MahaScience9

CLASS 9 SCIENCE · MAHARASHTRA STATE BOARD

CHAPTER 10

Information Communication Technology (ICT)

Chapter Notes

1. What is ICT?

Information Communication Technology (ICT) means using technology to **collect, store, process, share and communicate information**. ICT devices include computers, laptops, mobile phones, tablets, the internet, radio, television, satellites, projectors and digital cameras.

Today almost every field uses ICT: science, banking, railways, hospitals, education, weather forecasting, agriculture and entertainment. Information can now reach any corner of the world within seconds.

Role of ICT in science and technology

- **Collecting data:** sensors, satellites and instruments record readings automatically (temperature, rainfall, earthquakes).
- **Processing and analysis:** computers do huge calculations quickly and draw graphs from experimental data.
- **Simulation:** experiments that are costly or dangerous (rocket launches, weather, chemical reactions) can be tested as computer models first.
- **Sharing knowledge:** scientists share research through e-mail, websites, online journals and video conferences, so discoveries spread quickly.
- **Education:** students learn through videos, animations, presentations and online lessons.

2. The computer

A **computer** is an electronic machine that **accepts data (input), processes it according to instructions, stores it, and gives results (output)**. A computer cannot think on its own. It works only when it is given **instructions** in the form of a program, and it needs a supply of electricity.

Computers are fast, accurate, can store large amounts of information, and can repeat the same work many times without getting tired.

2.1 Generations of computers

As science and technology improved, computers became smaller, faster, cheaper and more reliable. Each stage is called a **generation**.

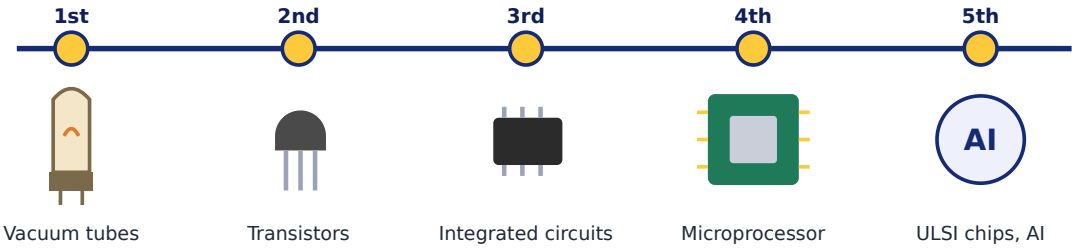


Fig. 10.1 The main component used in each generation

Generation	Period (approx.)	Main component	Features
First	1946–1959	Vacuum tubes	Very large (filled a whole room), used a lot of electricity and produced so much **heat** that they often **broke down and shut off**. Used machine language and punched cards. Example: ENIAC.
Second	1959–1965	Transistors	Smaller, faster, less heat and more reliable than first generation. Assembly language and early high-level languages.
Third	1965–1971	Integrated circuits (IC)	Many transistors on one small silicon chip. Smaller, cheaper, faster; keyboards and monitors came into use.
Fourth	1971–1980s	Microprocessor (VLSI)	A whole processor on one chip, which made personal computers (PCs) and laptops possible.
Fifth	1980s–present	ULSI chips, AI	Very powerful and portable: smartphones, tablets, the internet, artificial intelligence, voice recognition.

How science helped: discoveries in electronics and physics (vacuum tube → transistor → silicon chip) made each new generation possible.

2.2 Architecture of a computer

Every computer has three main parts: the **input unit**, the **central processing unit (CPU)** and the **output unit**, along with memory for storage.

