

Technical English

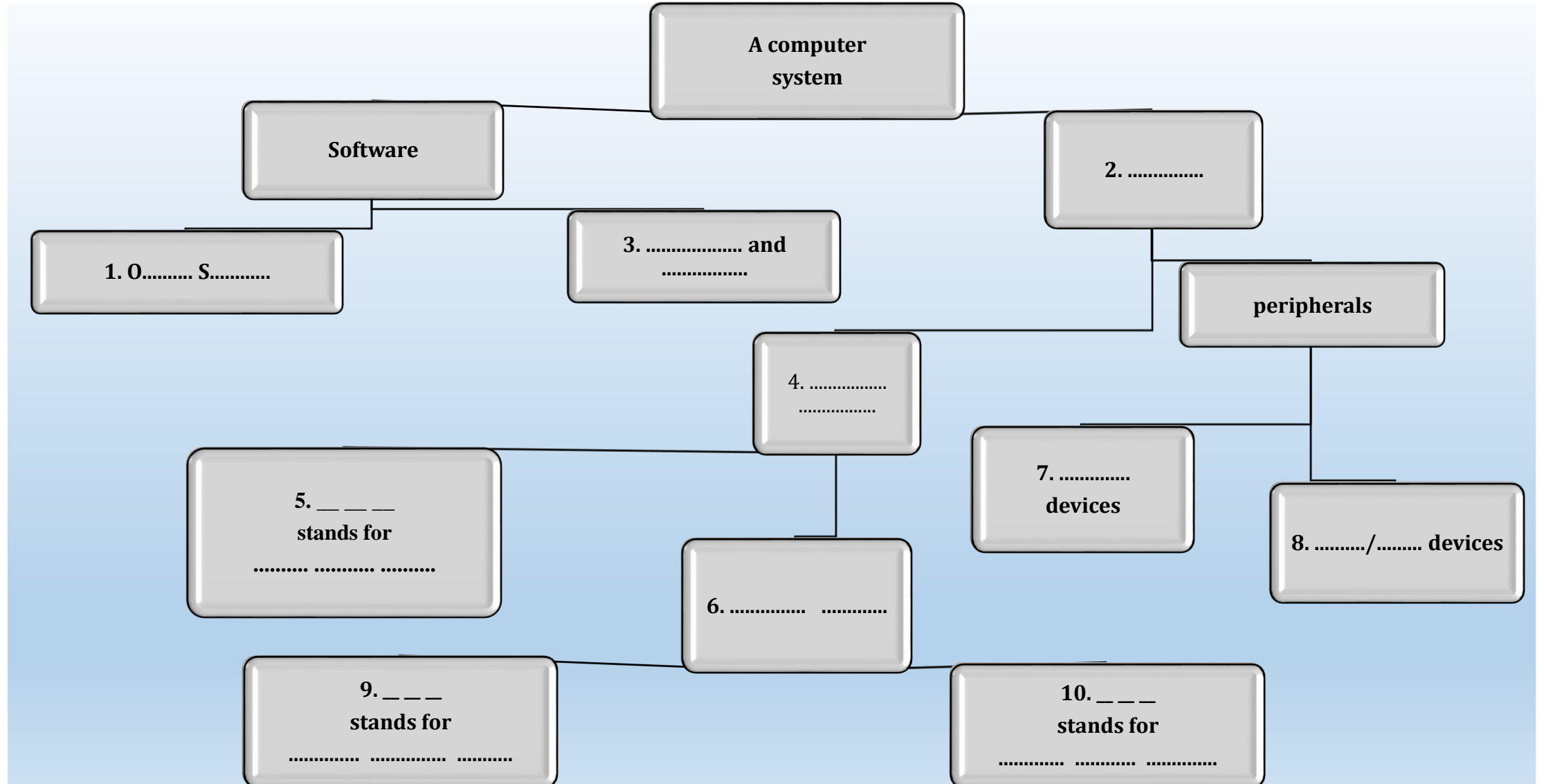
Chapter One

Computer, computing and data

- **In this chapter, you will study:**
 - ⇒ **The basic parts of a computer**
 - ⇒ **Review vocabulary related to computer parts**
 - ⇒ **Learn how to make definitions in scientific texts**
 - ⇒ **The structure of microchips and transistors**
 - ⇒ **Listen to a talk about how transistors can be made in a more cost-effective way**
 - ⇒ **Different types of computers**

