    b. heat is generated as a result of natural gas combustion;
    c. no heat is generated as it is not necessary.
150. Which of the following reactions is related to the electrolytic process of obtaining magnesium from molten salts:

The remaining questions (General knowledge questions) : 15 questions are drawn from a pool of 100 questions.
1. According to the Act on industrial property law, an invention is considered new if:
2. Patents are granted for:
3. According to the Act on industrial property law, an invention is considered new if:
4. The material scope of the patent is determined by the patent claims included in this document:
5. For a utility model to be entered into the appropriate register; it:
6. The impact test is based on the following:
7. The physical quantity measured during an impact test using the Charpy hammer is:
8. A device enabling the measurement of the absolute value of temperature is:
9. A clear yield point observed during the static tensile test of some materials is characterized by:
10. During the static tensile test at a high temperature, the prevailing deformation mechanism is:
11. A hardness test using the Rockwell method consists in:
12. A flat sample with a measuring base length of $l_0 = 50$ mm is stretched at a traverse speed of $v = 6$ mm/min. The tensile speed for this sample is:
13. During a static tensile test conducted at an elevated temperature, single or multiple stress oscillations as a function of time can be observed in the plastic flow of a material. This indicates the activity of :
14. Calculate the equivalent cross-section Sz of a flat sample with cross-section dimensions of 1 x 4 mm and on this basis determine its 10-fold measuring base:
15. The bulk density of powders is:
16. Powders obtained by grinding in ball and impact mills are characterized by:
17. The granular composition of powders is tested with:
18. Copper powder is obtained using:
19. The definition of a compact is:

20. With respect to the location of the atom in the lattice, solid solutions can be divided into:

21. According to the given double equilibrium system, the Al-Si alloy with the chemical composition of 12.2% of atomic Si is characterized by:
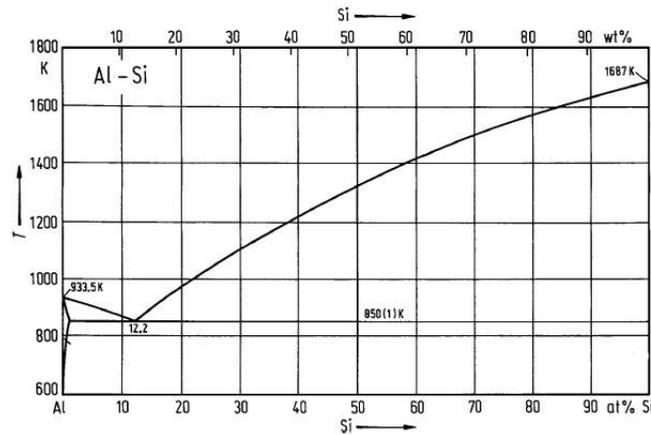

22. The unbalanced crystallization of continuous solid solutions can lead to the following unbalanced changes:

23. The order-disorder transformation :

24. In the double equilibrium system, alloys with a composition higher than 99% wt. Cu, are:
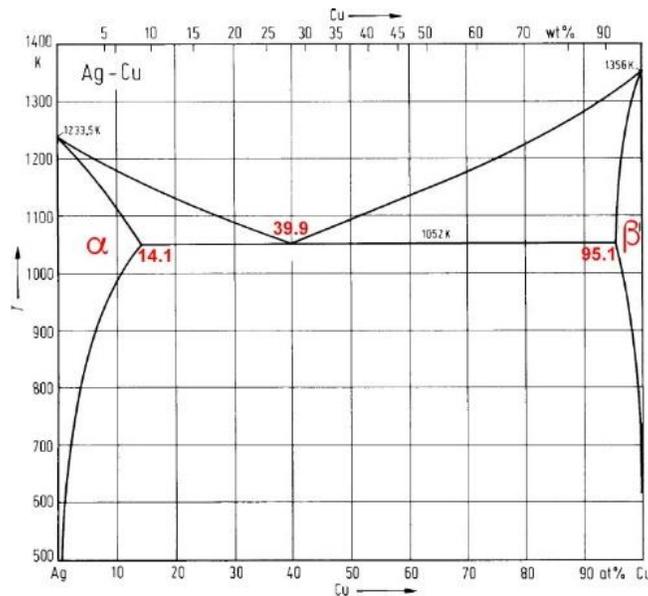
25. Intermetallic phases are:

