

**МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ
РЕСПУБЛИКИ КАЗАХСТАН**

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**ПРОФЕССИОНАЛЬНО-ОРИЕНТИРОВАННЫЙ
ИНОСТРАННЫЙ ЯЗЫК
АНГЛИЙСКИЙ ЯЗЫК**

Часть II

**Рекомендовано Научно - методическим советом университета
в качестве учебного пособия**

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*Учебное пособие предназначено для студентов 2, 3 курсов
специальностей (5В073200, 5В073800, 5В071300) института «Промышленной
Инженерии».*

*Для работы над языковым материалом используются оригинальные
тексты из современной английской и американской литературы,
используются аутентичные тексты, что позволяет постепенно готовить
студентов к пониманию технических текстов в подлиннике.*

*Тематика текстов охватывает такие разделы инженерии, как
транспорт и материаловедение и технология новых материалов, технология
обработки материалов давлением и сертификация метрология
и стандартизация.*

*В качестве основных учебных материалов используется оригинальные
тексты предполагающие точное понимание и преодоление при чтении
лексических и грамматических трудностей. Изложенные общие положения
свидетельствуют о том, что представленное к изданию учебное пособие
является полезным для специалистов желающих научиться различным
формам общения на английском языке.*

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ВВЕДЕНИЕ

Первая часть учебника состоит из 3-х глав или 2-х, объединенных единой тематикой и содержащих: основной текст, назначением которого является обучение чтению технической литературы по специальностям машиностроительных вузов; технические тексты для ознакомительного чтения, активизации общественной лексики, развития навыков профессионального обучения по изучаемой тематике; письменные и устные упражнения коммуникативной направленности.

Для студентов технических университетов и вузов машиностроительного профиля. Полезен для специалистов, желающих научиться различным формам общения на английском языке. Учебное пособие предназначено для студентов 2, 3 курсов всех специальностей института промышленной инженерии.

Цель учебного пособия – научить студентов читать, переводить тексты и вести беседу по специальности. Для работы над языковым материалом используются оригинальные тексты из современной английской и американской литературы, используются аутентичные тексты, что позволяет постепенно готовить студентов к пониманию технических текстов в подлиннике.

Тематика текстов охватывает такие разделы инженерии, как транспорт и материаловедение и технология новых материалов, технология обработки материалов давлением и сертификация, метрология и стандартизация.

Unit 1. Technology of new materials

General Overview of Materials and their Structure



Exercise 1. Answer the questions:

1. Which is a level of statistical rejection for industrial materials?
2. How are substances being in the hard state classified?
3. What property of materials in a greater degree does depend on a structure: physical or mechanical?
4. What do the physical depend on property of materials?

New words and expressions:

structure	структура	құрылым
sensitive	чувствительный	сезімтал
conductivity	проводимость	өткізгіштік
density	плотность	тығыздық
impact	удар	соққы
test	испытание	байқау, тексеру
rate	скорость	жылдамдық
specimen	образец	үлгі
average	средний	орташа
arrangement	расположение	орналасу реті
amount	количество	саны
excess	избыток	мөлшерден тыс
mobility	подвижность	қозғалғыштық

Exercise 2. Make up sentences using the following words and word combinations:

Thermal conductivity, traditional physical properties, internal structure.

Read the text and discuss it:

General Overview of Materials and their Structure

The properties of materials are sometimes referred to as structure-sensitive, as compared to structure-insensitive properties. In this case structure-insensitive properties include the traditional physical properties: electrical and thermal conductivity, specific heat, density, and magnetic and optical properties. The structure-sensitive properties include the tensile and yield strength, hardness, and impact, creep, and fatigue resistance. It is recognized that some sources maintain that hardness is not a true mechanical property, because it varies somewhat with the characteristics of the indenter and therefore is a technological test. It is well known that other mechanical properties vary significantly with rate of loading, temperature, geometry of notch in impact testing, and the size and geometry of the test specimen. In that sense all mechanical test of material properties are technological tests. Furthermore, since reported test values of materials properties are statistical averages, a commercial material frequently has a tolerance band of + 5 percent or more deviation from a given published value.

In the solid state, materials can be classified as metals, polymers, ceramics, and composites. Any particular material can be described by its behavior when subjected to external conditions. Thus, when it is loaded under known conditions of direction, magnitude, rate, and environment, the resulting responses are called mechanical properties. There are many possible complex interrelationships among the internal structure of a material and its service performance. Mechanical properties such as yield strength, i.e., they depend upon the arrangement of the atoms in the crystal lattice and on any imperfections in that arrangement, whereas the physical properties are less structure-sensitive. These include electrical, thermal, magnetic, and optical properties and do depend in

part upon structure; for example, the resistivity of a metal increases with the amount of cold work. Physical properties depend primarily upon the relative excess or deficiency of the electrons that establish structural bonds any upon their availability and mobility. Between the conductors with high electron mobility and the insulators with no free electrons, precise control of the atomic architecture has created semiconductors that can have a planned modification of their electron mobility. Similarly, advances in solid-state optics have led to the development of the simulated emission of electromagnetic energy in the microwave spectrum (masers) and in the visible spectrum (lasers).

Exercise 3. Complete the following sentences:

1. It is well known that other properties vary significantly with ...of loading, temperature, geometry of in impact testing, and the size and geometry of the test specimen.
2. In the state, materials can be classified as metals, polymers, ... and composites.
3. There are many possible complex among the internal structure of a material and its performance.
4. Physical properties depend primarily upon the excess or deficiency of the that establish structural bonds and upon their availability and mobility.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. The structure-sensitive properties include the tensile and yield strength, hardness, and impact, creep, and fatigue resistance.
2. In that sense all mechanical tests of material properties are technological tests.
3. In the solid state, materials can be classified as metals, polymers, ceramics, and composites.
4. Mechanical properties such as yield strength, impact strength, hardness, creep, and fatigue resistance are strongly structure-sensitive, they depend upon the arrangement of the atoms in the crystal lattice and on any imperfections in that arrangement, whereas the physical properties are less structure-sensitive.

Exercise 5. Discuss this theme.

Physical Properties of Materials

Exercise 2. Make up sentences using the following words and word combinations:

Atomic structure, electronic configuration, bonding forces, the lattice structure.

Read the text and discuss it:

Physical Properties of Materials

In studying the general structure of materials, one may consider three groupings: first, atomic structure, electronic configuration, bonding forces, and the arrangement of the aggregations of atoms; second, the physical aspect of materials, including properties such as electrical and thermal conductivity, specific heat, and magnetism; and third, their macroscopic properties, such as their mechanical behavior under load, which can be explained in terms of impurities and imperfections in the lattice structure and the procedures used to modify that behavior.

In the selection of materials for industrial applications, many engineers normally refer to their average macroscopic properties, as determined by engineering tests, and are seldom concerned with microscopic considerations.

Others, because of their specialty of the nature of their positions, have to deal with microscopic properties.

The average properties of materials are those involving matter in bulk with its flaws, variations in composition, and variations in density that are caused by manufacturing fluctuations. Microscopic properties pertain to atoms, molecules, and their interactions. These aspects of materials are studied for their direct applicability to industrial problems and also so that possible properties in the development of new materials can be estimated.

In order not to become confused by apparently contradictory concepts when dealing with the relationships between the microscopic aspects of matter and the average properties of materials, it is wise to consider the principles that account for the nature of matter at the different levels of our awareness. These levels are the commonplace, the extremely large. The commonplace level deals with the average properties already mentioned, and the principles involved are those set forth by classical physics. The realm

of the extremely small is largely explained by means of quantum mechanics, whereas that of the extremely large is dealt with by relativity.

Relativity is concerned with very large masses, such as planets or stars, and large velocities that may approach the velocity of light. It is also applicable to smaller masses, ranging down to subatomic particles, when they move at high velocities. Relativity has a definite place in the tool boxes of nuclear engineers and electrical engineers who deal with accelerators. For production engineers, relativity is of only academic interest and is mentioned here for the sake of completeness

Exercise 3. Complete the following sentences from the text:

1. The average properties of materials are those in bulk with its flaws, variations in composition, and in density that are caused by manufacturing fluctuations.

2. In the selection of materials for industrial, many engineers normally refer to their average properties, as determined by engineering tests, and are seldom concerned with microscopic considerations.

3. These levels are the, the extremely large.

4. The realm of the extremely small is largely explained by means of mechanics, whereas that of the extremely large is dealt with by

Exercise 4. Translate the sentences into Kazakh or Russian:

1. The average properties of materials are those involving matter in bulk with its flaws, variations in composition, and variations in density that are caused by manufacturing fluctuations.

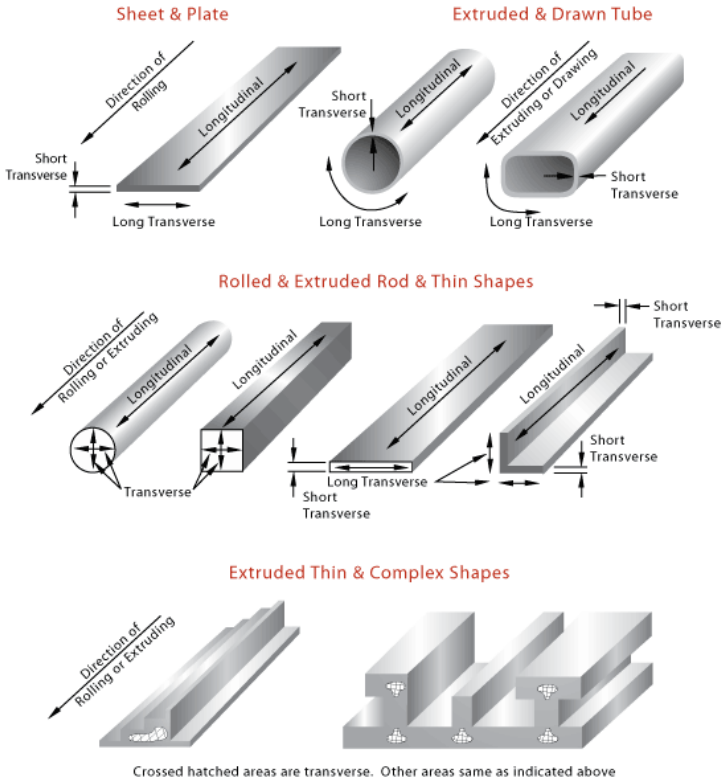
2. Microscopic properties pertain to atoms, molecules, and their interactions.

3. These aspects of materials are studied for their direct applicability to industrial problems and also so that possible properties in the development of new materials can be estimated.

4. In order not to become confused by apparently contradictory concepts when dealing with the relationships between the microscopic aspects of matter and the average properties of materials, it is wise to consider the principles that account for the nature of matter at the different levels of our awareness.

Exercise 5. Discuss this theme.

Mechanical Properties of Materials



Exercise 1. Answer the questions:

1. What sources is it possible to get one or other descriptions of materials from?
2. Are certificate properties of materials absolute or relative, why?
3. How does get a wire?
4. What is malleability?

New words and expressions:

magnitude	величина	көлем	
environment	внешние условия	қоршаған жағдайы	орта
handbook	справочник	анықтамалық	
supplier	поставщик	жабдықтаушы	
subfreezing	ниже точки замерзания	тоңазу төмен	шегінен
hammering	ковка	балқыту	
wire	проволока, провод	өткізгіш, сым	
brittleness	хрупкость	нәзіктік	
cast iron	чугун	шойын	
malleability	ковкость, пластичность	балқығыштық, икемділік	
resistant	стойкий	төзімді	
shape	форма	қалып	
bent	изогнутый, гнутый	иілген	

Exercise 2. Make up sentences using the following words and word combinations:

Mechanical properties, standard procedure, characteristic of metals.

Read the text and discuss it:

Mechanical Properties of Materials

Designers and engineers are usually more interested in the behavior of materials under load or when in a magnetic field than in why they behave as they do. Yet the better one understands the nature of materials and the reasons for their physical and mechanical properties the more quickly and wisely will he/she be able to choose the proper material for a given design. Generally, a material property is the measured magnitude of its response to a standard test performed according to a standard procedure in a given environment.

In engineering materials the loads are mechanical or physical in nature and the properties are recorded in handbooks or, for new materials, are made available by the supplier. Frequently such information is tabulated for room-temperature conditions only, so when the actual service conditions are at subfreezing or elevated temperatures, more information is needed.

All materials have properties that designers must use to their best advantage. The following terms describe these properties:

Ductility is softness present in some materials, such as copper and aluminum that permits them to be formed by stretching (drawing) or hammered without breaking. Wire is made of ductile materials that can be drawn through a die.

Brittleness is a characteristic of metals that will not stretch without breaking, such as cast irons and hardened steels.

Malleability is the ability of a metal to be rolled or hammered without breaking.

Hardness is the ability of a metal to resist being dented when it receives a blow.

Toughness is property of being resistant to cracking and braking while remaining malleable.

Elasticity is the ability of a metal to return to its original shape after being bent or stretched.

Exercise 3. Complete the following sentences from the text:

1. Material property is the measured of its response to a standard test performed according to a standard procedure in a given

2. In engineering materials the loads are mechanical or physical in nature and the properties are recorded in or, for new materials, are made available by the

3. Frequently such information is tabulated for room-temperature conditions only, so when the actual service conditions are at or temperatures, more information are needed.

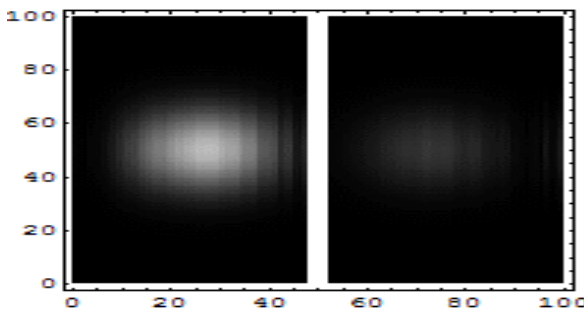
4. is made of ductile materials that can be drawn through a

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Designers and engineers are usually more interested in the behavior of materials under load or when in a magnetic field than in why they behave as they do.
2. Yet the better one understands the nature of materials and the reasons for their physical and mechanical properties the more quickly and wisely will he/she be able to choose the proper material for a given design.
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Exercise 5. Discuss this theme.

Application of Concepts from Quantum Mechanics



Exercise 1. Answer the questions:

1. What does the study of behavior of molecular particles help to understand from the point of view of quantum mechanics?
2. Which are two basic concepts is the basis of quantum mechanics?
3. Which are bases of pumping of energy?
4. How is a spontaneous radiation?

New words and expressions:

phenomenon	явление	құбылыс
scope	диапазон, объем	көлем
forbidden	запрещенный	шектеу қойылған
permissible	разрешенный	рұқсат етілген
empty	пустой	бос
neighbouring	соседний	көршілес
initial	начальный	бастапқы
entirely	полностью	толығымен
recall	возврат	қайтарым
equal	равный	теңбе-тең
vicinity	близость	жақындық

Exercise 2. Make up sentences using the following words and word combinations:

Production-design engineer, spontaneous tendency, existence of transistor.

Read the text and discuss it:

Application of Concepts from Quantum Mechanics

Quantum mechanics, once restricted to the academic halls, has now become a bread-and-butter topic. It generally deals with particles of atomic or subatomic sizes. But from the understanding of the behavior of these particles comes a better understanding of such phenomena as thermal conductivity, heat capacity, electric conductivity and the very existence of transistors and thermostats.

Quantum mechanics is a complex subject, largely outside the scope of this text, yet a brief mention of two of its most important concepts may aid the production-design engineer in the study of the basic characteristics of materials. One of these is Planck's quantum hypothesis, later extended by Einstein and others. The other is Pauli's exclusion principle.

The quantum hypothesis postulates that the bound energy state of particles of very small size cannot be represented by a continuous function but is discrete in nature. Thus, between any two permissible

energy states of a bound particle there exist a region of states that are forbidden.

Each of the electrons of any atom has a particular energy level E_1, E_2, E_3 , etc. For an electron to go from one energy state to a higher one, it must receive sufficient energy to jump through the forbidden-energy regions. Thus if an electron at energy level E_2 is to go to the higher-energy level E_3 , it must receive an energy ΔE_2 .

All matter has a spontaneous tendency to be in the lowest possible energy state. Consequently, the electrons of any atom fill the lowest permissible energy levels and are only excited to upper empty levels when they are given energy by means of interaction with electromagnetic radiation, particle bombardment, or an electric field, or by thermal excitation (collision with neighbouring atoms brought about by increased amplitude of atomic vibration caused by an increase in temperature).

Thus, if an electron is dislodged from its initial energy level, it can only go to a higher unoccupied level or entirely out of the atom. It may be recalled that the number of electrons in any atom is equal to the number of protons in the nucleus. If for any reason an atom is stripped of some or all of its electrons, free electrons in the vicinity of the ion will rapidly fall into the empty energy levels, emitting their excess energy in the form of radiation. Many of physical properties of materials are understood through this behavior of electrons.

Exercise 3. Complete the following sentences from the text:

1. Generally deals with particles of or
2. But from the understanding of the behavior of these particles comes a better understanding of such as thermal conductivity, heat capacity, electric conductivity and the very existence of and
3. If an electron is dislodged from its energy level, it can only go to a higher unoccupied level or out of the atom.
4. It may be that the number of electrons in any atom is equal to the number of in the nucleus.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Quantum mechanics, once restricted to the academic halls, has now become a bread-and-butter topic. It generally deals with particles of atomic or subatomic sizes.
2. But from the understanding of the behavior of these particles comes a better understanding of such phenomena as thermal conductivity, heat capacity, electric conductivity and the very existence of transistors and thermistors.
3. Quantum mechanics is a complex subject, largely outside the scope of this text, yet a brief mention of two of its most important concepts may aid the production-design engineer in the study of the basic characteristics of materials.
4. One of these is Planck's quantum hypothesis, later extended by Einstein and others. The other is Pauli's exclusion principle.

Exercise 5. Discuss this theme.

Impact Properties

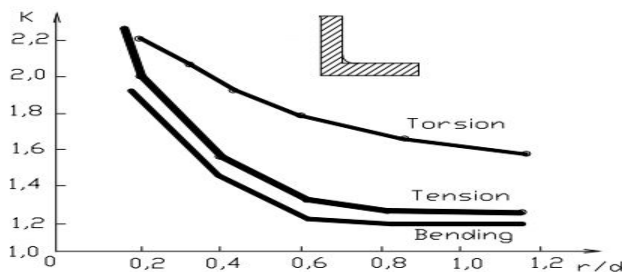


Fig. 5.1. K as a function of r/d:
r – fillet radius; d – wall thickness

Exercise 1. Answer the questions:

1. How does behavior of alloys depend at the shock loading from a temperature?
2. How does behave the low-carbon became at subzero temperatures?
3. Which are terms of realization of test on shock durability?
4. What does the result of such dough depend on substantially?

New words and expressions:

failure	отказ, разрушение	бұзылу
compressive	сжимающий	қысымдаушы
sharp	острый	өткір
triaxial	объемный, трехмерный	үшдеңгейлі
stress	напряжение	қысым
flow	течение	ағыс
flake	хлопья, волокно	талшық
thickness	толщина	қалыңдық
vintage	разлив	құйылу
denoted	обозначенный	белгіленген
torsion	кручение	бұралу

Exercise 2. Make up sentences using the following words and word combinations:

Low-carbon steels, calibrated hammer, flake graphite, second phases.

Read the text and discuss it:

Impact Properties

In some designs, dynamic forces are likely to cause failure. For example an alloy may be hard and have high compressive strength and yet be unable to withstand a sharp blow. In particular, low-carbon steels are susceptible to brittle failure at certain temperatures. Most impact test use a calibrated hammer to strike a notched or unnotched test specimen. In the former, the test result is strongly dependent on the base of the notch, where there is a large concentration of triaxial stresses that produce a fracture with little plastic flow. The impact test is particularly sensitive to internal stress producers such as inclusions, flake graphite, second phases, and internal cracks.

The result from an impact test are not easily expressed in terms of design requirements because it is not possible to determine the

triaxial stress conditions at the notch. There also seems to be no general agreement of the interpretation or significance of the result. Nonetheless the impact test has proved especially useful in defining the temperature at which steel changes from brittle to ductile behavior.

Low-carbon steels are particularly susceptible to brittle failure in a cold environment such as the North Atlantic. There were cases of Liberty ships of World War II vintage splitting in two as a result of brittle behavior when travelling in heavy seas during the winter.

In a particular design having a notch or any abrupt change in cross section, the maximum stress occurs at this location and may exceed the stress computed by typical formulas based upon simplified assumptions in connection with stress distribution. The ratio of this maximum stress to the nominal stress is known as a stress concentration factor, usually denoted by K . Stress concentration factors may be determined experimentally or by calculations based on the theory of elasticity. Figure 5.1 illustrates stress concentration factors K for fillets of various radius divided by the thickness of casting subjected to torsion, tension, and bending stresses.

Exercise 3. Complete the following sentences from the text:

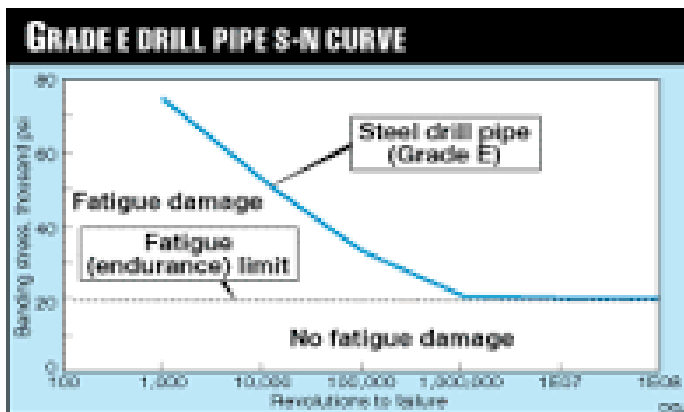
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Exercise 4. Translate the sentences into Kazakh or Russian:

1. The result from an impact test are not easily expressed in terms of design requirements because it is not possible to determine the triaxial stress conditions at the notch.
2. There also seems to be no general agreement of the interpretation or significance of the result.
3. Nonetheless the impact test has proved especially useful in defining the temperature at which steel changes from brittle to ductile behavior.
4. Low-carbon steels are particularly susceptible to brittle failure in a cold environment such as the North Atlantic.

Exercise 5. Discuss this theme.

Fatigue Properties and Endurance Limit



Exercise 1. Answer the questions:

1. What description is a suitable criterion for planning of wares working at static loads?
2. How does name loading at that tenure of employment of steel detail can be considered practically endless?
3. What is condition the large rejections of data on tests on a tiredness as compared to tests on tension?
4. Does the presence of recesses have influence in a detail on the limit of endurance, which character of this dependence is?

New words and expressions:

fatigue strength	выносливость	төзімділік
repeated	повторный	қайта жасалынған
extended	углубленный, расширенный	кенейтілген, тереңдетілген
curve	кривая	қисық
infinite	бесконечная	аяқталмайтын, мәңгілік
exposure time	время действия	әрекет мерзімі
polished	полированный	тегістелген
treatment	обработка	өңдеу
add	складывать, добавлять	қосу
invaluable	бесценный	баға жетпес
comparing	сравнение	салыстыру

Exercise 2. Make up sentences using the following words and word combinations:

Fatigue strength, scaly surfaces, residual compressive, standard types.

Read the text and discuss it:

Fatigue Properties and Endurance Limit

Although yield strength is a suitable criterion for designing components that are to be subjected to static loads, for cyclic loading the behavior of a material must be evaluated under dynamic conditions. The fatigue strength or endurance limit of a material should be used for the design of parts subjected to repeated alternating stresses over an extended period of time. As would be expected, the strength of material under cyclic loading is considerably less than it would be under a static load (Fig. 6.1.). The plot of stress as a function of the number of cycles to failure is commonly called an S-N curve. It is interesting to note that for specimens of SAE* 1047 steel there is a stress called the endurance of fatigue limit below which the material has an infinite life

(>10⁸ cycles), i.e., the steel would not fail regardless of exposure time . In contrast, the 2014-T6 aluminum alloy has no limiting stress value.

Fatigue dates are inherently more variable than tensile test data. In part the scatter is caused by variation in surface finish and environment. Polished specimens of the same material give significantly better life than machined or scaly surfaces. Since most fatigue failures initiate at surface notches, fatigue behavior and notch sensitivity are closely related. Thus mechanical or other treatments that improve the integrity of the surface, or add residual compressive stresses to it, improve the endurance limit of the specimen.

Overstressing above the fatigue limit for cycles fewer than necessary to produce failure at that stress reduces the fatigue limit. Also, under stressing below the fatigue limit may increase the fatigue limit. Thus, cold working and shot peening usually improve fatigue properties.

Several standard types of fatigue-testing machines are commercially available. The results of extensive fatigue-life testing programs are now available in the form of S-N curves that are invaluable for comparing the performance of a material that is expected to be subjected to dynamic loads.

Exercise 3. Complete the following sentences from the text:

1. The fatigue strength or of a material should be used for the design of parts subjected to repeated alternating stresses over an period of time.

2. As would be expected, the of material under loading is considerably less than it would be under a static load.

3. The of stress as a function of the number of cycles to is commonly called an S-N curve.

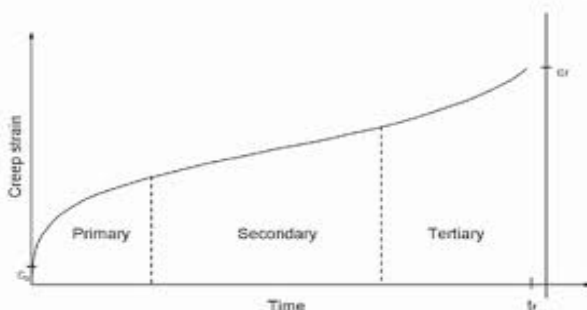
4. It is interesting to note that for of SAE* 1047 steel there is a stress called the endurance of fatigue limit below which the material has an infinite life (>10⁸ cycles), i.e., the steel would not of exposure time.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Fatigue data are inherently more variable than tensile test data. In part the scatter is caused by variation in surface finish and environment.
2. Polished specimens of the same material give significantly better life than machined or scaly surfaces.
3. Since most fatigue failures initiate at surface notches, fatigue behavior and notch sensitivity are closely related.
4. Thus mechanical or other treatments that improve the integrity of the surface, or add residual compressive stresses to it, improve the endurance limit of the specimen.

Exercise 5. Discuss this theme.

Creep. Stress Rupture and Strain Hardening



Exercise 1. Answer the questions:

1. What temperature does a creep show up at under the action of quiescent load?
2. What standard is used in tests on a creep?
3. Which is a level of loading in the test of creep of grey cast-iron?
4. What is working temperature range for aluminum alloys?

New words and expressions:

melting point	точка плавления	еру нүктесі, межесі
elongate	растягиваться	созылу
interplay	взаимодействие	әрекеттесу
gray iron	серый чугун	сұр шойын
stainless	нержавеющий	тот баспайтын
reinforced	армированный, усиленный	шыңдалған
vastmajority	подавляющее большинство	басым көпшілігі
tremendous	огромный	үлкен
stacking	накапливающийся	жинақталған
twinning	двойникование	қосарлану
severely	сильно	қатты
twisted	искаженный, скрученный	бұрмаланған

Exercise 2. Make up sentences using the following words and word combinations:

To elongate continuously, face-centered cubic crystallographic structures, particular alloy steels.

Read the text and discuss it:

Creep. Stress Rupture and Strain Hardening

As metals are exposed to temperatures within 40 percent of their absolute melting point, they begin to elongate continuously at low constant load (stresses beyond the proportional limit). A typical creep curve is a plot of the elongation against time of a wires subjected to a tensile load at a given temperature. Creep is explained in terms of the interplay between range from 20,000 lb/in.² or more for particular alloy steels.

The usage range of temperature for steel ranges from – 460°F to almost 2000°F for specific stainless steels. Aluminum alloys can withstand temperatures from 300 to 500°F, and some titanium-

reinforced polymers are useful up to 400 to 900°F, but the vast majority are good only to 200°F. Hardness is the most difficult property to use for making valid comparisons, because the deformation of plastics and elastomers under an indenter is different from that of metals. As a group, polymers are far softer than metals. Ferrous and nickel-base alloys range from 100 to 600 Brn, which is a tremendous range of values.

The strain-hardening behavior of a metal depends on its lattice structure. In face-centered cubic crystallographic structures, the rate of strain-hardening is affected by the stacking fault energy through its influence on mechanical properties. Copper, nickel and austenitic stainless steel strain-harden more rapidly than aluminum. Hexagonal close-packed metals are subject to twinning and strain-harden at a much higher rate than do other metals because there is only one plane of easy glide available in the close-packed hexagonal structure. Strain-hardening is also affected by grain size, impurity atoms, and the presence of a second phase. The strain-hardening rate increases with the complexity of the structure of the alloy.

Severely strained metal may have elongated grains with distorted and twisted lattices and a strong anisotropy that can be used by an astute designer if he takes advantage of directional strength in his design. On the other hand, because of the increased strength and hardness brought about by strain-hardening, the number of reduction in a forming sequence will be limited before annealing is required.

Exercise 3. Complete the following sentences from the text:

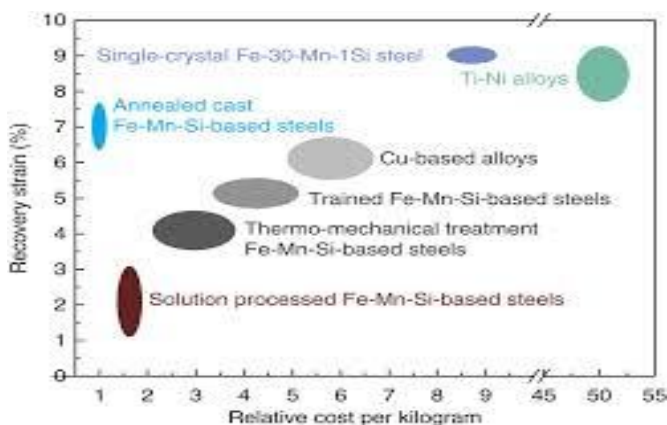
1. The usage range of temperature for steel ranges from to almost 2000°F for specific stainless steels.
2. Aluminum alloys can withstand temperatures from 300 to 500°F, and some titanium-reinforced are useful up to 400 to 900°F, but the vast are good only to 200°F.
3. is the most difficult property to use for making valid comparisons, because the deformation of plastics and elastomers under an is different from that of metals.
4. As a group, ... are far softer than metals. and nickel-base alloys range from 100 to 600 Brn, which is a tremendous range of values.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Hardness is the most difficult property to use for making valid comparisons, because the deformation of plastics and elastomers under an indenter is different from that of metals.
2. As a group, polymers are far softer than metals.
3. Ferrous and nickel-base alloys range from 100 to 600 Brn, which is a tremendous range of values.
4. The strain-hardening behavior of a metal depends on its lattice structure.

Exercise 5. Discuss this theme.

Relative cost of engineering materials



Exercise 1. Answer the questions:

1. What specialist does carry out the primary choice of material for the production of one or another detail?
2. What is condition neglect of designer and preference of functional design the choice of material?
3. What property of material taken into account at planning first of all?
4. What additional requirements in regard to the choice of material can be produced by end user?

New words and expressions:

selection	выбор	таңдау
lack	недостаток, пробел	олқылық
prope	надлежащий	тиесілі
deadline	срок	мерзім
enduser	конечный потребитель	соңғы тұтынушы
assignment	предписание, задача	тапсырыс
demand	спрос	сұраныс
production capacity	производительность	өнімділік
severely	сильно, значительно	қатты, мағыналы
comparison	сравнение	салыстыру
challenged	конкурировать	бәсекелесу

Exercise 2. Make up sentences using the following words and word combinations:

Functional design, particular material, design engineers, production engineers.

Read the text and discuss it:

Relative cost of engineering materials

The design engineer is responsible for the initial specification of an in material, yet in many cases he spends little time checking alternatives. Many designers feel that their obligation ends with the functional design, so they tend to minimize the importance of material selection. The reasons are many, but two are likely to be (1) lack of proper education in their engineering courses and (2) inadequate time because of the need to meet a deadline.

In over 90 percent of all designs a material is selected primarily on the basis of yield strength and ability to fill space at the lowest cost. In some cases, other criteria, depending primarily on physical properties such as electrical conductivity or chemical properties such as corrosion resistance, are dictated by the end-use of the design and form the basis for the material specification

It is the designer's responsibility to match the functional and esthetic requirements of his design with the behavior of particular material so that the total cost after manufacture is minimized. In large organization, this undertaking is team effort in which design engineers, production engineers, and materials specialists all play important role. In small company, the designer may handle the entire assignment.

The costs of engineering materials are in a constant state of flux. Three components may be recognized: first, the general price changes that follow the ebb and flow of the national economy; second, the supply-and-demand effect on the price of some metals, specifically copper and nickel ; and finally, the effect of rising production capacity and strong competition, as found in the polymer industry since the 1950s. In general the polymers have dropped in price in the past decade, whereas the cost of all metals but aluminum has increased. Inflation had led increasing prices.

Materials cannot be compared on the basis of cost alone because they have widely varying densities and strengths. If the cost per pound is converted to cost per unit volume, a more meaningful comparison can be made. When the same materials are compared on the basis of cost per unit strength per unit volume it is evident that not only do most materials become strongly competitive, but that in the future, if stronger polymers are created, the 4000-year dominance of metals may be severely challenged.

Exercise 3. Complete the following sentences from the text:

1. It is the designer's responsibility to the functional and of his design with the behavior of particular material so that the total cost after manufacture is minimized.
2. In large organization, this undertaking is team effort in which design engineers, ..., and all play important role.
3. The costs of engineering materials are in a constant state of
4. In small company, the designer may handle the

Exercise 4. Translate the sentences into Kazakh or Russian:

1. The costs of engineering materials are in a constant state of flux.
2. Three components may be recognized: first, the general price changes that follow the ebb and flow of the national economy; second, the supply-and-demand effect on the price of some metals, specifically copper and nickel ; and finally, the effect of rising production capacity and strong competition, as found in the polymer industry since the 1950s.
3. In general the polymers have dropped in price in the past decade, whereas the cost of all metals but aluminum has increased.
4. Inflation had led increasing prices.

Exercise 5. Discuss this theme.

Enhancement of the properties of materials



Exercise 1. Answer the questions:

1. What processes do the mechanical get better by means of property of metals?
2. Does influence thermo mechanical treatment on the change of structure and form of material?
3. What types of metals is it expedient to expose to heat treatment?
4. How does change limit of fluidity in the process of flowage at temperatures below than temperature recrystallization?

New words and expressions:

heat treatment	термообработка	жылумен өңдеу
enhance	повышать, усиливать	төзімділігін арттыру
solidstate	твердое состояние	қатты күйі
alter	изменять, искажать	өзгерту
strain	деформация	өзгеріске ұшырау
equation	уравнений	теңдіктер
denned	уединенный, отдельный	жеке, оқшауланған
interference	помеха, влияние	кедергі
woven	витой	иірілген
resin	смола	шайыр
nonferrous	цветной (металл)	түсті металл

Exercise 2. Make up sentences using the following words and word combinations:

Heat treatment, enhancement of properties, thermo mechanical treatments.

Read the text and discuss it:

Enhancement of the properties of materials

Heat treatment is commonly used to enhance the mechanical properties of materials in the solid state. Although the process is usually thermal and modifies only the structure, there are thermo mechanical treatments that also alter both the structure and shape, and thermo chemical treatments that may modify both the structure and the surface chemistry. All three of these processes for the enhancement of properties can be classified as heat treating. Many alloys are heat-treated, the more important being ferrous and aluminum alloys. The mechanical properties of metallic materials can be increased by strain-hardening.

When a metallic alloy is plastically deformed, its yield strength increases with increase in strain as long as the recrystallization temperature is not exceeded. Thus, controlled amounts of cold

working may be used to increase the mechanical properties of a metallic material. The true stress – true strain curves show that on a log-log plot, the strain-hardening equation is indeed a straight line and its slope is denoted as the coefficient of strain-hardening. Through the strain – hardening equation, an engineer can predict the improvement in properties that a given operation will impart to a material.

In polycrystalline alloys, the mutual interference of adjacent grains causes slip to occur on many intersecting slip planes with accompanying strain-hardening. This progressive strengthening with increasing deformation stems from the interaction of dislocations on intersecting slip planes.

The ultimate tensile strength of metals far exceeds that of polymers - by a factor of 25 for unreinforced materials and a factor of 8 for the woven glass-reinforced resins. In the case of the modulus of elasticity, the best thermosets are below the lowest nonferrous materials.

Exercise 3. Complete the following sentences from the text:

1. Heat treatment is commonly used to enhance the of materials in the solid state.
2. Although the process is usually thermal and modifies only the structure, there are treatments that also alter both the structure and shape, and thermo chemical treatments that may modify both the structure and the ... chemistry.
3. All three of these processes for the of properties can be classified as heat treating.
4. Many alloys are heat-treated, the more important being ferrous and alloys.

Exercise 4. Translate the sentences into Kazakh or Russian:

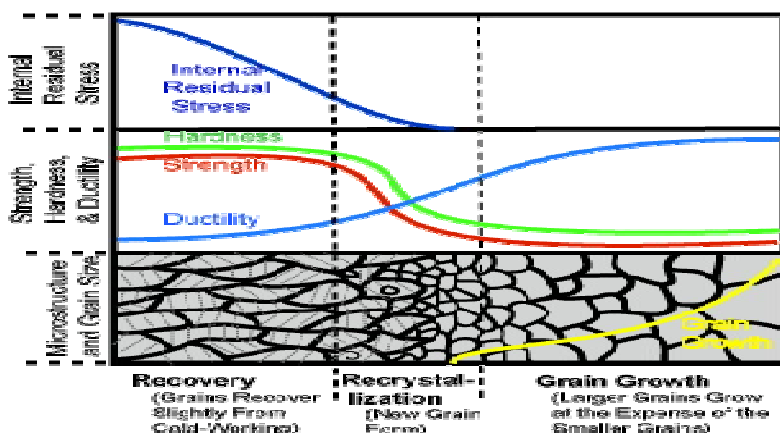
1. When a metallic alloy is plastically deformed, its yield strength increases with increase in strain as long as the recrystallization temperature is not exceeded.
2. Thus, controlled amounts of cold working may be used to increase the mechanical properties of a metallic material .

3. The true stress – true strain curves show that on a log-log plot, the strain-hardening equation is indeed a straight line and its slope is denoted as the coefficient of strain- hardening.

4. Through the strain – hardening equation, an engineer can predict the improvement in properties that a given operation will impart to a material.

Exercise 5. Discuss this theme.

Recovery and Recrystallization



Exercise 1. Answer the questions:

1. That does take place in a spatial grate in the process of cold treatment of material?
2. What defects of spatial form do arise up in large details after heat treatment?
3. What is characterized the process of renewal?
4. What operation does diminish remaining tension considerably?

New words and expressions:

recovery	восстановление	қайта қалпына келтіру
built up	наращивать	өсіру
washer	шайба	шайба, тығырық
punching	штамповка	қалыптама, қалыптау
flattening	правка	түзету
appreciable	заметный	ерекше
residual	остаточный	қалған, қалдық
springback	пружинение	серіппелік, бұама сым
solid	твердый	қатты
solution	раствор	ерітінді
matrix	матрица, форма	қалып

Exercise 2. Make up sentences using the following words and word combinations:

Lattice structure of the alloy, flattening warp, drawing operation.

Read the text and discuss it:

Recovery and Recrystallization

Recovery. During a cold working process most of the energy used is dissipated as heat but a small percentage is stored within the distorted lattice structure of the alloy. That energy is the thermodynamic driving force that tends to return the metal to its original state provided there is sufficient thermal energy to enable the reactions to occur. Cold forming is done above the yield point in the work-hardening range, so internal stresses can be built up easily. Evidence of this is the springback as the work leaves the forming operation and the warpage in any subsequent heat treatment. Even a simple washer might, by virtue of the internal stresses resulting from punching and then flattening warp severely during heat treating.

Recovery is a gradual change in the mechanical properties of an alloy, i.e., loss in brittleness, or marked increase in toughness

brought about by controlling the heat-treating times and temperatures so that there are no appreciable changes in the microstructure. However, recovery does significantly reduce the residual stresses within the distorted lattice structure.

When doubt exists as to whether internal stresses will cause warpage, a piece can be checked by heating it to about 1100 deg. F and then letting it cool. If there are internal stresses, the piece is likely to deform. Pieces that will warp severely while being heated have been seen, yet the heat-treated was expected to put them through and bring them out than they were in the first place.

Recrystallization. All the properties of a cold-worked metal are affected to some degree by a yield behavior heat treatment, but the yield strength and ductility can only be restored by recrystallization. This may be defined as the nucleation and growth of strain-free grains out of the matrix of cold-worked metal. In general the properties of the recrystallized alloy are those of the metal before the cold-working operation. This is of commercial importance because if an alloy has become work-hardened in a drawing operation, it can be recrystallized and the drawing operation can be continued. Nucleation is encouraged by a highly cold-worked initial structure and a high annealing temperature. The presence of alloying elements in solid solution decreases the rate of nucleation.

Exercise 3. Complete the following sentences from the text:

1. That energy is the driving force that tends to return the metal to its original state provided there is sufficient thermal energy to enable the reactions to occur.

2. Cold forming is done above the in the work-hardening range, so stresses can be built up easily.

3. Evidence of this is the as the work leaves the forming operation, and the warpage in any subsequent treatment.

4. Recovery is a gradual change in the mechanical properties of an alloy, i.e., loss in, or marked increase in toughness brought about by controlling the heat-treating times and temperatures so that there are no appreciable changes in the

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Recovery is a gradual change in the mechanical properties of an alloy, i.e., loss in brittleness, or marked increase in toughness brought about by controlling the heat-treating times and temperatures so that there are no appreciable changes in the microstructure.

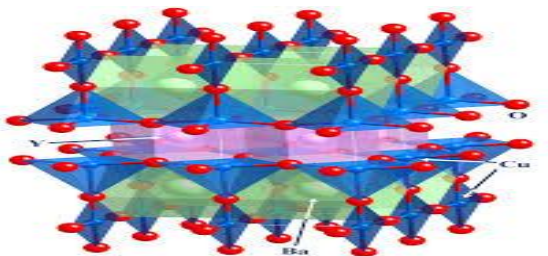
2. However, recovery does significantly reduce the residual stresses within the distorted lattice structure.

3. When doubt exists as to whether internal stresses will cause warpage, a piece can be checked by heating it to about 1100 deg. F and then letting it cool. If there are internal stresses, the piece is likely to deform.

4. Pieces that will warp severely while being heated have been seen, yet the heat-treater was expected to put them through and bring them out than they were in the first place.

Exercise 5. Discuss this theme.

Solid-state Reactions that Improve Mechanical Properties



Exercise 1. Answer the questions:

1. Does exist reactions of the hard state, a step-up mechanical properties without a flowage?

2. Are there limitations for such reactions and which character of these limitations is?

3. How always does the diagram of the equilibrium state with power favourable reactions result in work-hardening ?

4. What change does diffusion of metal result in an alloy?

New words and expressions:

alloy hardening	легирование	қосындыланған
augment	увеличивать	үлкейту
decomposition	разложение	ыдырату
nonequilibrium	неуравновешенность	тұрақсыздық
occurrence	распространение, положение	таралуы
prerequisite	предпосылка	алғышарт
slope	наклон	көлбеу
overall	полный, общий	ортақ, толық
particle	частица	бөлшек
inherent	присущий, неотъемлемый	тән, ажырамас бөлік
chromium	хром	хром ,техникада қолданатын қатты элемент

Exercise 2. Make up sentences using the following words and word combinations:

Plastic deformation, metastable structure, typical phase diagrams, phase regions slopes.

Read the text and discuss it:

Solid-state Reactions that Improve Mechanical Properties

Strain hardening and alloy hardening are widely used in industry, especially in aluminum – and copper – based alloys. It is possible to augment the mechanical properties of certain alloys by other solid-state reactions that can produce much greater hardness than is possible by alloying alone, and plastic deformation is not required. However, solid-state reactions are usually limited to certain alloys for several reasons. Relatively few alloys can be affected by a given solid-state reaction. Eutectoid decompositions, for instance, is rare in alloy systems other than the iron-carbon system.

To achieve significant hardening, a solid-state reaction must form a no equilibrium or metastable structure such as marten site.

Even though an energetically favorable solid-state reaction is possible according to the equilibrium phase diagram, it may produce little or no hardening. Therefore the occurrence of a given reaction is a necessary, but not a sufficient, condition for strengthening.

Several solid-state reactions produce gains in mechanical properties that are important to engineers. Typical phase diagrams indicate the combination of phases that is needed before a solid-state reaction can occur, but that alone does not mean that a significant improvement will occur. A typical eutectoid reaction is a prerequisite to eutectoid decomposition. However the iron-carbon system is the only one of commercial value. When the solvus line which separates one - and two – phase regions slopes to indicate decreasing solid solubility of B in A, there is a chance that precipitation hardening may occur. Several aluminum alloys have this type of phase diagram. Although many binary alloys have similar solvus lines, aluminum alloys are the best example of precipitation hardening. The requirements of the diffusion reaction are indicated in. In this case the diffusion of metal C into the alloy causes the composition of the hardenable alloy metal C diffuses into the solid solution, the overall composition gradually shifts into process works according to this reaction because aluminum, chromium, and vanadium from nitrides. Thus, when nitrogen gas diffuses into the steel surface that contains those elements, their nitrides form within the surface of the metal to produce an extremely hard surface. The unusual surface hardness is thought to be a result of the fine dispersion of nitride particles rather than of the inherent hardness of the nitrides alone.

Exercise 3. Complete the following sentences from the text:

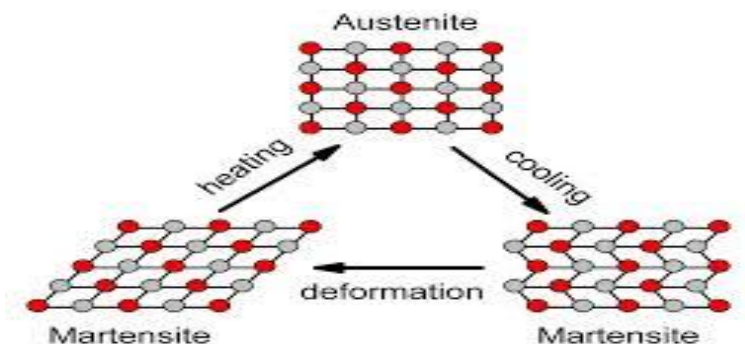
1. Several solid-state reactions produce in mechanical properties that are important to engineers.
2. Typical indicate the combination of phases that is needed before a solid-state reaction can occur, but that alone does not mean that a significant will occur.
3. A typical eutectoid reaction is a to eutectoid decomposition.
4. However the iron-carbon system is the only one of commercial value. When the which separates one- and two – phase regions slopes to indicate decreasing solid solubility of B in A, there is a chance that may occur.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Strain hardening and alloy hardening are widely used in industry, especially in aluminum – and copper-based alloys.
2. It is possible to augment the mechanical properties of certain alloys by other solid-state reactions that can produce much greater hardness than is possible by alloying alone, and plastic deformation is not required.
3. However, solid-state reactions are usually limited to certain alloys for several reasons.
4. Relatively few alloys can be affected by a given solid-state reaction.

Exercise 5. Discuss this theme.

Solid – state Transformations in Ferrous Alloys



Exercise 1. Answer the questions:

1. What temperature are allotropic changes at in steel?
2. Which is solubility of carbon in material?
3. What reaction do two new hard phases appear at?
4. What phases does an austenite grow into in carbon steels?

New words and expressions:

machine	обрабатывать резанием	кесіп өңдеу
tough	прочный, плотный	тығыз, берік
undergo	подвергать	ұшырату
lattice	решетка	тор
dissolve	растворять	еріту
quench	закачивать	шыңдау
trap	улавливать	аңғару, қолайлы сәтін табу
needlelike	игольчатый	ине тәріздес
interstitial	щелистый	жарықшақты, сызатты
tetragonal	четырёхугольный	төртбұрышты
supersaturate	перенасыщать (раствор)	ерітіндіні шылықтыру
retain	удерживать	ұстап тұру, сақтап калу

Exercise 2. Make up sentences using the following words and word combinations:

An allotropic change, eutectoid reaction, quenched in water.

Read the text and discuss it:

Solid – state Transformations in Ferrous Alloys

Steel is unique in its ability to exist as a soft ductile material that can easily be formed or machined and then, as a result of a heat treatment, assume the role of a hard, tough material that resists changing shape. There are two reasons for this behavior. The first is the fact that iron undergoes an allotropic change at 1330°F. Carbon has little solubility in the body-centered cubic lattice that is characteristic of iron at room temperature, but up to 2 percent carbon is soluble in the face-centered cubic lattice which is stable above 1330°F. The second is the solid-state eutectoid reaction in which a solid solution at a certain temperature can react to form two new solid phases. In the case of carbon steels, the γ – phase, austenite,

transforms to α -iron (ferrite) and cementite, (Fe_3C) by the eutectoid reaction. The eutectoid reaction is common in many materials, but only steel exhibits such a marked change in properties.

Thus, when iron with 0, 8 percent carbon is heated above 1330°F , the carbon dissolves and the resulting solid solution is called austenite or γ -iron. If the austenite is suddenly quenched in water, the carbon cannot escape and thus is trapped within the lattice structure as an interstitial atom that strains the lattice because of the increased volume it must occupy in the new body-centered tetragonal structure called marten site, which is characterized by a needlelike microstructure. Martensit is a hard, brittle, metastable structure, i.e., a nonequilibrium structure, that is a supersaturated solid solution of cementite, Fe_3C , in a body-centered tetragonal iron. In the presence of a moderate temperature reise (300 to 400°F), tempering or recovery occurs and the brittle structure becomes tougher, while still retaining its strength and hardness.

Exercise 3. Complete the following sentences from the text:

1. is unique in its ability to exist as a soft ductile material that can easily be formed or and then, as a result of a heat treatment, assume the role of a hard, tough material that resists changing shape.

2. There are two reasons for this

3. If the austenite is suddenly in water, the carbon cannot escape and thus is trapped within the lattice structure as an atom that strains the lattice because of the increased volume it must occupy in the new body-centered tetragonal structure called, which is characterized by a needlelike microstructure

4. The second is the reaction in which a solid solution at a certain temperature can react to form two new solid phases. In the case of carbon steels, the γ – phase, austenite, transforms to α -iron (ferrite) and, (Fe_3C) by the eutectoid reaction.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. The austenite is suddenly quenched in water, the carbon cannot escape and thus is trapped within the lattice structure as an interstitial atom that strains the lattice because of the increased volume it must occupy in the new body-centered tetragonal structure

called marten site, which is characterized by a needlelike microstructure.

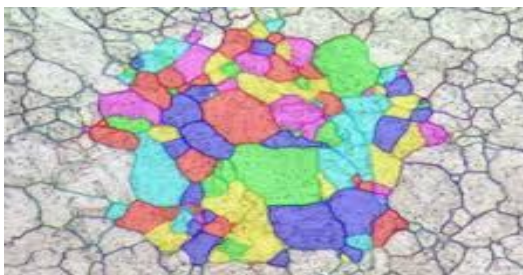
2. Martensit is a hard, brittle, metastable structure, i.e., a nonequilibrium structure, that is a supersaturated solid solution of cementite, Fe_3C , in a body-centered tetragonal iron. In the presence of a moderate temperature reise, tempering or recovery occurs and the brittle structure becomes tougher, while still retaining its strength and hardness.

3. Steel is unique in its ability to exist as a soft ductile material that can easily be formed or machined and then, as a result of a heat treatment, assume the role of a hard, tough material that resists changing shape.

4. The first is the fact that iron undergoes an allotropic change at 1330°F . Carbon has little solubility in the body-centered cubic lattice that is characteristic of iron at room temperature, but up to 2 percent carbon is soluble in the face-centered cubic lattice which is stable above 1330°F .

Exercise 5. Discuss this theme

Grain Size and Austenitizing



Exercise 1. Answer the questions:

1. Are size of grain an important factor at heat treatment was become?
2. How does a fine-grained structure influence on viscosity and hardness became?
3. How is it possible to get material with the controlled size of grain?
4. How does cooling speed influence on forming of grain

New words and expressions:

mill	прокатный (стан)	жұқартатын
casting	литье	балқыту
ingot	слиток	құйма, сом
tensile strength	предел прочности	беріктік шегі
soaking	выдержка	төзімділік
shift	сдвиг	жылжыту, ысыру
boundaries	границы, граничные условия	меже, межелеу
stabilizer	стабилизатор	тұрақтандырғыш
molybdenum	молибден	молибден, қатты жылтырақ ақ металл
ferritic	ферритный	ферриттік
restrict	ограничивать	шектеу, тежеу

Exercise 2. Make up sentences using the following words and word combinations:

Microscopic grains, ingots freeze, molybdenum, ferritic.

Read the text and discuss it:

Grain Size and Austenitizing

An important factor in the heat treatment of steel is the grain size, by which is meant the size of the microscopic grains that are established at the last temperature above the critical range to which the piece of steel has been treated. Fine-grained steels show better toughness at high hardness. Grain-size-controlled steels will show less war page. Coarse-grained steels harden better.

Grain-size-controlled steel can be secured from the steel mill within certain limits. If a given grain size is specified, it must be obtained by suitable control of the recrystallization process and by prevention of excessive grain growth.

A relatively large dendrite grain size may be developed in the process of solidification as a result of the freezing rate or section size of casting. Large castings and ingots freeze with coarse grains. Thin-sectioned castings develop a fine grain size owing to rapid

freezing. Normally, a fine grain size is desirable, since higher ductility and impact strength values are obtained at a given tensile strengths level with fine grain size

Most ferrous heat treatments require that austenite be produced as the first step in a heat-treating operation. The iron-carbon phase diagram (fig. 13.2) shows the minimum temperature at which austenite can form. Austenitizing is a function of both time and temperature. In practice, a soaking time of 1 hour/m, of cross section and initial carbide particle size are both important factors.

Steels and cast irons contain, in addition to iron and carbon, other elements that shift the boundaries of the phase fields in the Fe-C diagram. Some alloying elements such as manganese and nickel are austenite stabilizers and extend the temperature range over which austenite is stable, while elements such as chromium and molybdenum are ferrite stabilizers and restrict the range of austenitic stability.

Exercise 3. Complete the following sentences from the text:

1. An important factor in the heat treatment of steel is the grain size, by which is meant the size of the microscopic grains that are established at the last temperature above the to which the piece of steel has been treated.
2. steels show better at high **hardness**. Grain-size-controlled steels will show less warpage.
3. steels harden better.
4. steel can be secured from the steel mill within certain limits.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Most ferrous heat treatments require that austenite be produced as the first step in a heat-treating operation.
2. The iron-carbon phase diagram shows the minimum temperature at which austenite can form.
3. Austenitizing is a function of both time and temperature. In practice, a soaking time of 1 hour/m, of cross section and initial carbide particle size are both important factors.
4. Steels and cast irons contain, in addition to iron and carbon, other elements that shift the boundaries of the phase fields in the Fe-C diagram.

Exercise 5. Discuss this theme.

Heat Treatment of Ferrous Materials



Exercise 1. Answer the questions:

1. What metals are most subject to the action of heat treatment in part of change of their properties?
2. What environments can be used for cooling of the heated metal?
3. Which is setting of operation of annealing?
4. How does cool a metal in the process of normalization?

New words and expressions:

affect	влиять	ықпал ету
stress relieving	снятие напряжений	қысымды азайту, жою
immerse	погружать, окунаы	сүнгіту
liquid	жидкость	сұйықтық
limestone	известняк	эктас
layer	слой	қабат
compound	смесь	қоспа
reworking	переработка	қайта өңдеу
overlooked	выступающий	ерекшеленетін
induced	вызванный	қозғалынған
casting	литье	балқыту
welding	сварка	дәнекерлеу

Exercise 2. Make up sentences using the following words and word combinations:

Annealing, harden a metal, critical temperature, reworking, casting.

Read the text and discuss it:

Heat Treatment of Ferrous Materials

The properties of metals can be changed by various forms of heat treating. Steels are affected to a greater extent by heat treating than are other materials. All heat treatments either soften or harden a metal. The most common treatments for softening are stress relieving, annealing, and normalizing; while the major hardening processes are case-hardening or surface-hardening, and through-hardening.

Hardening is performed by heating steel to a prescribed temperature and then quenching it in oil or water.

Quenching is the process of rapidly heated metal by immersing it in liquids, gases or solids (such as sand, limestone, or asbestos).

Tempering is the process of reheating previously hardened steel and then cooling it, usual by air. This increases the steel's toughness.

Annealing is the process of heating and cooling metals to soften them, release their internal stresses, and make them easier to machine.

Normalizing is achieved by heating metals and letting them cool in air to relieve their internal stresses.

Case Hardening is the process of hardening thin outside layer of a metal. The outer layer placed in contact with carbon or nitrogen compounds that are absorbed by the metal as it is heated; afterward, the metal is quenched.

Flame Hardening is the method of harden by heating a metal to within a prescribed temperature range with a flame and then quenching metal.

Stress relieving is used to relieve stresses that remain locked in a structure, usually as a consequence of some manufacturing process. It involves heating to a temperature below the critical temperature

and cooling slowly. This process is particularly applicable after straightening and cold-working operations and either prior to or after heat treatments to reduce distortion. In stress relieving, no change in microstructure is involved, but residual stresses are markedly reduced and toughness is improved. The relief of locked-in stresses is a time-temperature phenomenon.

When consideration is given to the simplicity of the stress-relieving operation and the equipment required, this important process, which can save considerable amounts of straightening and reworking time, cannot be overlooked. It may be applied to relieve stresses induced by casting, quenching, normalizing, machining, cold working, or welding.

Exercise 3. Complete the following sentences from the text:

1. Hardening is performed by heating steel to a prescribed temperature and then it in oil or water.
2. Quenching is the process of rapidly heated metal by it in liquids, gases or solids (such as sand, limestone, or asbestos).
3. is the process of reheating previously hardened steel and then cooling it, usual by air. This increases the steel's toughness.
4. Annealing is the process of heating and cooling metals to soften them, release their, and make them easier to

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Case Hardening is the process of hardening thin outside layer of a metal.
2. The outer layer placed in contact with carbon or nitrogen compounds that are absorbed by the metal as it its heated; afterward, the metal is quenched.
3. Flame Hardening is the method of harden by heating a metal to within a prescribed temperature range with a flame and then quenching metal.
4. Stress relieving is used to relieve stresses that remain locked in a structure, usually as a consequence of some manufacturing process. It involves heating to a temperature below the critical temperature and cooling slowly.

Exercise 5. Discuss this theme.

Annealing



Exercise 1. Answer the questions:

1. What stages are envisaged by the operation of annealing?
2. Which are requirements to heating and cooling at annealing?
3. Does workability get better became cutting after annealing?
4. Which are requirements of material under draft treatment in case of subzero requirements to exactness and cleanness of surface?

New words and expressions:

annealing	отжиг	босандату, суару
heating	нагрев	қыздыру
cooling	охлаждение	суыту
furnace	печь	пеш, пісіру
refine	повышать качество, очищать	сапасын арттыру, тазалау
diversity	разнообразить	түрлендіру
roughing cuts	черновая обработка	алғашқы қарапайым өңдеу

broaching	протяжка	созу, тарту
lamellar	слоистый	қатпарлы
additional	дополнительный	қосалқы
spot	пятно	дақ
torch	горелка	оттық

Exercise 2. Make up sentences using the following words and word combinations:

Annealing, roughing cuts, lamellar, cooling method.

Read the text and discuss it:

Annealing

Annealing involves heating to and holding at a suitable temperature, followed by cooling at an appropriate rate, primarily for softening of metals. When annealing iron-based alloys, the work is 50 to 100°F above the critical temperature range. The alloy is held for a period of time to insure uniform temperature throughout the part, and then allowed to cool slowly by keeping the parts in the furnace and allowing both to cool. The cooling method should not permit one portion of the part to cool more rapidly than another portion. Its purpose is to remove stresses; induce softness; alter ductility, toughness, and magnetic properties; change grain size; remove gases; and produce a definite microstructure.

Steel is annealed for one or more of the following reasons:

- To soften it for machining or fabrication operations;
- To relieve stresses in the material (often necessary after casting or welding operations);
- To alter its properties;
- To condition the steel for subsequent heat treatment or cold work;
- To refine grain size, improve ductility and promote dimensional stability.

Perhaps, the principal reason for annealing is to improve machinability characteristics of the steel. It is not possible to present a general rule for annealing that can be used on all types of steel subjected to diversified metal-removal operations. For heavy roughing cuts, the material should be as soft as possible (Rockwell B80). This is especially true when accuracy and finish are not important; however, if a close tolerance is required, as on a broaching operation, then a finer lamellar microstructure with a hardness of approximately Rockwell B100 is more desirable. The principal point for the engineer to keep in mind when using medium-carbon steel is to specify the condition of the steel as purchased.

As the hardness of steel increases during cold working, ductility decreases and additional cold working becomes so difficult that the steel must be annealed to restore its ductility.

Localized or spot annealing can be accomplished with an oxyacetylene torch and is a valuable technique when salvaging scrap work, but tool steels should not be torch-annealed – they will crack.

Exercise 3. Complete the following sentences from the text:

1. This is especially true when accuracy and finish are not important; however, if a close is required, as on a broaching operation, then a finer microstructure with a hardness of approximately Rockwell B100 is more desirable.

2. The principal point for the engineer to keep in mind when using steel is to specify the condition of the steel as purchased.

3. As the hardness of steel increases during, ductility decreases and cold working becomes so difficult that the steel must be annealed to restore its ductility.

4. Localized or spot annealing can be accomplished with an and is a valuable technique when work, but tool steels should not be torch-annealed – they will crack.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. The principal reason for annealing is to improve machinability characteristics of the steel.
2. It is not possible to present a general rule for annealing that can be used on all types of steel subjected to diversified metal-removal operations.
3. For heavy roughing cuts, the material should be as soft as possible (Rockwell B80).
4. This is especially true when accuracy and finish are not important; however, if a close tolerance is required, as on a broaching operation, then a finer lamellar microstructure with a hardness of approximately Rockwell B100 is more desirable.

Exercise 5. Discuss this theme.

Unit 2.

Poligraphy

Print Media



History of print media

Exercise 1. Answer the questions:

1. Do you know the print media?
2. What types of media do you know?
3. Where was invented the first printing?
4. What is commercial printing?

New words and expressions:

crucial	важно	маңызды
differentiates	различает	ажыратады
segment	сегмент	бөлім
leaflets	брошюры	кітапша
income	доход	кіріс
variety	разнообразие	ерекшелік

Exercise 2. Make up sentences using the following words and word combinations:

Print media, the sociocultural, level of education, commercial printing, production process.

Read the text and discuss it:

Print Media

Topical surveys on the significance and use of print media prove that the need for print media is growing worldwide. This is indicated by the fact that at the end of the millenium *Time Magazine* acknowledged the sociocultural significance of the invention and utilization of book printing and elected Johannes Gutenberg's work as the most crucial event of the millennium. It is true that the age of electronic media has started; however printed information is and remains omnipresent. Depending on level of education, income, and household type, between US\$ 20 and US\$ 55 per month and household were spent in Germany in 2010 on books, brochures, magazines, and newspapers. The market for print products offers more variety than ever before. Usually, printed products are categorized into commercial printing and periodicals. This classification differentiates printed matter with regard to its *frequency of publication*. Since the production process also depends largely on these basic conditions, print shops usually specialize in one or the other market segment.

Commercial printing refers to print products that are produced occasionally (e.g., catalogs, brochures, leaflets, business cards, etc.). *Periodicals* are printed matter that appears periodically (e.g., newspapers, journals, magazines). Publishing houses and companies are the typical clients for periodicals printing. These individual groups are described briefly in the following.

Exercise 3. Complete the following sentences from the text:

1. Topical surveys on the significance need for print media is growing worldwide.
2. It is true that the age of electronic media has is and remains omnipresent.
3. Usually, printed products printing and periodicals
4. Publishing houses and for periodicals printing.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. This is indicated by the fact that at the end of the millennium *Time Magazine* acknowledged the sociocultural significance of the invention and utilization of book printing and elected Johannes Gutenberg's work as the most crucial event of the millennium.

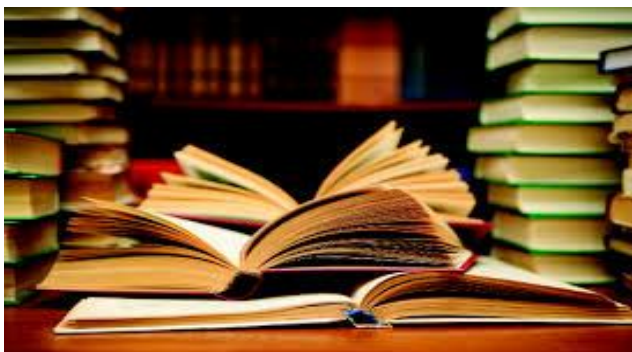
2. Depending on level of education, income, and household type, between US\$ 20 and US\$ 55 per month and household were spent in Germany in 2010 on books, brochures, magazines, and newspapers.

3. This classification differentiates printed matter with regard to its *frequency of publication*.

4. *Periodicals* are printed matter that appears periodically (e.g., newspapers, journals, magazines).

Exercise 5. Discuss this theme.

Books



Exercise 1. Answer the questions:

1. What Kazakhstani book publishers do you know?
2. When did appear colour books?
3. What does lithographic mean?
4. How classified the range of books?

New words and expressions:

trigger	запускать	шығару
acquire	приобрести	алу
illiteracy	неграмотность	саутсыздық
phototypesetting	фотонаборный	фотожинақтық
lithographic	литографский	литографиялық
widespread	широкое	кең таралған
	распространение	
decisive	решающий	шешуші
imitated	подражали	еліктеді
extensive range	широкий	кең сұрыпталым
	ассортимент	
thread-stitched	сшитые нитками	жіппен тігілген
giltedge	позолоченный	алтын жиекті
	край	
risen	поднялись	көтерілді

Exercise 2. Make up sentences using the following words and word combinations:

Movable lead type, hand-written books, phototypesetting, , thread-stitched leather volumes.

Read the text and discuss it:

Books

Gutenberg's work and his invention, printing with movable lead type, in the middle of the fifteenth century triggered a revolution in book production. A much greater proportion of the population had the chance to acquire education, culture, and information than had ever been possible with hand-written books. Consequently, illiteracy decreased in the following centuries. Books continued to be colored by hand after Gutenberg's invention, so that very colorful volumes of high quality comparable to earlier ones were still produced.

For over 500 years, letterpress was the dominant printing technology for books. Only when phototypesetting and lithographic printing became widespread in the 1970s did the printed book turn into a low cost mass medium. It was not only more efficient production processes but also the availability of inexpensive paper that were decisive reasons for the breakthrough of books as mass media. The printed book developed its independent appearance over time. The form of the type used moved away from imitated script types to its own type forms. The number of new book titles produced has grown continually since Gutenberg's invention. Even today, in the age of electronic media, annual growth rates in book production are still recorded. With close to eighty thousand titles produced annually, Germany is one of the biggest markets for books in the world today. Only China and Great Britain produced more titles in 2007. In 2010 more than 500 million books worth over 3.5 billion Euros were produced in Germany.

The extensive range of books is classified on the one hand in terms of content; on the other, it extends from high-quality, thread-stitched leather volumes with a gilt edge to simple perfect-bound pocket books/paperbacks. Books are offered both in one color (book printing) as well as in top-quality multicolor art publications. The range of books available today in Germany has risen to over 770000 titles. The same applies to other printed products such as magazines, periodicals, newspapers, and brochures.

Exercise 3. Complete the following sentences from the text:

1. Consequently, ... in the following centuries.
2. Only when phototypesetting and in the 1970 s did the printed book turn into a low cost mass medium.
3. With close to eighty thousand titles produced annually, ...markets for books in the world today.
4. Books are offered both in one color (book printing) art publications.

New words and expressions:

attracting	привлечение	қызықтыру
lifespan	продолжительность жизни	өмірінің ұзақтығы
external form	внешняя форма	сыртқы келбеті
flexible	гибкая	икемді
binding	связывания	байланыстыру
sheet-fed	листовой	беттік
pamphlets	памфлеты	өткір мақала
precursor	предшественник	бастамашы, ізашар
external	внешний	сыртқы
loosesheets	незакрепленные листы	бекітілмеген парақтар

Exercise 2. Make up sentences using the following words and word combinations:

Trade magazines, publishing houses, flexible cover, large-size loose sheets, advertising inserts.

Read the text and discuss it:

Magazines, Newspapers, Other Printed Media

The range of magazines consists mainly of periodicals, including trade magazines, journals, and illustrated magazines. Trade magazines cover a limited field, thus attracting a limited specialist readership. Unlike books, production costs for *magazines* are not paid for exclusively by the final consumer. Often more than half of the costs are financed by advertising. Magazines are usually published by publishing houses just like books. Unlike books, magazines usually have a shorter lifespan. This is due to the content and it is a major characteristic of the periodical. Since magazines have a limited length of use and differ from books greatly in terms of content, their external form also differs from that of books. Magazine production differs considerably from book production. Magazines

are generally multicolored booklets with a flexible cover. They often have a high circulation and are bound using simple binding processes (e.g., wire-stitching, perfect binding). Depending on the circulation, magazines are printed with sheet-fed offset or web offset presses, but rotogravure presses are also used for magazines with a very high circulation.

The newspaper is still one of the most significant mass media today. The first *newspapers* appeared at the start of the seventeenth century. Pamphlets in the sixteenth century were the precursor of the newspaper. Most newspapers are produced daily and have a high circulation. Some daily papers even appear a few times per day, to ensure that their content is very up-to-date. The two most important categories of newspapers are daily papers (dailies) and weekly papers. The external appearance of newspapers differs considerably from that of magazines. Newspapers normally consist of large-size loose sheets. Several of these loose sheets are combined during production and form an individual section of the paper. A newspaper consists of several sections/parts with varying content called “newspaper books.” Generally, newspapers are produced on special newspaper printing presses. These presses are highly productive web presses, which can print on uncoated paper, at low cost. The traditional newspaper used to be black and white. Modern printing presses are able to print in color economically. This has created the opportunity to adapt the newspaper’s appearance to today’s expectations (color photographs, color TV), but also to conform to the wish of many advertising customers that their advertisements be published in color. The production of a newspaper is mainly financed by advertising inserts and advertisements. For this reason the ultimate consumer price for a newspaper is relatively low.

Packaging represents another important group of printed products. It can be made of very different materials such as paper, cardboard, plastic, metal, glass, and so on. In the first place, packaging is used to protect the actual goods inside, but it also makes for an attractive presentation. At the same time packaging is also printed on to provide information about the package content. All the major printing technologies are used for printing packaging – often in a combination of several technologies.

Exercise 3. Complete the following sentences from the text:

1. Trade magazines cover, thus attracting a limited specialist readership.
2. Magazines are booklets with a flexible cover.
3. These presses are highly productive web presses, which can print on uncoated paper, at low cost.
4. At the same time packaging is also printed on about the package content.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. The range of magazines consists mainly of periodicals, including trade magazines, journals, and illustrated magazines.
2. Depending on the circulation, magazines are printed with sheet-fed offset or web offset presses, but rotogravure presses are also used for magazines with a very high circulation.
3. This has created the opportunity to adapt the newspaper's appearance to today's expectations (color photographs, color TV), but also to conform to the wish of many advertising customers that their advertisements be published in color.
4. *Packaging* represents another important group of printed products. It can be made of very different materials such as paper, cardboard, plastic, metal, glass, and so on. In the first place, packaging is used to protect the actual goods inside, but it also makes for an attractive presentation.

Exercise 5. Discuss this theme.

Typography



Exercise 1. Answer the questions:

1. Who invented the typography first?
2. Why do we use punches?
3. What is the cuneiform?
4. Where the brick stamps were found?

New words and expressions:

traces	следы	іздер
punches	штампы	калыптар
seals	печати	мөрлер
uneven	неровный	тегіс емес
evidence	свидетельство	куәлік
reuse	многократное	көп мәрте
	использование	пайдалану
cuneiform	клинообразный	сына тәрізді
cylinder seals	цилиндрические	дөңгелек
	печати	мөртабан
enigmatic	загадочный	жұмбақ
widespread	широко	кең таралған
	распространенный	

Exercise 2. Make up sentences using the following words and word combinations:

First punches, cylinderseals, punches, lead pipe inscriptions, medieval print.

Read the text and discuss it:

Typography

Typography traces its origins to the first punches and dies used to make seals and currency in ancient times. The uneven spacing of the impressions on brick stamps found in the Mesopotamian cities of Uruk and Larsa, dating from the 2nd millennium BC, may have been evidence of type where the reuse of identical characters were applied to create cuneiform text. Babylonian cylinder seals were used to create an impression on a surface by rolling the seal on wet clay. Typography was also realized in the Phaistos Disc, an enigmatic Minoan print item from Crete, Greece, which dates

between 1850 and 1600 BC. It has been proposed that Roman lead pipe inscriptions were created by movable type printing, but German typographer Herbert Brekle recently dismissed this view.

The essential criterion of type identity was met by medieval print artifacts such as the Latin Pruefening Abbey inscription of 1119 that was created by the same technique as the Phaistos disc. The silver altarpiece of patriarch Pellegrinus II (1195–1204) in the cathedral of Cividale was printed with individual letter punches. The same printing technique can apparently be found in 10th to 12th century Byzantine reliquaries. Individual letter tiles where the words are formed by assembling single letter tiles in the desired order were reasonably widespread in medieval Northern Europe.

Exercise 3. Complete the following sentences from the text:

1. Babylonian cylinder seals were used on a surface by rolling the seal on wet clay.
2. It has been proposed that Roman lead pipe inscriptions were Herbert Brekle recently dismissed this view.
3. The essential criterion of was met by medieval print artifacts.
4. The same printing can apparently be found in 10th to 12th.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. The uneven spacing of the impressions on brick stamps found in the Mesopotamian cities of Uruk and Larsa, dating from the 2nd millennium BC, may have been evidence of type where the reuse of identical characters were applied to create cuneiform text.

2. Typography was also realized in the Phaistos Disc, an enigmatic Minoan print item from Crete, Greece, which dates between 1850 and 1600 BC.

3. The silver altarpiece of patriarch Pellegrinus II (1195–1204) in the cathedral of Cividale was printed with individual letter punches.

4. Individual letter tiles where the words are formed by assembling single letter tiles in the desired order were reasonably widespread in medieval Northern Europe.

Exercise 5. Discuss this theme.

The printing process



Exercise 1. Answer the questions:

1. Who are the estimators and the importance of their job?
2. What is the scheduling?
3. What controlled machines?
4. How do you understand “scanning”?

New words and expressions:

executive
estimator
supplies

исполнительный
оценщик
расходные материалы

орындаушы
бағалаушы
жұмсалатын
материалдар

quote
deadline
layout
printing plates
scanning
paper jams

цитата
крайний срок
макет
печатные формы
сканирование
замятия бумаги

дәйексөз
соңғы мерзім
үлгі
баспа түрлері
көшіріп алу
қағаздың қысылып
қалуы

trim	отделка	эрлеу
collate	собирать	жинақтау
drill	дрель	бұрғы
fold	сложить	қиыстыру
staple	штапель	штапель мата
stitch	стежок	тігіс

Exercise 2. Make up sentences using the following words and word combinations:

The printing industry, desktop-publishing software, machine printer's tasks, paper jams, www.careerswales.com Page 2.

Read the text and discuss it:

The printing process

Looking at the process from the moment when a customer first contacts the company gives an idea of the range of jobs that are available in the printing industry. The sales representative or executive of the printing firm discusses with the customer what sort of job is wanted. Sales staff needs to know all about printing processes in order to be able to advise customers.

The estimator works out how much the job will cost and supplies a quote for the customer. Estimators use their experience of printing processes to work out the most cost-effective way to carry out a job.

Pre-press or origination

The production controller, or print production planner works out the scheduling, to meet the customer's deadline and to fit in with other print jobs. The design and layout are created with desktop-publishing software. This may be done by the printer's graphic designer or the work may be supplied electronically by the customer, already designed. Once the finalized layout is checked, it is transferred from computer to film or printing plate. There are many different jobs involved in transferring the text and art work to printing plates ready for printing, including scanning, checking, retouching and plate making. Computer skills are vital, as is an eye for detail, the ability to concentrate and a sense of design.

Press

Machine printers prepare and operate different printing presses. There is several different kinds' of printing process and the choice of process depends on the kind of job. Machine printers may specialize in one particular printing process. Most machines are computer controlled. A machine printer's tasks can include:

- preparing the paper or card so that it runs smoothly through the machine
- positioning the printing plates in the press and taking trial prints to ensure everything is correctly placed
- loading the machine with inks and making sure colours are reproduced correctly
- maintaining quality checks during the running of the press
- looking out for problems, such as paper jams, to avoid machine downtime
- routine maintenance and cleaning of the press.

Post-press or finishing

Print finishers use machines to cut, trim, collate, drill, fold, staple, glue or stitch the printed material into books, magazines, cartons or other printed products. Accuracy is essential. Specialist skills are needed www.careerswales.com Page 2 in firms that make printed boxes, embossed stationery etc. Occasionally, book binding is done by hand, although this would be exceptional, e.g. for special editions and where the numbers printed are low.

Exercise 3. Complete the following sentences from the text:

1. Sales staff needs to know all about to be able to advise customers.
2. The design and layout with desktop-publishing software.
3. Most machines controlled.
4. Print finishers use machines magazines, cartons or other printed products.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Looking at the process from the moment when a customer first contacts the company gives an idea of the range of jobs that are available in the printing industry.

2. There are many different jobs involved in transferring the text and artwork to printing plates ready for printing, including scanning, checking, retouching and plate making.

3. Computer skills are vital, as is an eye for detail, the ability to concentrate and a sense of design.

4. Specialist skills are needed www.careerswales.com Page 2 in firms that make printed boxes, embossed stationery etc.

Exercise 5. Discuss this theme.

Types of Printing Process



Sheetfed Offset Printing Machine

Exercise 1. Answer the questions:

1. What is the offset printing?
2. When was invented movable type?
3. What is the get blurry?
4. What can you say about engraving method?

New words and expressions:

broadsheets	плакат	плакат
meticulous	дотошный	егжей-тегжейлі
advancement	продвижение	алға басушылық
adheres	придерживается	ұстану
layout	макет	үлгі
omissions	упущения	олқылықтар
blurry	расплывчатый	анық емес
avored	благоприятствование	қолайлы жағдай
letterhead	бланки	бланктер
strenuous	напряженные	шиеленіскен

Exercise 2. Make up sentences using the following words and word combinations:

Printed materials, publications today, high quantity of prints, full of images, offset printing.

Read the text and discuss it:

Types of Printing Process

Back in the days printing of books, broadsheets, brochures and other printed materials are done via a meticulous process. Thanks to Johannes Gutenberg's invention of movable type in 1439, printing process has been revolutionized and has been widely known all across Europe and America. The movable type allows a faster printing of books which in turn helped spread knowledge and education to many people.

Now printing has gone a long way because of technological advancement the people made. Books and other publications today can now be mass produced in a very short period of time while maintaining the quality of prints. There are now several ways of printing that publishers could choose from. Here are some of the well-known printing processes.

1. Offset Lithography

Famously known as Offset printing this process is considered the most cost-effective that is why many in the industry prefer this process. This also allows publishers to print high quantity of prints in faster time because the printing machine is very quick and easy to set up as long as plates are already available. Basically in offset printing, the roller plates are run through water and then ink. Ink adheres to areas with images (including texts and designs) while water on the white spaces of the layout. It is then pressed to a rubber plate before pressing on a paper. One of the major drawbacks of this printing process is the plate. Once a layout is already made into a plate, omissions cannot be easily changed.

2. Letterpress

This is the original process done by Gutenberg. Although it is clearly more advanced than the original press, the process is still the same. The image being printed is higher than the surface of the plate which will be pressed on the paper. With the technology becoming more advanced, this process is becoming less famous and obsolete.

3. Digital Printing

If you will be printing a layout full of images you might want your prints to be of high quality so that the images won't get blurry. The printing process that you should do is digital printing. This process is the most favored today because of its high quality prints and quick printing process from computer directly to the printer. Plates are not needed on digital printing so it needs lesser man power. This process however is expensive because of the ink and paper used by the printer. The colors can also be difficult to adjust or predict since the colors of the image to be printed might be different on the computer monitor.

4. Engraving

Most of company letterhead and stationery are still printed using this method. The images printed on the paper are raised or engraved creating a more defined and attractive image. This however is only used for corporate logos or formal party invitations because it is very expensive and strenuous process.

5. Electrostatic Printing

Just like the xerography process or dry photocopying invented by Chester Carlson, electrostatic printing invented by Georg Christoph Lichtenberg in 1778, does not need ink or plates to print. In this process, the paper is coated with zinc oxide which acts as insulator in the dark and conductor if exposed to light. This process is mainly used for short run printing just like geographical maps and is becoming famous because it is prints faster than inkjet printers.

Exercise 3. Complete the following sentences from the text:

1. The movable type allows a which in turn helped spread knowledge and education to many people.
2. Once a layout is already made into a plate, ... be easily changed.
3. If you will be printing a layout full to be of high quality so that the images won't get blurry.
4. This however is only used for invitations because it is very expensive and strenuous process.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Books and other publications today can now be mass produced in a very short period of time while maintaining the quality of prints.
2. Famously known as Offset printing this process is considered the most cost-effective that is why many in the industry prefer this process.
3. The printing process that you should do is digital printing. This process is the most favored today because of its high quality prints and quick printing process from computer directly to the printer.
4. Just like the xerography process or dry photocopying invented by Chester Carlson, electrostatic printing invented by Georg Christoph Lichtenberg in 1778, does not need ink or plates to print.

Exercise 5. Discuss this theme.

Print Quality



Exercise 1. Answer the questions:

1. What can you say about quality?
2. What is the inkjet printing?
3. What includes the output?
4. Do you use graphic design?

New words and expressions:

utilizing	использованный	пайдаланылған
patterns	шаблоны	үлгілер
trick	хитрость	қулық
requires	требуется	талап етіледі
inkjet	струйный	кездейсоқ
apparent	очевидно	анық
naked	голый	жалаң
hues	оттенки	реңктер

Exercise 2. Make up sentences using the following words and word combinations:

Graphic design, amount of color, the commercial printing, quality inkjet, output includes.

Read the text and discuss it:

Printing Quality

The combination of graphic design utilizing high resolution images printed at ultra high line screen values defines the photo quality printing process.

When designing for photo quality printing, graphic designers and printers start with high resolution images of 2400 dpi or higher? Traditional full color non-photo quality printing is done from images of 1200 dpi or less. Photo quality printing requires images to contain the most amount of color information possible. The high resolution images used in photo quality printing is saved in a CMYK file format to best utilize either the commercial printing process or inkjet printing photo quality output capabilities. CMYK dots of Cyan (blue), Magenta (red), Yellow, and Black are placed next to each other in specific patterns that trick the eye into seeing millions of colors. Photo quality inkjet printing transfers 4 or more toner colors to the substrate in a single cycle through the printer. In photo quality commercial printing each color of ink is applied separately.

The high resolution photos are printed (or output) at a line screen value of 1200 lines per inch. Traditional full color printing is done at a line screen ranging from 300 to 600 lpi. The resulting photo quality output is apparent to the naked eye and by using a micrometer. The output includes more dots of ink or toner within each square inch output - and - true color values and hues due to the greater amount of color information stored in the high resolution image or artwork file.

Exercise 3. Complete the following sentences from the text:

1. Traditional full color non-photo from images of 1200 dpi or less.
2. Photo quality printing requires of color information possible.
3. In photo quality commercial of ink is applied separately.
4. The resulting photo quality output and by using a micrometer.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. The combination of graphic design utilizing high resolution images printed at ultra high line screen values defines the photo quality printing process.

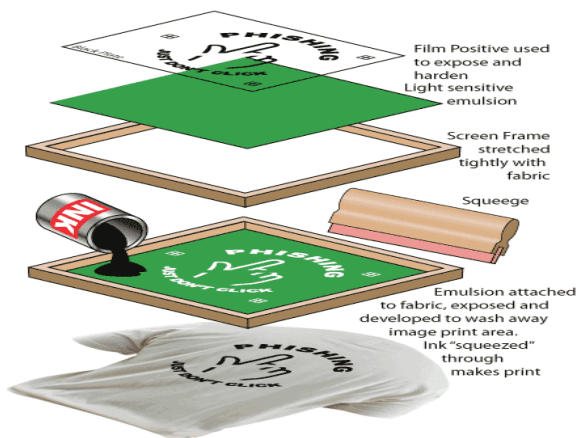
2. The high resolution images used in photo quality printing is saved in a CMYK file format to best utilize either the commercial printing process or inkjet printing photo quality output capabilities.

3. The high resolution photos are printed (or output) at a line screen value of 1200 lines per inch.

4. The output includes more dots of ink or toner within each square inch output - and - true color values and hues due to the greater amount of color information stored in the high resolution image or artwork file.

Exercise 5. Discuss this theme.

Screen Printing



Exercise 1. Answer the questions:

1. What kind of materials can be used in screen printing?
2. What is a significant characteristic?
3. When we use the oxidizers?
4. Why the utilization of screen printing presses has begun to increase?

New words and expressions:

arguably	возможно	мүмкін
versatile	универсальный	эмбебап
decals	отличительные знаки	айрықша белгілері
signage	указатели	көрсеткіштері
simplicity	простота	қарапайымдылық
dyes	красители	бояғыштар
rotary	вращающийся	айналмалы
curable	отверждаемый	қататын
solvents	растворители	еріткіштер
surfactants	поверхностно- активные вещества	үстіңгі беттегі белсенді заттар
caustics	каустика	натрий гидоокидінің техникалық атауы
oxidizers	окислители	тотықтандырғыштар

Exercise 2. Make up sentences using the following words and word combinations:

Variety of substrates, paperboard, circuit boards, production rates, posters, decals, application process.

Read the text and discuss it:

Screen Printing

Screen printing is arguably the most versatile of all printing processes. It can be used to print on a wide variety of substrates, including paper, paperboard, plastics, glass, metals, fabrics, and many other materials. Including paper, plastics, glass, metals, nylon and cotton. Some common products from the screen printing industry include posters, labels, decals, signage, and all types of textiles and electronic circuit boards. The advantage of screen printing over other print processes is that the press can print on substrates of any shape, thickness and size.

A significant characteristic of screen printing is that a greater thickness of the ink can be applied to the substrate than is possible with other printing techniques. This allows for some very interesting effects that are not possible using other printing methods. Because of the simplicity of the application process, a wider range of inks and dyes are available for use in screen printing than for use in any other printing process.

Utilization of screen printing presses has begun to increase because production rates have improved. This has been a result of the development of the automated and rotary screen printing press, improved dryers, and U.V. curable ink. The major chemicals used include screen emulsions, inks, and solvents, surfactants, caustics and oxidizers used in screen reclamation. The inks used vary dramatically in their formulations.

Exercise 3. Complete the following sentences from the text:

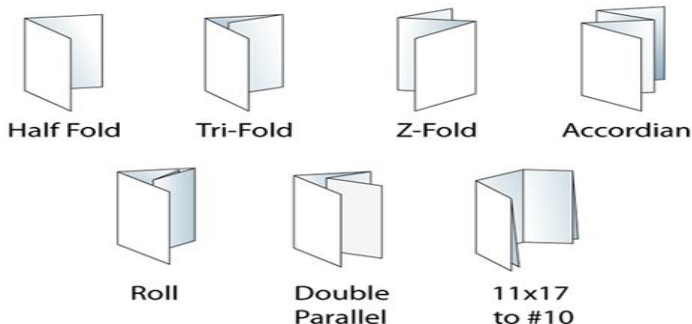
1. Including paper, plastics, ..., nylon and cotton.
2. The advantage of screen printing over other can print on substrates of any shape, thickness and size.
3. This allows for some very using other printing methods.
4. Utilization of screen has begun to increase because have improved.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Screen printing is arguably the most versatile of all printing processes. It can be used to print on a wide variety of substrates, including paper, paperboard, plastics, glass, metals, fabrics, and many other materials.
2. A significant characteristic of screen printing is that a greater thickness of the ink can be applied to the substrate than is possible with other printing techniques.
3. This has been a result of the development of the automated and rotary screen printing press, improved dryers, and U.V. curable ink.
4. The major chemicals used include screen emulsions, inks, and solvents, surfactants, caustics and oxidizers used in screen reclamation.

Exercise 5. Discuss this theme.

Folding



Exercise 1. Answer the questions:

1. What is the folding?
2. How do you understand pleated?
3. What kind of methods of folding do you know?
4. How many attempts might be there?

New words and expressions:

challenge	проблема	мәселе
current	ток	электр қуаты
attempts	попытки	ұмтылыс
laudable	похвально	мақтауға тұрарлық
eventually	в конечном итоге	нәтижесінде
preclude	исключает	есепке алмайды
modifying	модификаций	жаңарту
stacking	укладка	жайғастыру
tearing	разрывая	жырта, ажырата
pleated	плиссированные	қатпарланған

Exercise 2. Make up sentences using the following words and word combinations:

Taping, pieces together, cutting paper, tearing paper, geometric progression, confirmed by scholars.

Read the text and discuss it:

Britney's paper folding

The long standing challenge was that a *single* piece of paper, no matter the size, cannot be *folded* in half more than 7 or 8 times. Recently, reports have been made that Britney's paper folding record of folding a piece of paper in half 12 times has been broken. These current attempts, though laudable and will eventually be successful, are not satisfactory due to strict rules she followed to also preclude criticism from modifying the problem. Challengers have used methods including stacking separate pieces on top of one another, taping pieces together, cutting paper, tearing paper, and pleated (fan) folding instead of folding in half. These methods circumvent the principles of the simply defined paper folding problem and demonstrate a misunderstanding of why the challenge was thought to be impossible.

The most significant part of Britney's work is actually not the geometric progression of a folding sequence but rather the detailed analysis to find why geometric sequences have practical limits that prevent them from expanding.

Her book provides the size of paper needed to fold paper and gold 16 times using different folding techniques. Her equations have been confirmed by scholars at Cal Tech and Harvey Mudd and are posted on Wolfram MathWorld.

Exercise 3. Complete the following sentences from the text:

1. The long standing challenge was that a *single* piece of paper.....cannot be *folded* in half more than 7 or 8 times.
2. Challengers have used methods including on top of one another, ... and pleated (fan) folding instead of folding in half.

3. These methods circumvent the principles of the simply defined paper a misunderstanding of thought to be impossible.

4. Her book provides the size of paper needed 16 times using different folding techniques.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. These current attempts, though laudable and will eventually be successful, are not satisfactory due to strict rules she followed to also preclude criticism from modifying the problem.

2. Reports have been made that Britney's paper folding record of folding a piece of paper in half 12 times has been broken.

3. The most significant part of Britney's work is actually not the geometric progression of a folding sequence but rather the detailed analysis to find why geometric sequences have practical limits that prevent them from expanding.

4. Her equations have been confirmed by scholars at Cal Tech and Harvey Mudd and are posted on Wolfram MathWorld.

Exercise 5. Discuss this theme.

Graphic design



Exercise 1. Answer the questions:

1. What is the overlapping?
2. How to prepare the page layout?
3. What is the visual representation?
4. What does product package might include?

New words and expressions:

field	поле	аймак
subset	подмножеством	көп жағдайда
overlapping	перекрытие	жабу
to create	создать	шығару, жасау
page layout	макет страницы	парақтың үлгісі
pre-existing	уже	қолданыста бар
	существующие	
diverse	разнообразный	әртүрлі

Exercise 2. Make up sentences using the following words and word combinations:

Visual communication, space and image, graphic design, visual art, print advertisements, website graphics.

Read the text and discuss it:

Graphic design

Graphic design is the methodology of visual communication, and problem-solving through the use of type, space and image. The field is considered a subset of visual communication and communication design, but sometimes the term "graphic design" is used interchangeably with these due to overlapping skills involved. Graphic designers use various methods to create and combine words, symbols, and images to create a visual representation of ideas and messages. A graphic designer may use a combination of typography, visual arts and page layout techniques to produce a final result. Graphic design often refers to both the process (designing) by which the communication is created and the products (designs) which are generated.

Common uses of graphic design include identity (logos and branding), publications (magazines, newspapers and books), print advertisements, posters, billboards, website graphics and elements, signs and product packaging. For example, a product package might include a logo or other artwork, organized text and pure design elements such as images, shapes and color which unify the piece. Composition is one of the most important features of graphic design, especially when using pre-existing materials or diverse elements.

Exercise 3. Complete the following sentences from the text:

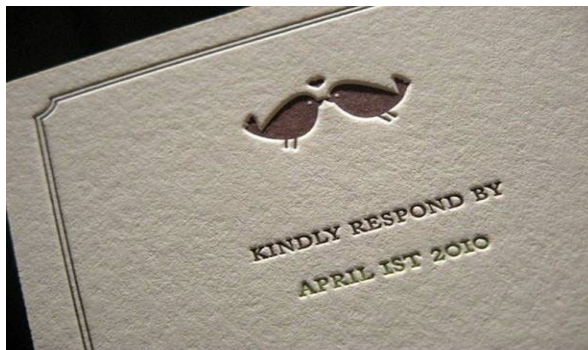
1. The field is considered a subset and
2. communication design.
3. Graphic design often (designing) by which the communication is created and which are generated.
4. Common uses of graphic identity (logos and branding).
4. Composition is one of features of graphic design.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Graphic design is the methodology of visual communication, and problem-solving through the use of type, space and image.
2. Graphic designers use various methods to create and combine words, symbols, and images to create a visual representation of ideas and messages.
3. Common uses of graphic design include identity (logos and branding), publications (magazines, newspapers and books), print advertisements, posters, billboards, website graphics and elements, signs and product packaging.
4. For example, a product package might include a logo or other artwork, organized text and pure design elements such as images, shapes and color which unify the piece.

Exercise 5. Discuss this theme.

Letterpress printing



Exercise 1. Answer the questions:

1. What is the meaning of viscous?
2. Why in letterpress used platens?
3. Letterpress printing is a mechanical technology or not?
4. How do you understand paperbacks?

New words and expressions:

relatively	сравнительно	салыстырмалы түрде
raised	подняты	көтерілген
viscous	вязкая	жабысқақ, тұтқыр
pasty ink	пастообразные чернила	паста тәрізді сия
via	через	арқылы
platens	валики	білікше
rigid	жесткая	қатты
predominant	преимущество	артықшылығы
antimony	сурьма	сүрме
offset	смещение	жылжыту
niche	ниша	қуыс, ойықша, текше

blanket	одеяло	көрпе
impose	наложить	бастыру
substrate	субстрат	тоғысу
viscosity inks	вязкость краски	баяудың
		тұтқырлығы
solely	исключительно	ерекше
rough	шероховато	кедір- бұдыр

Exercise 2. Make up sentences using the following words and word combinations:

Mechanical technology, printing plates, printing quality, flexography, offset printing, the substrate, rough surfaces.

Read the text and discuss it:

Letterpress printing

Letterpress (relief) printing, of which traditional letterpress and flexography form a part, is the oldest printing technology. Printing is done by means of raised printing elements. Letterpress printing is a mechanical technology in which a relatively high pressure is required to transfer the highly viscous, pasty ink to the paper via the hard printing elements. In the chronology of their development, presses and machinery are subdivided into hand presses and platens, high-speed presses and web presses, on the basis of the different pressing methods involved. For centuries letterpress printing with rigid printing plates, predominantly made from alloys of lead, tin and antimony, was the dominant printing technology. For many years letterpress printing has been increasingly losing favor, having been replaced primarily by offset printing, and it is now only used in niche areas. Letterpress printing is sometimes used for printed products such as paperbacks and telephone books that do not impose particularly high demands on printing quality, and for some daily newspapers. Indirect letterpress printing (letterset), in which the print image is transferred to the substrate from the inked-up printing plate via a blanket cylinder, is still used in certain special fields, packaging printing in particular.

In the last several decades, a modified letterpress printing method, flexography, has become increasingly more prevalent, especially in the packaging industry, for printing on the most varied materials. The term “flexography” was introduced at the beginning of the 1950s (it was previously known as “aniline printing”). Unlike letterpress printing, flexography uses low viscosity inks and resilient or soft, flexible printing plates, and the pressure applied between plate cylinder and substrate is low (“kiss printing”). Because of the flexible printing plates, which were formerly made solely from rubber and are now made mostly from photopolymeric plastic, printing can also be done on materials with very rough surfaces and even on fabrics.

Exercise 3. Complete the following sentences from the text:

1. Letterpress printing is a mechanical technology in which a to transfer the highly viscous, pasty ink to the paper via the hard printing elements.
2. In the chronology of their development, presses and into hand presses and platens.
3. Letterpress printing is sometimes used for and telephone books that do not impose particularly high, and for some daily newspapers.
4. In the last several decades, a method, flexography, ... more prevalent, especially in the packaging industry

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Printing is done by means of raised printing elements.
2. In the chronology of their development, presses and machinery are subdivided into hand presses and platens, high-speed presses and web presses, on the basis of the different pressing methods involved.
3. Indirect letterpress printing (letterset), in which the print image is transferred to the substrate from the inked-up printing plate via a blanket cylinder, is still used in certain special fields, packaging printing in particular.
4. The term “flexography” was introduced at the beginning of the 1950s (it was previously known as “aniline printing”).

Exercise 5. Discuss this theme.

Packaging81



Exercise 1. Answer the questions:

1. What is packaging?
2. When we use warehousing?
3. How is the packaging can be described?
4. What is the labelling?

New words and expressions:

enclosing	вшита	тігiлген
storage	хранение	сақтау
refers	относится	жатады
warehousing	складирование	қоймалау
preserves	сохраняет	сақтайды
integrated	интегрированы	кіріккен

Exercise 2. Make up sentences using the following words and word combinations:

Enclosing, protecting products, coordinated system, logistics, integrated into government, graphic communication.

Read the text and discuss it:

Packaging

Packaging is the technology of enclosing or protecting products for distribution, storage, sale, and use. Packaging also refers to the process of design, evaluation, and production of packages. Packaging can be described as a coordinated system of preparing goods for transport, warehousing, logistics, sale, and end use. Packaging contains, protects, preserves, transports, informs, and sells. In many countries it is fully integrated into government, business, and institutional, industrial, and personal use.

Package labeling (American English) or labeling (British English) is any written, electronic, or graphic communication on the package or on a separate but associated label.

Exercise 3. Complete the following sentences from the text:

1. Packaging is the technology of for distribution, storage, sale, and use.
2. Packaging can be described as a of preparing goods for transport.
3. Packaging contains, ..., informs, and sells.
4. Written, electronic, or graphic communication on the package or on a separate label.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Packaging is the technology of enclosing or protecting products for distribution, storage, sale, and use.
2. Packaging can be described as a coordinated system of preparing goods for transport, warehousing, logistics, sale, and end use.
3. Packaging contains, protects, preserves, transports, informs, and sells.
4. Package labeling (American English) or labeling (British English) is any written, electronic, or graphic communication on the package or on a separate but associated label.

Exercise 5. Discuss this theme.

Digital prepress



Exercise 1. Answer the questions:

1. With what prepress process begins?
2. Who made adjustments?
3. How do you understand tiny dots?
4. What is the screening?

New words and expressions:

screenings	просмотры	қаралымдар
convert	конвертировать	конверсиялау
crafted	созданный	жасалынған
lifelike	реалистичными	шынайы
sharp	резкое	өткір
stunning	потрясающий	ғажайып
transparencies	прозрачные	мөлдір
drum	барабан	барабан
proofing	теплоизолирующие	жылу айырғыш
adjustments	корректировки	түзетілімдер
deletions	удаления	өшіру
preflight	предполетный	ұшар алдындағы
scrutinized	тщательно	мұқият
corruption	коррупция	жемқорлық
fonts	шрифты	әріп үлгісі

Exercise 2. Make up sentences using the following words and word combinations:

Prepress houses, conventional cameras, digital files, artwork, paper for proofing.

Read the text and discuss it:

Digital prepress

Historically, prepress houses used a system of mechanical boards, paste-ups and conventional cameras to output film suitable for the printing press. With the introduction of the Apple IIgs in 1984, projects were not only being designed on computer, but software was developed that would convert digital files into press ready information. Today, prepress houses are able to work with large, complex files to produce film with special screenings, drop shadows, four-color images, traps and bleeds. This results in beautifully crafted pieces with lifelike photographs, sharp text and stunning graphics, all creating visual interest for the reader.

The prepress process begins with the creation of digital artwork saved in a software layout program such as Quark Express, the industry standard. The file is given to a prepress house, where transparencies of photos are drum scanned, turned into high resolution digital information, downloaded onto a disk and output on thick specialty paper for proofing. At this stage, color correction (minor adjustments) or retouching (major additions or deletions to an image) are done in Adobe Photoshop, an image manipulation and special effects software program. The high resolution images are dropped into the layout and a sent to the preflight department, where disks are scrutinized, with specialized software, like Extensis ProFlight, for corruption, missing logos, fonts and correct color. Once a file has passed thorough inspection, it is sent through a complex computer network to an image setter, a computer controlled device that outputs images as a pattern of millions of tiny dots on photographic paper that will be developed into film.

Exercise 3. Complete the following sentences from the text:

1. Today, prepress houses are able to work with large, ... with special screenings, drop shadows, four-color images, traps and bleeds.
2. This results in with lifelike photographs, sharp text and stunning graphics, all creating visual interest for the reader.
3. The high resolution images are and a sent to the preflight department.
4. Once a file has passed thorough inspection, it is sent through ...to an image setter.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. Historically, prepress houses used a system of mechanical boards, paste-ups and conventional cameras to output film suitable for the printing press.
2. With the introduction of the Apple IIgs in 1984, projects were not only being designed on computer, but software was developed that would convert digital files into press ready information.
3. The prepress process begins with the creation of digital artwork saved in a software layout program such as QuarkExpress, the industry standard.
4. Once a file has passed thorough inspection, it is sent through a complex computer network to an image setter, a computer controlled device that outputs images as a pattern of millions of tiny dots on photographic paper that will be developed into film.

Exercise 5. Discuss this theme.

Electronic Reproduction Technology



Exercise 1. Answer the questions:

1. How do you understand the electronic reproduction technology?
2. What do you see in the picture?
3. What is the versatility?
4. What is the classic industrial model?

New words and expressions:

features	особенности	ерекшеліктері
shape	форма	түр, келбеті
versatility	универсальность	эмбебаптық
restricted	ограничено	шектеу қойылған
erases	удаляет	өшіреді
commodities	товары	тауарлар
diffusion	диффузия	араласу, сіңу
immateriality	духовность	рухани
reductions	снижение	төмендеу
sobering	отрезвляюще	сауықтыра
elusive	недостижимый	қол жетпес

Exercise 2. Make up sentences using the following words and word combinations:

Mechanical reproduction, mechanical antecedents, industrial model, productivity gains.

Read the text and discuss it:

Electronic Reproduction

Two features, more than anything else, set electronic technologies apart from the technologies of mechanical reproduction that have shaped the cultural role of the book. The first is the versatility of the technology: unlike mechanical antecedents like the printing press, the typewriter, or the telegraph, the computer isn't restricted to a single role in production or diffusion. To a large extent, in fact, the technology erases the distinctions between the separate processes of creation, reproduction and distribution that

characterize the classic industrial model of print commodities, not just because the same technology is used at each stage, but because control over the processes can be exercised by at any point in the chain. (There's a nice indication of this in the way the names of modes of distribution undergo a semantic shift when they are applied to electronic domains. The difference between "posting" and "sending" an electronic memo has mostly to do with what commands a user has to enter to see the document; it is nothing like the difference between tacking a paper memo to an office bulletin board and putting copies of it in everyone's mailbox.)

The second important difference between the two technologies follows from the immateriality of electronic representations and the resulting reductions in the cost of reproduction. It remains to be seen whether information technology will make substantially lower the initial costs of producing electronic documents - there is not a lot of large-scale experience to go by here, and the sobering lesson of the last ten years is that the savings and productivity gains that people expected from the introduction of office automation have generally proven to be elusive. One thing is certain, though: electronic technology reduces the incremental costs of reproduction, by eliminating the economies of scale associated with the mass production of books. So the unit cost of making a copy or printout of an electronic file doesn't decrease with the number of copies made.

Exercise 3. Complete the following sentences from the text:

1. There's a nice indication of this in the way the names of a semantic shift when they are applied to electronic domains.
2. The second important difference between the of electronic representations and the resulting reductions in the cost of reproduction.
3. It remains to be seen whether information the initial costs of producing electronic documents - there is not a lot of large-scale experience.
4. One thing is certain, though: electronic technology reduces the incremental costs of reproduction

Exercise 4. Translate the sentences into Kazakh or Russian:

1. The difference between "posting" and "sending" an electronic memo has mostly to do with what commands a user has to enter to see the document; it is nothing like the difference between tacking a paper memo to an office bulletin board and putting copies of it in everyone's mailbox.)

2. The second important difference between the two technologies follows from the immateriality of electronic representations and the resulting reductions in the cost of reproduction.

3. The difference between "posting" and "sending" an electronic memo has mostly to do with what commands a user has to enter to see the document; it is nothing like the difference between tacking a paper memo to an office bulletin board and putting copies of it in everyone's mailbox.

4. So the unit cost of making a copy or printout of an electronic file doesn't decrease with the number of copies made.

Exercise 5. Discuss this theme.

Biography of Johann Gutenberg



Exercise 1. Answer the questions:

1. Who is the Johann Gutenberg?
2. When he was born?
3. Who helped him to carry on his experiments?
4. When his first book was printed?

New words and expressions:

obtained	получено	алынды
impatience	нетерпение	шыдамсыздық
wealthy	богатый	бай
determined	определяется	анықталады
contrive	надуманный	ойдан шығарылған
monks	монахи	монахтар
discouraged	обескуражен	түсінбей қалу
distinctly	отчетлив	анық, тайға таңба
		басқандай
completion	завершение	аяқталуы

Exercise 2. Make up sentences using the following words and word combinations:

Experimenting, movable type, quick way of printing, metal types.

Read the text and discuss it:

Johannes Gutenberg

Johannes Gutenberg was born 1395, in Mainz, Germany. He started experimenting with printing by 1438. He obtained backing in 1450 from the financier Johann Fust, whose impatience and other factors led to Gutenberg's loss of his establishment to Fust in 1455. Gutenberg's masterpiece, and the first book ever printed from movable type, is the "Forty-Two-Line" Bible, completed no later than 1455.

Gutenberg enjoyed reading the manuscripts and block books that his parents and their wealthy friends had; and he often said it was a pity that only rich people could own books. Finally he determined to contrive some easy and quick way of printing. Gutenberg did a great deal of his work in secret, for he thought it was much better that his neighbors should know nothing of what he was doing. He looked for a workshop where no one would be likely to find him. Gutenberg was now living in Strasburg, and there was in that city a ruined old building where, long before his time, a number

of monks had lived. There was one room of the building which needed only a little repairing to make it fit to be used. So Gutenberg got the right to repair that room and use it as his workshop.

All his neighbors wondered what became of him when he left home in the early morning, and where he had been when they saw him coming back late in the twilight. Gutenberg did not care much what people had to say, and in his quiet room he patiently tried one experiment after another, often feeling very sad and discouraged day after day because his experiments did not succeed. At last the time came when he had no money left.

He went back to his old home, Mainz, and there met a rich goldsmith and lawyer named Joahann Fust (or Faust). Gutenberg told him how hard he had tried in Strasburg to find some way of making books cheaply, and how he had now no more money to carry on his experiments. Fust became greatly interested and gave Gutenberg what money he needed.

First of all it is thought that he made types of hard wood. Each type was a little block with a single letter at one end. Such types were a great deal better than block letters. The block letters were fixed. They could not be taken out of the words of which they were parts. The new types were movable so they could be set up to print one page, then taken apart and set up again and again to print any number of pages. But type made of wood did not always print the letters clearly and distinctly, so Gutenberg gave up wood types and tried metal types. This worked much better, and Gutenberg was progressing well toward the completion of the first book ever printed by movable type: the Bible in Latin.

Exercise 3. Complete the following sentences from the text:

1. He started experimenting by 1438.
2. Gutenberg did a great deal of his work in secret, for he that his neighbors should know nothing of what he was doing.
2. He went back to his old home, Mainz, and there met a ... and lawyer named Joahann Fust (or Faust).
4. They could not be of which they were parts.

Exercise 4. Translate the sentences into Kazakh or Russian:

1. He obtained backing in 1450 from the financier Johann Fust, whose impatience and other factors led to Gutenberg's loss of his establishment to Fust in 1455.

2. Gutenberg enjoyed reading the manuscripts and block books that his parents and their wealthy friends had; and he often said it was a pity that only rich people could own books.

3. All his neighbors wondered what became of him when he left home in the early morning, and where he had been when they saw him coming back late in the twilight.

4. This worked much better, and Gutenberg was progressing well toward the completion of the first book ever printed by movable type: the Bible in Latin.

Exercise 5. Discuss this theme.

Test assignments for self-control:

Test Unit 1

1. The properties of materials are sometimes referred to as....., as compared to structure-insensitive properties.
 - a) structure-sensitive
 - b) to structure-insensitive
 - c) structure – density
2. There are many possible complex interrelationships among the structure of a material and its service performance.
 - a) mobility
 - b) internal
 - c) rate
3. Microscopic properties pertain to, and their interactions.
 - a) parts
 - b) impurities
 - c) atoms, molecules
4. Physical and mechanical properties the more and wisely will he/she be able to choose the proper material for a given design.
 - a) unquickly
 - b) quickly
 - c) seldom
5. mechanics, once restricted to the academic halls, has now become a bread-and-butter topic.
 - a) equal
 - b) quantum
 - c) phenomenon
6. Most impact test use a calibrated hammer a notched or unnotched test specimen.
 - a) failure
 - b) to bite
 - c) to strike
7. is a suitable criterion for designing components that are to be subjected to static loads, for cyclic loading the behavior of a material must be evaluated under dynamic

conditions.

- a) yield strength
- b) fatigue strength
- c) extended

8. A typical creep curve is a plot of the..... against time of a wires subjected to a tensile load at a given temperature.

- a) elongation
- b) stainless
- c) twinning

9. In over of all designs a material is selected primarily on the basis of yield strength and ability to fill space at the lowest cost.

- a) 80 percent
- b) 65 percent
- c) 90 percent

10. The effect of rising production capacity and strong competition, as found in the polymer industry.....

- a) since the 1945s
- b) since the 1950s
- c) since the 1959s

Test assignments for self-control:

Test Unit 2.

1. In 2010 more than worth over 3.5 billion Euros were produced in Germany.
 - a) 500 million books
 - b) 250million books
 - c) 100 million books
2. .. were spent in Germany in 2010 on books, brochures, magazines, and newspapers.
 - a) Between US\$ 15 and US\$ 45 per month and household
 - b) Between US\$ 35 and US\$ 55 per month and household
 - c) Between US\$ 20 and US\$ 55 per month and household
3. The developed its independent appearance over time.
 - a) periodicals
 - b) printed book
 - c) magazines
4. Printing is done by means of elements.
 - a) raised printing
 - b) highest printing
 - c) lowest printing
5. Letterpress printing is sometimes used for printed products such as
 - a) books and magazines
 - b) paperbacks and telephone books
 - c) papers
6. The long standing challenge was that a *single* piece of paper, no matter the size, cannot be *folded* in half more than
 - a) 7 or 8 times
 - b) 2 or 7
 - c) 6 or 15

7. Screen printing is arguably the most versatile of printing processes.
- a) 1
 - b) 5
 - c) all
8. Packaging is the technology of or protecting products for distribution, storage, sale, and use.
- a) enclosing
 - b) made
 - c) outclosing
9. Prepress houses are able to work with....., complex files.
- a) small
 - b) little
 - c) large
10. Johannes Gutenberg was born, in Mainz, Germany.
- a) 1395, in Mainz, Germany.
 - b) 1365, in Mainz, Germany.
 - c) 1296, in Mainz, Germany.

Keys:

Test Unit 1	1	2	3	4	5	6	7	8	9	10
1	a	b	c	b	b	c	a	a	c	b

Test Unit 2	1	2	3	4	5	6	7	8	9	10
1	a	c	b	a	b	a	c	a	c	a

GLOSSARY

Accreditation – the formal recognition by an independent body, generally known as an accreditation body, that a certification body is capable of carrying out certification. Accreditation is not obligatory but it adds another level of confidence, as ‘accredited’ means the certification body has been independently checked to make sure it operates according to international standards.

Austenite – a solid solution of carbon in a nonmagnetic form of iron, stable at high temperatures. It is a constituent of some forms of steel.

"Titanium can reduce carbon in austenite by forming very stable carbides."

Anneal - heat (metal or glass) and allow it to cool slowly, in order to remove internal stresses and toughen it.

"The heat of welding will anneal the copper in the heat-affected area adjacent to the weld and reduce the strength provided by cold working."

Bronze - copper alloys with aluminum, beryllium, tin, lead, etc., in addition to zinc (zinc may be included in the composition of the alloying element as bronze)

Certification - the provision by an independent body of written assurance (a certificate) that the product, service or system in question meets specific requirements.

Compliance mark - sign on the legality of products and services.

Criteria for matching of products - definition that specifies the similarity sign products with regulations.

Declaration of Conformity - asserting document compliance of produced products and rendered services.

Discreteness - (From Latin word *discretus*) – dividing, discontinuous

Fragility - state of the material in which the failure occurs without appreciable plastic deformation

Hardness - ability of a material to resist indentation in the surface of a solid body

Inspection audit- verification of the accreditation body for compliance quality sign of products with regulations.

Iron - ferrous alloys with carbon

ISO Survey – 2012 Every year ISO performs a survey of certifications to its management system standards. The latest edition shows a significant increase in certificates for ISO 27001 (information security) and ISO 22000 (food safety management) as well as for energy and environmental management.

Modification - (From Latin word modification) change, variation.

Parameter - (From Greece word parametron - measure) quantity characterizing a property of the process, phenomenon, or system, machine, or devices.

Polymers - Macromolecular substances composed of giant molecules consisting of repeating units of the elementary (chains)

Plastics - artificially produced non-metallic materials, consisting mainly or entirely of high-molecular compounds based on natural or synthetic polymers

Pearlite – a finely laminated mixture of ferrite and cementite present in cast iron and steel, formed by the cooling of austenite.

"The structure now consists of free cementite and pearlite ."

Qualimetric compliance - Determine the suitability of products for demanded regulations.

Quasi - (From Latin word quasi) supposed.

Registration – certification is very often referred to as registration in North America

Reliability - The ability of the body to maintain over time within the established values of all parameters characterizing the functions required in a given mode and conditions of use

Solid solution – a solid mixture containing a minor component uniformly distributed within the crystal lattice of the major component.

Steel - iron-carbon alloys containing carbon

Strength - the body's ability to resist deformation

Selective - one of the principles of standardization.

Services - (work) operating action that satisfies the customer's requirements.

Simplification - Simple, cost-effective and technically available kind of standardization.

Succession - the use of constructive decisions previously already taken other developed production vehicles to new machines.

Standardization - verb (From Latin word standard- norm, sample)

to bring to or make of an established standard size, weight, quality, strength, : to standardize manufactured parts.

Services - (work) operating action that satisfies the customer's requirements.

Succession - the use of constructive decisions previously already taken other developed production vehicles to new machines.

The structure of the metal or alloy - the nature and positioning of the phases in the metal or alloy

Unification - (From Latin word unus- one) -

the process of unifying or uniting; union:

the state or condition of being unified: The unification of the manufacturing and distribution functions under one executive has advantages.

Unitization - method of establishing and operating the products.

White cast iron - iron, in which all the carbon associated with iron in the form of cementite. White cast iron is light (white) kink, high hardness and brittleness

ACRONYMS

BIPM	International Bureau of Weights and Measures
CN	Common Name
CA	Certification Authorities
DN	Distinguished Name
GOST-K	State standardization of Kazakhstan
GDP	Gross Domestic Product
IAF	International Accreditation Forum
ILAC	International Laboratory Accreditation Cooperation
ISO	International Organization for Standardization
IEC	International Electrotechnical Commission
IFCC	International Federation of Clinical Chemistry and laboratory Medicine
IUPAC	International Union of Pure and Applied Chemistry
IUPAP	International Union of Pure and Applied Physics
JCGM	Joint Committee for Guides in Metrology
JCS	Joint Committee of Services
NCES	Net-Centric Enterprise Services
OIN	in French for Organization internationale de normalisation
OIML	Organisation Internationale de Metrology Legale
VIM	International vocabulary of metrology
WTO	World Trade Organization
WELMEC	Western European Legal Metrology Cooperation

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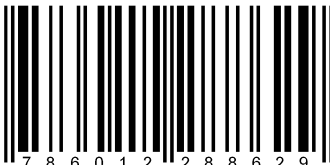
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