Computer and its constituent parts

I. Tuning-in



II. Reading section

A computer and its constituent parts

- **Introduction**

To compute comes from the Latin word *computare* meaning *to count, sum up or reckon together* and computing means *arithmetic, accounting, or reckoning*. Once in France in 16th century, the term computer referred to a person who did accountings or computations, like what was done by abacuses or later calculators; however, today, it almost generally and universally refers to automated electronic machines used for processing, storing and displaying information as it is possible to encode any kind of information numerically. Their capacity to store and handle huge amounts of data has extended their usage to many different areas from online education, accounting and banking, weather forecast, databases and communication. Carrying out financial transactions, performing mathematical operations, accessing and surfing the Internet and doing research have all been made possible through computers.



Self-check

Locate the names of the two above objects in the text.

Parts of a computer

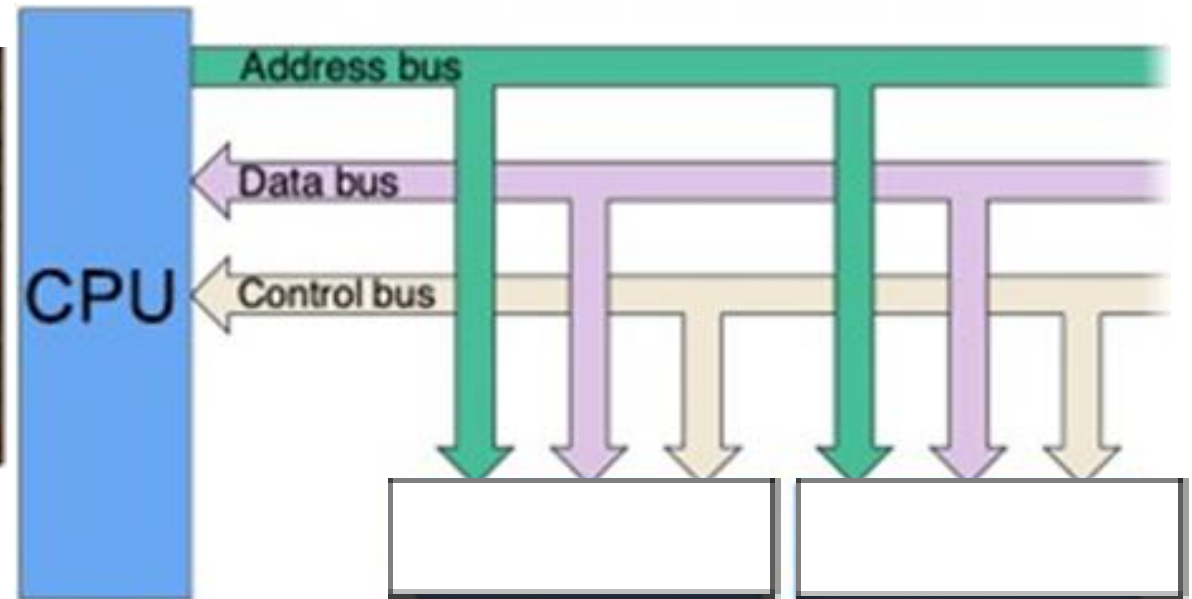
- But what are the constituent parts of a computer? A computer is composed of two main parts: hardware and software. Hardware, which refers to the physical parts of a system, includes two components: main parts and peripherals. Main parts encompass the central processing unit (CPU) or the processor which is the brain or the nerve center of the computer and the primary memory which is a collection of RAM (random access memory) or ROM (read only memory) chips while peripherals include storage devices (hard drives, DVD/CD drives, flash drives) and input/output devices. All components are connected to the system through buses, which are electrical paths or channels which maintain a strict schedule, "picking up" data and "dropping it off" at a regular interval. In other words, data, control and address buses are the pathways between the CPU and other components. Also, expansion slots are used to add expansion cards such as graphic, memory and network

- The CPU is a single chip which executes program instructions and coordinates activities that takes place within the computer system. A chip is a small piece of silicon with a complex electrical circuit called an integrated circuit or a small wafer of semiconductor material embedded with integrated circuitry. In the CPU, you can find three main parts: The *control unit* which is responsible for evaluating instructions in the user's program, interpreting each instruction and making the circuits and other components of the system execute their specified functions; the second part is *arithmetic and logic unit*, responsible for performing mathematical calculations (+, -, ×, etc.) on the one hand and logical operations on the other (AND, OR, NOT, etc.). Finally, the third part is *the immediate access store* (IAS, also called registers) which includes high speed units of memory holding programs and data that the user is currently working with. One register called program counter records the next instruction while another register called instruction register keeps the instruction that is being executed at the moment.

- These components are integrated together as a single microprocessor that is mounted on the computer's motherboard. The power of your system depends on the power and speed of its CPU. A system clock is an electronic device which regulates the internal components of the computer by issuing a steady high-frequency signal at fixed intervals which ensures all those components are synchronized and measures the flow of data. Clock speed is assessed in gigahertz (e.g. 4 GHz).
- Random Access Memory or RAM (also known as *read write memory* or the *main memory* or the *primary memory* is the place where the programs and data that the CPU requires are stored during the execution. It is a volatile memory as the data loses when the power is turned off. In other words, the programs and data that pass through the CPU or processor must be loaded into part of the primary or main memory in order to be processed. This temporary place for transferring a copy of a program (Word Processor, Antiviruses for example) is RAM. On the other hand, read only memory (ROM) is the primary non-volatile memory which stores crucial information, routines and instructions essential to operate the CPU, like the program essential to boot the computer to control communication with peripherals by BIOS (basic input/output system) and also operation of calculators and some peripherals (e.g. printers). It always retains its data, is used in embedded systems or where the programming needs no change. Another difference between RAM and ROM is that you can expand the RAM capacity by adding extra chips in small circuit boards called dual in-line memory modules (DIMMs) or commonly named RAM stick.

Self-check

Try to complete the following image based on the information presented in this text.

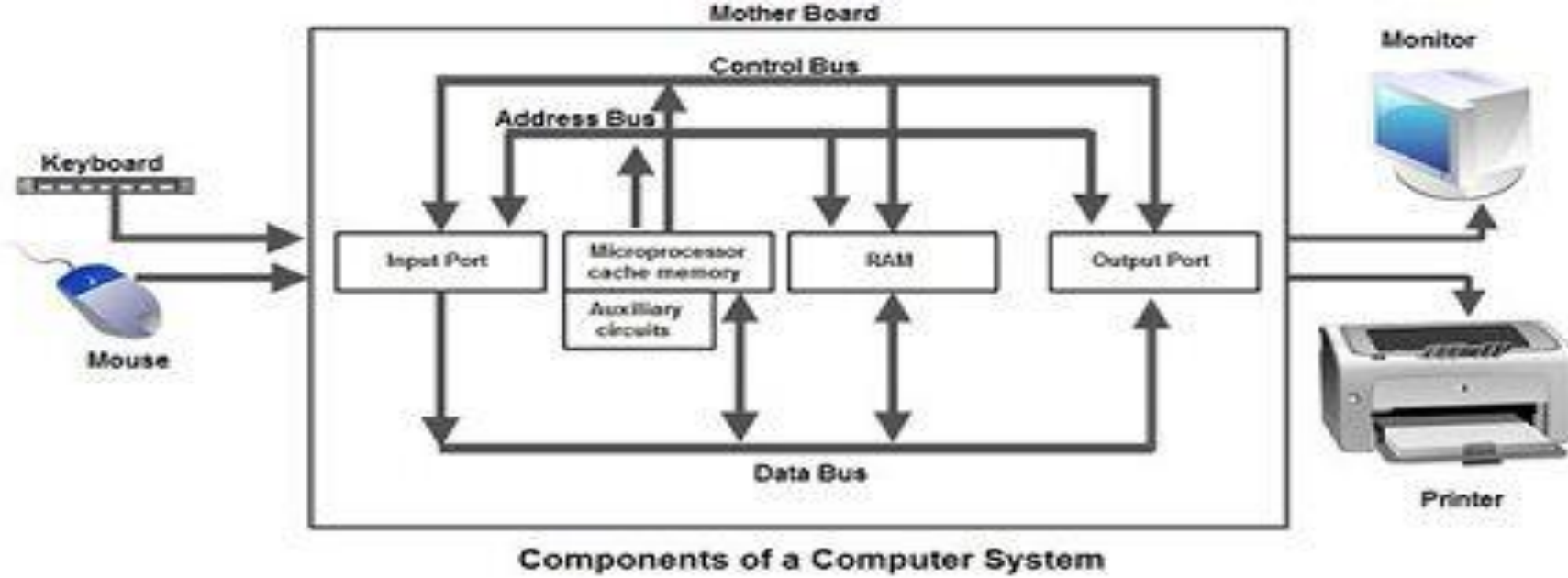


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- Software on the other hand refers to programs and applications which are needed for running the system generally and for different purposes. Software include Operating System (OS) and all different applications and programs needed for different operations and purposes. Games, antiviruses, processors, engineering, accounting, drawing and problem solving programs are just a few examples of an infinite world of ever-increasing programs and applications. Modern operating systems like Mac, Windows, Ubuntu Unity or Linux work based on a graphical user interface (GUI) which indicates the visual representations on digital control panels by making use of a WIMP environment (windows, icons, menus and pointer), which makes it possible to access programs, documents and nested folders.

Data and information

- A computer receives input and demonstrates output. Input is the raw data that we insert into a device through input peripherals like keyboard or mouse. This data changes into a code that can be read and interpreted by a computer, i.e. a binary digit or bit of 1 or 0 which are in fact two states of electric current ON (can pass) and OFF (cannot pass) detected by the circuits. Bits are clustered into a particular arrangement of 8-digit codes called bytes that represent different characters (a letter, number, symbol). Bigger units of binary codes such as kilobyte, megabyte and gigabyte are used to make computations easier. There are universal standard codes for representing characters for example the American Standard Code for Information Interchange or ASCII (/ˈaski/).



Data is raw and unorganized facts, observations, perceptions, numbers, characters, symbols, and images that need to be processed to be meaningful. Data is always interpreted, by a human or machine, to derive meaning. Therefore, data is meaningless. Information, on the other hand, is a set of data which is processed in a meaningful way according to the given requirement. Information is processed, structured, or presented in a given context to make it meaningful and useful. It is processed or manipulated data which possesses context, relevance, and purpose.

III. Exercises

A. Reading Comprehension check

Decide whether the following sentences are True, False or Not Mentioned.

1. The term compute comes from a French Origin.
2. Processing, storing and displaying information are three basic functions of computers.
3. A peripheral is not needed for displaying or storing information.
4. The address bus allows the CPU to send the address to RAM, and the data bus allows the actual data transfer to the CPU.
5. Random access memory can retain data even if there is a break in the power supply.
6. A byte is a set of 8 characters.

B. Answer the following questions based on the text.

1. What is the best main idea for the second paragraph under the heading ‘Parts of a Computer’?

- a. The main differences between software and hardware
- b. What does a CPU include?
- c. How the CPU processes the input data?
- d. The regulation of CPU based on the system clock

2. The two registers of the immediate access store are

- a. instruction and program counter
- b. bit and byte
- c. arithmetic and logic
- d. storage and input/output

3. According to the text, which of the following sentences is NOT true?

- a. ASCII is a standard encoding system to represent characters.
- b. Some types of information are not encodable.
- c. The control unit examines instructions in the user's program.
- d. Mouse and keyboard are examples of a peripheral device.

4. Which of the following sentences is mentioned in the text about OS?

- a. Most modern OSs provide both a GUI and some level of a CLI.
- b. OSs can be for desktop environments and for smartphones.
- c. Nested folders are possible through the use of GUI.
- d. GNOME Shell is the user interface of the GNOME desktop.