26. Phase transformations that can take place without nucleation and the growth of nuclei are:

27. Straight transition brasses contain:

28. Aluminum alloys from the series 2xxx mostly contain:

29. The maximum effect of precipitation hardening is observed when the precipitates are:

30. The magnesium alloy denoted as AZ61A contains

31. Adding Pb to brasses leads to:

32. Dendritic microsegregation in bronzes consists in:

33. The modification of silumins is:
34. Titanium alloys with the α structure are titanium alloys with a content of:
35. The element used as a deoxidizing agent for Cu is:
36. With respect to the criterion of the type of matrix, composites are divided into:
37. An "in situ" metallic composite is:
38. An aluminum alloy-based composite contains 35% vol. of unidirectionally oriented fibers. The Young's modulus for the fibers is E = 390 GPa and for the aluminum alloy E = 70 GPa. The matrix density: 2.7 g/cm3, the reinforcement density : 1.95 g/cm3. Determine the density of the composite and the Young's modulus of the composite under a load parallel to the direction of the fibers.
39. The wettability in a metallic matrix-fiber system can be improved by:
40. The basic function of the reinforcement in composite materials is:
41. The lowest obligatory standard of fineness for gold and silver products in Poland is:
42. The equivalent of an 18 carat gold alloy is a fineness of:
43. Which of the following precious metals is characterized by the highest density:
44. "Fineness" is defined as:
45. The most frequently introduced elements into a gold alloy in order to obtain the so-called white gold, are:
46. The strength properties of the popular 925 silver-copper alloy can be significantly improved by applying:
47. The theory of X-ray diffraction implies that:
48. Metal texture is defined as:
49. Using an X-ray diffractometer equipped with a cobalt lamp with a wavelength of 1.789 Å, during the texture measurement, the diffraction conditions for the tested plane were met for an angle of 2 = 88.833, so the distance between the plane of the tested sample is:
50. The methods for measuring and determining the texture are:
51. Characteristic X-ray radiation originates from:
52. Metal texture is not formed as a result of:
53. The allotropic transformation of iron α into iron γ occurs at a temperature of:
54. For the iron-carbon system (cementite) at 727°C for a carbon content of 0.77% , the following transformation takes place:
55. What is the phase of the microstructure with an iron matrix shown in the figure below:
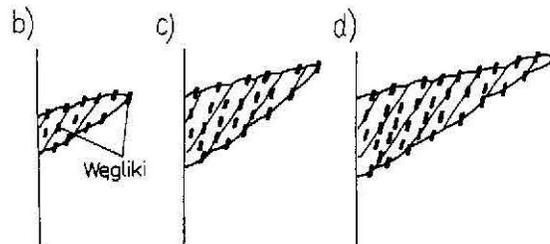
56. The martensitic transformation is :
57. What is the CTP curve?
58. Which of the following alloying additives does not contribute to the strengthening of superalloys with the grain boundaries:
59. Which of the following sentences is not true for Ni-based alloys:

a. Ni-based alloys are more resistant to a harmful working environment than Co-based alloys,
b. Ni-based alloys do not require the FCC stabilization,
c. Ni-alloys are used in manufacturing blades for jet turbines

60. Which of the following statements is/are correct:
    a. Cr, Mo and Co stabilize the γ' phase above 0.6 T_H (inhibit its rapid growth and coagulation),
    b. particles of the γ' phase can have different shapes and sizes, regardless of the degree of mismatch between austenite and the γ' phase, the chemical composition, the heat treatment and the alloying technology,
    c. the change of the shape of M23C6 carbides at the grain boundaries from large precipitates to fine, globular particles increases the temporary creep resistance and improves plasticity.

61. The purpose of the heat treatment of Ni-based alloy is for:
    a. plastically processed alloys to obtain the appropriate dispersion of the γ' phase or to release the M23C6-type carbides,
    b. casting alloys to homogenize the chemical composition and obtain the appropriate dispersion and shape of the precipitate of the γ' phase as the main reinforcing phase;
    c. casting alloys generally are not subjected to a multi-stage heat treatment.

62. Choose the correct statement:
    a. the γ' phase has the crystal (RPC) structure;
    b. the γ' phase is often coherent with the γ phase;
    c. $M_{23}C_6$ – and M_6C_2- type carbides are often found in the γ' phase

63. Recycling is a comprehensive method of environmental protection because:

64. Using eddy-current precipitators, it is possible to separate:

65. One of the methods of recycling silver from scrap metal is to dissolve it in an HNO_3-H_2O solution. To precipitate silver chloride from such a solution, the following should be used:

66. The fly ash during the process of re-melting the battery paste from the disassembly of used car batteries acts as:

67. Which of the following solutions dissolves gold from scrap material:

68. The metallic phase, called "black copper", which is the product of melting low-copper scrap in a shaft furnace contains:

69. The most serious problems when melting thin-walled aluminum scrap are due to:

70. The recycling of used lead-acid car batteries is currently:

71. One of the products of remelting in roll down furnaces, processing steel dust, is:

72. Electronic scrap can be fed into a shaft furnace for copper matte smelting. In this case:

73. Homogenous nucleation takes place when:

74. The most important heat treatment operations include:

75. The shortest definition of martensite is:

76. The Hume-Rothery principles are satisfied by:

77. With respect to the type of chemical influence on the heated surfaces of certain metal materials, the atmospheres in heat treatment furnaces are divided into:

78. The cooling rate in the heat treatment process depends on, among other things:

79. Annealing:

80. Recovery:
81. Ferrite is:
82. Matrices of metal-diamond tools for cutting hard materials are most commonly made of:
83. The removal of heat from the processing zone and the flushing of impurities from the grinding wheel during the grinding process are the tasks of:
84. Which of the following tool materials has the lowest density?
85. Diamond is an allotrope of:
86. The hardest known material is :
87. In a monocrystal crystallized by zone melting, the segregation factor k_0 is responsible for the distribution of the admixture along the crystallized monocrystal. If $k_0 < 1$, where is the area enriched with the admixture
88. Which of the following parameters does not affect the morphology of the second phase distribution in two-phase monocrystals:
89. The method(s) in which the material in the crucible is completely melted is/are:
90. Factors that may affect the growth of metal whiskers are:
91. What was the basic assumption of the Griffith theory:
92. According to most theories of microcrack nucleation, a microcrack is formed as a result of which of the following?
93. A comparison of the theoretical strength of a material with the experimentally determined tensile strength values indicates that the actual strength is:
94. The linear-elastic crack mechanics includes cases where the area of plastic deformation zone around the apex of the growing microcrack is:
95. Material fatigue is the process of:
96. The definition of deformability:
97. The most favorable conditions for plastic deformation, due to the state of stress and deformation of a material, occur during the process of:
98. In flat states of stress, the greatest differences between the values of plasticizing stresses that meet both the plasticity condition according to the hypothesis of the specific energy of the non-dilatational strain and the maximum tangential stress hypothesis, occur when:
99. The susceptibility of the material to deformation reinforcement has an influence on the susceptibility of the sheet to be pressed:
100. Lankford's anisotropy coefficient is determined for the conventional elongation of sheet samples that: