PART 2. CLASSIFICATION OF CUTTING TOOLS

LEAD-IN

1. **Answer the following questions.**
   1. What types of cutting tools do you know?
   2. Give examples of single-point cutting tools and multiple-cutting tools.
   3. What advantages of indexable tools can you name?

2. **Which of the following can you see in the pictures? There is one extra cutting tool.**
   - Grinding wheel
   - Broach
   - Drill
   - File
   - Saw
   - Milling cutter
   - Turning tool

1.  
2.  
3.  
4.  
5.  
6.  
3  **Match the columns to make sentences.**

<table>
<thead>
<tr>
<th>1. The single-point cutting tool</th>
<th>is known as a tool with a mechanically clamped insert.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Multiple-point cutting tools</td>
<td>are known as b) a tool that has one effective cutting edge.</td>
</tr>
<tr>
<td>3. A solid tool</td>
<td>c) tools that remove materials on two or more cutting edges simultaneously</td>
</tr>
<tr>
<td>4. Indexable tool</td>
<td>d) a tool having the same material throughout</td>
</tr>
</tbody>
</table>

**READING**

4  **Read the text and fill in the word combinations (A-H) which best fit each paragraph (1–6). There is one extra sentence which you do not need to use.**

A  Regrinding of these tools
B  roughing tools
C  special groups of
D  a solid tool
E  a screw
F  metal-cutting tools
G  turning tools
H  cutting

**CUTTING TOOLS CLASSIFICATION**

The number and types of cutting tools used is known to be very large. There are turning tools, milling cutters, drills, broaches and etc.; the type of cutter depends on the machine which employs it. Tools can also be classified as being (1) ________ or finishing tools according to the task: to take deep cuts or to achieve better accuracy and surface finish.

The cutting tools mention above can further be divided into single-point and multipoint tools. The single-point cutting tool is the most universally used and can be defined as a tool that has one effective cutting edge. Ordinary lathe or (2) ________ that do turning, facing, or boring operations are examples of single-point cutting tools. Tools that remove material on two or more cutting edges simultaneously are known as multipoint cutting tools.
Another general grouping of cutting tools in common use gives the following types:

- (3) ________________ having the same material throughout;
- a composite type with the cutting edge in the form of a tip which is brazed or soldered on to the shank;
- an indexable type where a small piece of the cutting material is held in a bar or tool holder by means of (4) _______ or wedge.

Indexable inserts are made so precisely that after (5) ________________ edge has dulled, the insert may be unclamped, rotated to the next cutting edge, reclamped, and cutting continued without any change in the position of the toolholder. (6) ________________ is generally more costly than replacing them. Thus, they are discarded after all cutting edges have been dulled.

In general, cutting tools, used for various metal-cutting operations include quite a wide range of shapes and may appear to have nothing in common but all (7) ________________ in general conform to certain fundamental principles, as follows: the tool is harder than the metal; the tool is so shaped that its edge can be effective in cutting or shearing off the metal; and the tool is strong or rigid enough to resist the cutting pressure but keen enough to sever the metal.

5 Read the text again and underline the main types of cutting tools. Can you think of any others? What are the main groups of single-point tools according to the text?

VOCABULARY PRACTICE

6 Fill in: brazed, resist, dulled, shaped, sever, remove.
1. A composite type is _______ or soldered on the shank.
2. Indexable inserts are discarded after all cutting edges have been _______.
3. The tool is so ________________ that its edges can be effective in cutting the metal.
4. Multipoint cutting tools _______ material on two or more cutting edges simultaneously.
5. The tool is rigid enough to ________________ the cutting pressure, but keen enough to ________________ the metal.

7 Match the types of cutting tools 1-6 to the definitions a-f, then make sentences.
a) a long tapered multipoint cutting tool used primarily for enlarging holes in one stroke.

b) a single-point cutting tool used on lathes for creating circular parts

c) a round, end cutting tool with one or more cutting lips and one or more straight or helical flutes used to create cylindrical holes by rotational action.

d) a hand tool used to shape material by cutting. It typically takes the form of a flat hardened steel bar covered with a series of sharp edges or teeth.

e) a rotary cutting tool composed of small grains held together by a bonding material and used to finish parts.

f) rotary multipoint cutting tool used to produce flat or curved surfaces.

8 Match Russian and English equivalents.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>b</td>
<td>Turning tool</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Milling cutter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Drill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Broach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>File</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Abrasive wheel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9 Complete the sentences with the words given:
1. Lifeblood of any profitable metalworking shop is …
2. The most widely used coating today is …
3. The TiCN coating can be considered as one of the most … coating on the market.
4. Some coatings become … when heated.
5. TiCN coatings are mostly applied by the physical … process.
6. TiAlN coatings are often supposed to be the … of Al₂O₃ coatings.
**GRAMMAR PRACTICE**