5. It can be inferred from the last section that
- a. the two states of ON and OFF indicate the binary mode of encoding process.
 - b. characters and symbols are not examples of data.
 - c. information is a set of data which is processed in a meaningful way.
 - d. data is the input and information is the output of a CPU.

Classify the following as linked in the passage to:

RAM

ROM

Both

Neither

1. is a read and write type of memory
2. a sub-branch of peripheral hardware of a computer
3. Some other devices like printers have this type of memory
4. includes hard drives, DVD/CD drives, flash drives
5. stores essential information and instructions to operate the CPU
6. is permanent and its stored data is not lost even when you turn the system off

Vocabulary exercises

A. Match the words with their definitions.

- | | | |
|----------------|-------|---|
| 1. volatile | | a. inserted; specialized |
| 2. synchronize | | b. stored or located within another object (e.g. folder) |
| 3. embedded | | c. a slice of silicon crystal ingot which is the base unit of chip making |
| 4. clock speed | | d. to assign a value to represent data |
| 5. nested | | e. keeping and storing data temporarily |
| 6. wafer | | f. to transfer and change one piece of data |
| 7. boot (v) | | g. cause two or more things to happen at the same time and speed |
| 8. encode | | h. to start built-in executing instructions stored in a ROM or flash memory automatically |
| | | i. fixed vibrations generated from a quartz crystal to deliver a steady stream of pulses to the CPU |

B. Fill in the blanks with the appropriate words (extra choices).

BIOS	slot	multitasking	clustering	buses	interfaces
DIMMs		expansion	nested folders		recon

1. A set of routines residing in firmware that boots the operating system and sets up the hardware in an x86-based PC. In newer computers, the UEFI is used as the startup system and not the
2. In GUI, having the quality that each folder can be contained in another one or increased accessibility and user-friendliness of the systems.
3. is a feature of digital appliances when they run more than one program at the same time on a single processor.
4. The communication among the main functional units of a computer including central processor, memory and input/output as well as other components like keyboard, screen and hard drive takes place through multiple

BIOS	slot	multitasking	clustering	buses	interfaces
DIMMs		expansion	nested folders		reckon

6. The aim is for companies to acquire this software for profiling, cross-analyzing and ,,,,,,,,,,,,,,,,,,,,,,, different variables about their customer records in one single database.

Language Focus

Making definitions

- In scientific texts, we are commonly dealing with many new concepts and ideas. These concepts are mostly new and need to be clarified and defined. Making (and of course identifying) definitions is a necessary skill in reading and writing academic and scientific texts. Now, look at the different patterns used to make definitions:
 1. ... it almost generally and universally **refers** to automated electronic machines used for processing, storing and displaying information.
 2. One register **called** program counter records the next instruction while another register **called** instruction register keeps the instruction that is being executed at the moment.
 3. Bits are clustered into a particular arrangement of 8-digit codes **called** bytes.
 4. All components are connected to the system through buses, **which are** electrical paths or channels which maintain a strict schedule.
- Other expressions used for definitions include **be referred to**, **be named (as)**, **comprise**, be comprised of, include, contain, etc. Punctuations such as colon, commas, dashes and parentheses are also used to provide definitions.

Language focus exercises

A. Go through the main text and find how these terms are defined.

- DIMMs
- RAM
- ROM
- CPU

B. Using the expressions above and a technical dictionary or your knowledge, provide a definition for the following terms.