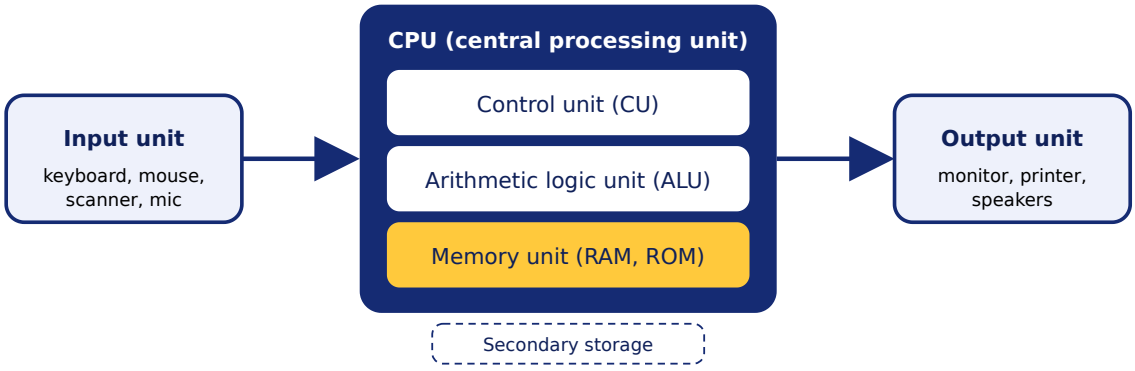


Fig. 10.2 Block diagram of a computer

- **Input unit:** sends data and instructions into the computer (keyboard, mouse, scanner, microphone, webcam, touch screen).
- **Control unit (CU):** controls and coordinates all the parts of the computer, like the brain giving orders.
- **Arithmetic logic unit (ALU):** does all calculations (+, −, ×, ÷) and comparisons (greater than, equal to).

- **Memory unit:** stores data, instructions and results.
- **Output unit:** shows the results to the user (monitor, printer, speakers, projector).

2.3 Memory

PRIMARY MEMORY

- **RAM (Random Access Memory):** the computer's **working memory**. It holds the programs and files in use right now. It is temporary: data is lost when power goes off.
- **ROM (Read Only Memory):** stores permanent start-up instructions. Data stays even without power.

SECONDARY MEMORY

- Stores data permanently for later use.
- Examples: hard disk, SSD, pen drive, memory card, CD/DVD, cloud storage.
- Larger and cheaper than RAM, but slower.

REMEMBER

When you open a stored file, the computer copies it from secondary memory (hard disk) into **RAM** and works on it there. Units: 8 bits = 1 byte; 1024 bytes = 1 KB; 1024 KB = 1 MB; 1024 MB = 1 GB; 1024 GB = 1 TB.

3. Hardware and software

Hardware is every part of a computer that we can **see and touch**: monitor, keyboard, mouse, CPU cabinet, printer, speakers, pen drive.

Software is the set of **programs (instructions)** that tells the hardware what to do. We cannot touch software. Hardware without software is useless, and software cannot run without hardware.

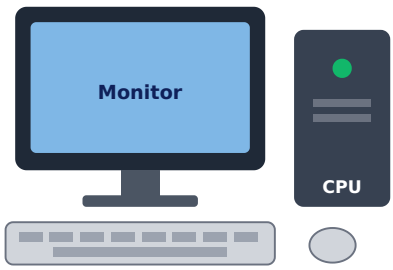


Fig. 10.3 Hardware of a desktop computer

Type of software	What it does	Examples
System software (operating system)	Runs the computer, manages hardware and files, and lets other programs work.	Windows, Linux, macOS, Android
Application software	Does a particular job for the user.	MS Word, Excel, PowerPoint, web browsers, media players

4. Useful application software for studying science

4.1 MS Word (word processor)

Used to type, edit, format and print documents: notes, reports of experiments, project work and letters. You can add tables, pictures, headings and page numbers, and check spelling.

4.2 MS Excel (spreadsheet)

A spreadsheet is a grid of **rows** (numbered 1, 2, 3…) and **columns** (lettered A, B, C…). Each box is a **cell**, named by its column and row, for example B3. Excel can do calculations with **formulas** (such as =B2/C2) and turn **quantitative data from experiments into graphs** (line, bar, pie charts).

Steps to draw a distance–time graph:

1. Type **Time** in column A and **Distance** in column B, then enter the readings.
2. Select both columns of data.
3. Click **Insert → Chart → Line (or Scatter)**.
4. Add a chart title and axis titles with units.
5. For several people (for example Amar, Akbar and Anthony), put each person's distance in a separate column to get one line each.

Precautions: enter correct values and units, keep time on the x-axis, label the axes, and save your file.

	A	B
1	**Time**	**Dist.**
2	0	0
3	5	20
4	10	40
5	15	60

example data

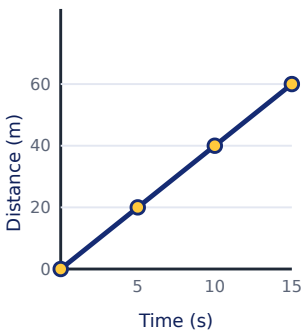


Fig. 10.4 Data in a spreadsheet and its graph

4.3 MS PowerPoint (presentation software)

Used to make **slides** with text, pictures, charts, audio, video and animation, and show them on a screen or projector. It is the best tool to present the **work of scientists with pictures and videos**, or to explain a topic to the class.

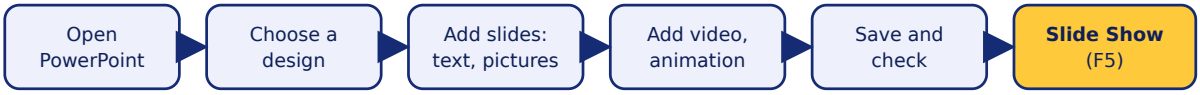


Fig. 10.5 Steps to make a presentation

5. Sharing knowledge using ICT

We can share what we learn through **e-mail, websites and blogs, video-sharing platforms, online meetings and video conferences, educational apps, and presentations on a projector**. Devices used include computers, smartphones, tablets, projectors, webcams and microphones.

6. Opportunities in the field of computers

Career	Work
Software engineer / programmer	Writes programs and apps
Hardware and network engineer	Builds, repairs and connects computers and networks
Web designer / developer	Makes websites
Data analyst / data scientist	Studies large amounts of data to find useful results
Cyber security expert	Protects computers and data from hackers and viruses
Animator / graphic designer	Creates animations, games, videos and designs
Teacher / trainer, DTP operator	Teaches computer skills; prepares documents and books

7. Precautions while using computers and software

SOFTWARE AND DATA

- Use genuine (licensed) software and keep it updated.
- Install antivirus software; scan pen drives before opening them.
- Don't open unknown links, e-mails or downloads.
- Use strong passwords and never share them.
- Save your work often and keep a backup copy.

COMPUTER AND HEALTH

- Shut down properly; don't just switch off the power.
- Use a UPS so a power cut doesn't erase unsaved work.
- Keep food and water away from the keyboard.
- Sit straight, keep the screen at eye level, and take short breaks to rest your eyes.

Common problems and how to solve them

Problem	What to do
Computer hangs or is very slow	Close unused programs, restart, delete unwanted files, scan for viruses.
Virus infection	Run a full antivirus scan; avoid unknown pen drives and downloads.
Unsaved work lost in a power cut	Save often, use a UPS, turn on AutoSave.
Storage full	Move old files to a pen drive, hard disk or cloud storage.

8. Important questions for the exam

1. Fill in the blank: While working, a computer uses _____ memory (RAM) to read stored information. Explain.
2. Which software is used to show pictures and videos of scientists' work? (PowerPoint)
3. Which software is used to draw graphs from quantitative data of experiments? (Excel / spreadsheet)
4. Why did first-generation computers often shut down? (Vacuum tubes produced a lot of heat.)
5. A computer does not work unless it is given _____. (instructions / a program)
6. Explain the role and importance of ICT in science and technology.
7. Explain how a computer works with the help of a block diagram.
8. Write the differences between the five generations of computers. How did science help in their development?
9. What precautions should be taken while using different types of software?
10. Draw a flowchart of the steps for making a PowerPoint presentation.
11. Which devices can you use to share your knowledge with others?