*The Passive Voice*

<table>
<thead>
<tr>
<th>Tense</th>
<th>Active</th>
<th>Passive</th>
<th>Note:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>to be + Participle II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>drill(s)</td>
<td>am drilled</td>
<td>It drills /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>is drilled</td>
<td>It is drilled</td>
</tr>
<tr>
<td>Past</td>
<td>drilled</td>
<td>was drilled</td>
<td></td>
</tr>
<tr>
<td>Future</td>
<td>will drill</td>
<td>will be drilled</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>am is drilling</td>
<td>am is being drilled</td>
<td>It is drilling /</td>
</tr>
<tr>
<td></td>
<td>are</td>
<td>are</td>
<td>It is being drilled</td>
</tr>
<tr>
<td>Past</td>
<td>was drilling</td>
<td>was being drilled</td>
<td></td>
</tr>
<tr>
<td></td>
<td>were</td>
<td>were</td>
<td></td>
</tr>
<tr>
<td>Future</td>
<td>will be drilling</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perfect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>have asked</td>
<td>have has been asked</td>
<td>It has drilled /</td>
</tr>
<tr>
<td></td>
<td>has drilled</td>
<td>has been drilled</td>
<td>It has been drilled</td>
</tr>
<tr>
<td>Past</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future</td>
<td>will have drilled</td>
<td>will have been drilled</td>
<td></td>
</tr>
</tbody>
</table>

**Modal Verbs**

Can/could
May/might
Must/have to
Should/would
Needn’t

have been done
be done

10  **Read the sentences a-f and write out the passive forms in the table below, then answer the questions 1-4.**

a) This type of machine tool is being referred to computer numerical control, better known as C.N.C.
b) The workpiece is mounted on the table that controls the feed against the cutter.
c) The steel manufacture has been considerably increased recently.
d) The wheel is composed of many small grains of abrasive.
e) Concrete units have been brought to the site.
f) The substance was being heated for three hours.

| Simple | 1.  
|        | 2.  
|        | 1.  
|        | 2.  
| Perfect| 1.  
|        | 2.  
1. How do we form the Passive?  
2. Are there any sentence(s) with an agent?  
3. How do we form the passive of modal verbs?  
4. When do we use *with* or *by* to introduce the agent?  

11 **Put the verbs in brackets in the correct Passive form (Simple, Progressive or Perfect).**

1. Tools (always be) reliable helpmates in all fields of activities.  
2. The twist drill bit (invent) by Steven A. Morse in 1861.  
3. New materials and advanced coatings (develop) at present to prolong tool life.  
4. Machining with geometrically specified cutting tools (require).  
5. The knives (sharpen) in a workshop at the moment.  
6. Various cutting tools (use) during the whole history.  
7. Yesterday this mill cutter (use) by the apprentice, so there is something wrong with it.  
8. It must (produce) of steel; otherwise it wouldn’t be so strong and tough.  
9. The best performance of cutting tools (achieve) with the help of special computer programs.  
10. The heat treatment of a material (finish) by the time a group of foreign engineers entered the workshop.  

12 **Use the prompts to make complete passive sentences, as in the example.**

1. designed\ existing hole\ or\ A broach\ an\ may also\ be designed to pushed or pulled through \be\  
   *A broach may also be designed to be pushed or pulled through an existing hole.*  
2. as either/ Abrasives/ may be / natural/ classified/ or synthetic/  
3. by a chuck / The drill bit/ gripped // is being / the drill /at one end of
4. used in / are usually/ Drills with a hammer action / hard materials/
5. the cutter/ The chips/ disposed/ are/ behind

13 **Translate into Russian.**

1. All means of production have been recently modernized in this field.
2. Much attention is being given at present to the modern equipment of research laboratories.
3. Every tool, machine and materials used by the engineer to accomplish his purpose stems directly from machine-tools or has been evolved from machines which themselves were produced by machine-tools.
4. Much is being done to improve the conditions for research work.
5. Many old plants and shops are being expanded and reconstructed now.
LISTENING

14 Listen to three monologues. You will hear it twice. As you listen for the first time, answer questions 1-3. As you listen for the second time, answer questions 4-8.

For questions 1-3, choose the correct answer (A, B, C or D). You have 30 seconds to read questions 1-3.

1. How can you name the engineers who focus on dam, flood control, wells and reservoirs?
   A Environmental engineers
   B Hydraulic and irrigation engineers
   C Traffic engineers
   D Civil engineers

2. What must mechanical engineers know about?
   A carbide
   B kitchen
   C machine
   D design

3. What is the specific area where materials engineers can be found more often?
   A education
   B research
   C selling or marketing
   D metals or electronics

For questions 4-8, choose the correct answer (A, B, C or D). You have 40 seconds to read questions 4-8.

4. What do civil engineers design?
   A roads, bridges
   B geology and hydraulics
   C recycling plants
   D commuter railroads

5. When may mechanical engineers be involved in selling the product?
   A the work can be demanding
   B an item is highly technical
   C to make products last longer
   D the new material is tested repeatedly

6. What are the main objects of environmental engineers?
   A wells and reservoirs
   B underground subways
   C wastewater products, garbage disposal and recycling plants
   D structure of substances

7. What is the specialization of traffic engineers?
   A to create physical infrastructure
   B to deal with wastewater products
   C to improve roads and highways
   D to design roads
8. What is the most important requirement to be an engineer?
   A  to have basic knowledge of engineering
   B  to have a specialization in specific area
   C  to pass entry exams
   D  a bachelor’s degree

16  Gap filling
   Fill the gaps in the sentences below with suggested words and word combinations. Listen again if necessary.

<table>
<thead>
<tr>
<th>materials</th>
<th>recycling</th>
<th>educational</th>
<th>bachelor’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>design</td>
<td>materials science</td>
<td>railroads</td>
<td>machine</td>
</tr>
</tbody>
</table>

1. They combine knowledge of ____________, engineering, economics, physics, geology and hydraulics to create physical infrastructure essential to modern life.
2. Environmental engineers deal with wastewater products, garbage disposal and ____________ plants.
3. Traffic engineers specialize in designing “people-movie systems”, underground subways, commuter ____________.
4. A bachelor’s degree is the minimum ____________ requirement.
5. Some mechanical engineers, for example, do the research needed to create a product itself, while still others ____________ the machines to make the product.
6. Mechanical engineers often get to see their designs turned into new products or ____________.
7. Often called a ____________ person in industry, this inventor plays key role in the manufacture of any product.
8. Entry-level positions require a minimum of a ____________ degree from an accredited engineering program.

17  Detailed Comprehension
   Listen again and read these sentences, then decide which are true ☑ or false ☐?
   1. Becoming a civil engineer is a lot of work.
   2. Mechanical engineers also design everyday items like kitchen appliances and power tools.
   3. Some mechanical engineers, for example, don’t do the research needed to create a product itself, while still others design the machines to make the product.
   4. Being a mechanical engineer, you’ll need excellent math and science skills, plus the ability to think analytically and to deal with abstract ideas.
   5. This job of materials engineer is multi-faceted – part inventor, part scientist.
**PREPARING FOR PRESENTATION**

18 Prepare to introduce and state the purpose of the presentation of your own by completing the notes below. Then make up your own presentation, based on the topics “Cutting tools in every day life”, “Cutting tools in industrial application”, “Classification of cutting tools”.

<table>
<thead>
<tr>
<th>Perhaps we should begin.</th>
<th>or</th>
<th>OK, let’s get started.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good morning / afternoon / evening, everyone.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thanks for coming. I’m …………………</th>
<th>And, as you know, I’m ….</th>
</tr>
</thead>
<tbody>
<tr>
<td>..........................................................</td>
<td>..........................................................</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>This morning I’m going to be</th>
<th>- talking to you about</th>
</tr>
</thead>
<tbody>
<tr>
<td>- telling you</td>
<td>- showing you</td>
</tr>
<tr>
<td>- reporting on</td>
<td>- taking a look at</td>
</tr>
<tr>
<td>..........................................................</td>
<td>..........................................................</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>So, I’ll start off by</th>
<th>- filling you in on the background to</th>
</tr>
</thead>
<tbody>
<tr>
<td>- bringing you up-to-date on</td>
<td></td>
</tr>
<tr>
<td>- giving you an overview of</td>
<td></td>
</tr>
<tr>
<td>- making a few observations about</td>
<td></td>
</tr>
<tr>
<td>- outlining</td>
<td></td>
</tr>
<tr>
<td>..........................................................</td>
<td>..........................................................</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>And then I’ll go on to</th>
<th>- highlight what I see as the main</th>
</tr>
</thead>
<tbody>
<tr>
<td>- put the situation into some kind of perspective</td>
<td></td>
</tr>
<tr>
<td>- discuss in more depth the applications of</td>
<td></td>
</tr>
<tr>
<td>- talk you through</td>
<td></td>
</tr>
<tr>
<td>- make detailed recommendations regarding</td>
<td></td>
</tr>
<tr>
<td>..........................................................</td>
<td>..........................................................</td>
</tr>
</tbody>
</table>
**REVISION TASK**

**CUTTING TOOLS**

Across
3. It is a tool designed primarily for the purpose of digging or removing earth.
6. It is a long-edged piece of metal, used as a cutting and thrusting weapon in many civilizations throughout the world.
7. A holemaking operation.
9. A hand tool used to shape material by cutting. It typically takes the form of a flat hardened steel bar covered with a series of sharp edges or teeth.
10. Part of a tool by which it is held in the machine and rotated.

Down
1. A block of solid material that is shaped like a narrow V in cross section and can be pushed or driven between two objects or parts of an object in order to split or secure them.
2. Machining process used to produce circular parts with single point cutters.
3. A tool that uses a hard blade or wire with an abrasive edge to cut through softer material.
4. A hard material, often a mineral, that is used in grinding wheels.
7. A round, end cutting tool with one or more cutting lips and one or more straight or helical flutes used to create cylindrical holes by rotational action.
8. A replaceable tool bit with several cutting points.
11. It is an implement that has been used for millennia to shape, split and cut wood, harvest timber, as a weapon and a ceremonial or heraldic symbol.