- USB*pixel*high-definition*drag and drop*compatibility*conceptual model*cryptocurrency

IV. Follow-up section

A. Complementary Reading

Cloze: Read the following text and complete the blanks with the suggested words (extra choices)

fabrication	unexposed	replicates	embodied	integrated
accounting	photoresist	arithmetic	contamination	wafers

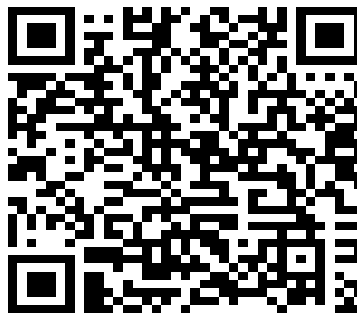
There are few things in the world as simple as sand, and perhaps none as complex as computer chips. Yet the simple element silicon in sand is the starting point for making the circuits that power everything today, from supercomputers to cell phones to microwave ovens. Chips are made in multibillion-dollar plants called fabs. Fabs melt and refine sand to produce 99.9999% pure single-crystal silicon ingots. Saws slice the ingots into about as thick as a small coin and several inches in diameter. The wafers are cleaned and polished, and each one is used to build multiple chips. These and subsequent steps are done in a "clean room" environment, where extensive precautions are taken to prevent by dust and other foreign substances.

fabrication	unexposed	replicates	embodied
integrated accounting	photoresist		arithmetic
contamination	wafers		

- A nonconducting layer of silicon dioxide is grown or deposited on the surface of the silicon wafer, and that layer is covered with a photosensitive chemical called a The photoresist is exposed to ultraviolet light shined through a patterned plate or "mask," which hardens the areas exposed to the light. areas are then scraped away by hot gasses to reveal the silicon dioxide base below. The base and the silicon layer below are further scraped to varying depths. The hardened photoresist is then stripped away, leaving a 3-D landscape on the chip that the circuit design in the mask. The electrical conductivity of certain parts of the chip can also be altered by doping them with chemicals under heat and pressure.

Listening: Listening to talks, speeches and lectures is an important listening skill. It is important to use your working memory to follow what is being presented. Even if there is no title for the presentation (which is rare), we can comprehend the main idea by listening to and concentrating on the first few sentences. Both gist and details are important. To get more details

Scan the following QR code. Listen to the talk and do the following exercises. Listen one time without looking at the subtitles and try to complete the following sentences. For the second time listen while checking the captions and check your answers.



1. How the word '*transistor*' is defined in this talk?
.....
2. What does the lecturer mean by 'digital roadblock'? The rate of software development is (limited by*developed because of*as equal as*faster than) that of Or the miniaturization of transistors.
3. What are two creative solutions suggested by semiconductor industry?
----- and using transistors in ----- such as

4. In the second part of his lecture, Karl makes a comparison. What is it? Write a title. In spite of this development in nanotechnology, the reason behind the digital roadblock is the mounting complexity of nanotransistors'.
5. Two positive features of nanotransistors: They are ----- and ----- switches.

6. In conventional manufacturing process of an integrated circuit, every single is on a silicon wafer.
7. The alternative solution provided for the viability and high cost of making nanotransistors given by the lecturer is by making use of ----- and imitating the ----- structure of today's transistors to the level of nano-dimensions by using ----- materials.
8. The tension in self-assembling materials will come to a/n ----- that is nono-scale, regular, periodic, long range and what is necessary for transistor arrays.
9. In molecular engineering to manufacture microconductors, the second step in making micro-conductors is called -----, which means positioning the transistors in the desired structure of a/n ----- .
10. The most important challenge of the alternative way presented by the lecturer is to ensure that

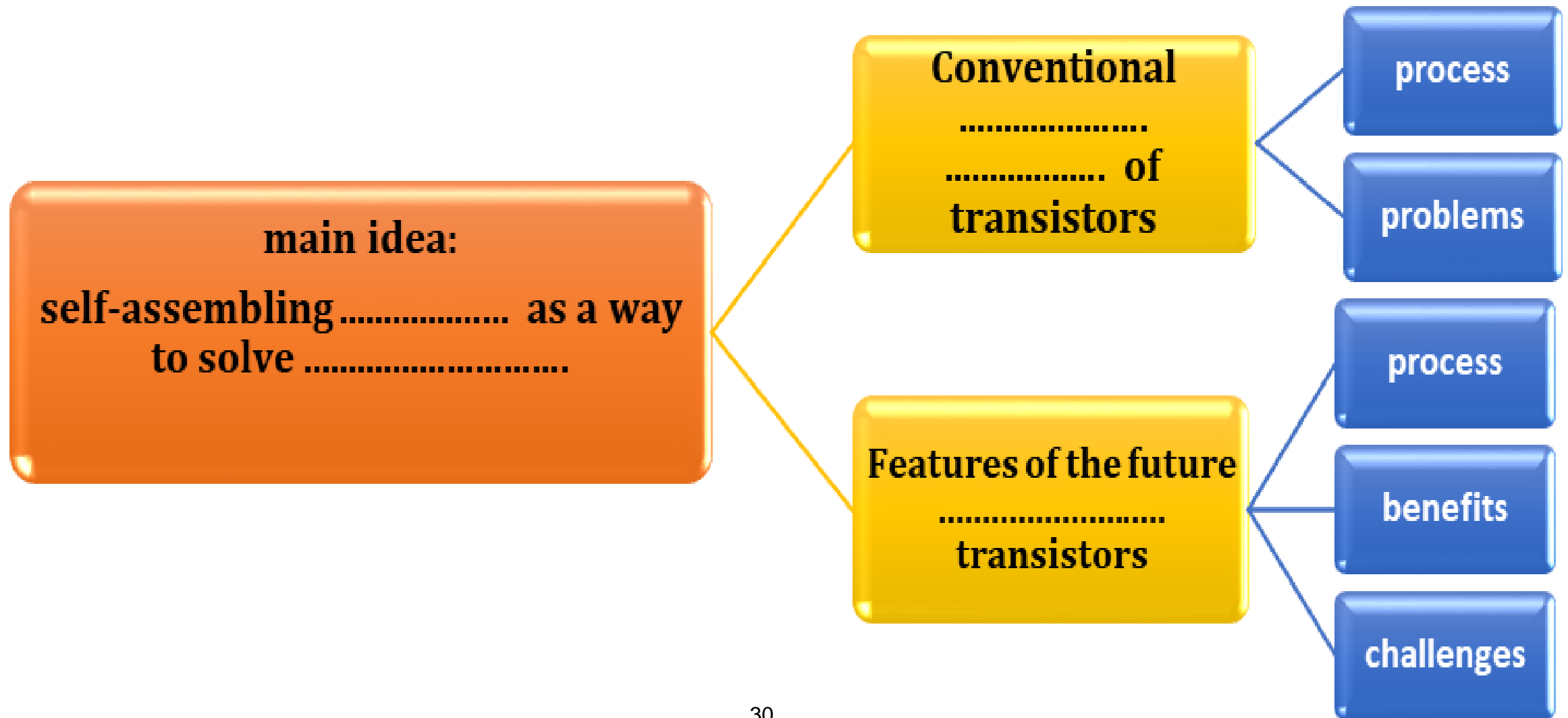
D. Discussion panel

- **You can talk about the following topic in class or as a presentation.**
- How tiny transistors, microchips and computers are going to be?

D. Writing

- Writing a summary based on a reading or listening is a common technique for developing both your comprehension and writing skills. In composing a summary, you need to include main idea(s) and supporting details. For this purpose, write an outline including the main idea of the whole text, the main ideas of different sections of the text and the supporting ideas. Delete examples and small details. The word count of the summary depends on length of the text, however, a length of 100 to 250 is normal.

Exercise: Based on what was presented in the previous TED Talk, write a summary of 150-200. Complete the following chart and use it as a guide to write this summary. Use appropriate conjunctions to make the sentences connected.



E. Translation

Translate the following paragraph into fluent Persian.

Computers can be classified from many different aspects. Regarding their capacity and applicability, computers can be categorized as follows: mainframes (costly and useful for big organizations where many people need to use it simultaneously), supercomputers (very fast, expensive, useful for fast processing of huge amounts of data), workstation computers (a high-end and expensive computer made exclusively for complicated work purposes) and PCs (a low capacity computer for single users). Based on their architecture and design we can have laptops (portable computers that can be carried everywhere), personal digital assistants (PDAs) or a handheld PC (using touch screen and light or stylus pen technologies) and finally tablets and smartphones (pocket-size, having all features of Wi-Fi, Internet connectivity, gaming, browsing, etc.).