



Dr. Bhasa Science

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The Science Foundation College
Uganda East Africa
Senior one to senior six

+256 778 633682 0753 143413

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A-level ICT

SENIOR Five term 2

TOPIC 1/2: Computer Hardware

Competency: The learner performs routine service on computer hardware to ensure its optimal functionality and performance.

Computer hardware

Computer hardware is the collection of physical parts that make up a computer.

Classification of Computer Hardware Components

(i) Input Devices

Input devices are computer hardware components that allow users to **enter data, instructions, or signals into a computer system** for processing.

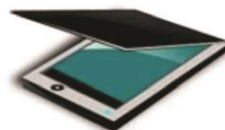
Examples of input devices



Keyboard



Mouse



Scanner



Joystick



Light pen



Webcam



Microphone



Barcode reader



Touch screen



Remote

- (i) **Keyboard** – allows users to type text, numbers, and commands into the computer.

- (ii) **Mouse** – controls the pointer on the screen, used for clicking, selecting, and dragging items.
- (iii) **Scanner** – converts physical documents or images into digital format.
- (iv) **Joystick** – controls movement or actions in a computer system or electronic device.
- (v) **Light pen** – allows users to point, draw, or select objects directly on the screen.
- (vi) **Webcam** – records video and takes pictures for video calls or media creation.
- (vii) **Microphone** – captures audio input for recording or communication.
- (viii) **Barcode reader/barcode scanner** – captures and interprets information stored in barcodes. It helps computers quickly identify products, track inventory, and process transactions.
- (ix) **Touchscreen** – lets users interact directly with the display by touching it.
- (x) **Remote (remote control)** – operate electronic equipment from a distance without direct contact.

(ii) Output Devices

Output devices are computer hardware components that **present processed information to the user** in a readable or usable form. They take data from the computer and convert it into text, images, audio, or other formats.

Examples of output devices



- (i) **Monitor** – displays text, images, and videos.
- (ii) **Headphones** – output sound
- (iii) **Printer** – produces hard copies of documents.
- (iv) **Projector** – enlarges visual output for audiences.
- (v) **Speakers** – output sound.
- (vi) **Plotter** - produce high-quality graphics, drawings, and large-scale prints. Unlike regular printers, plotters draw continuous lines using pens, making them ideal for technical and engineering applications.

(iii) Storage Devices

Storage devices store data permanently or temporarily.

Examples:

- (i) **Hard Disk Drive (HDD)** – long-term storage of files and programs.
- (ii) **Solid State Drive (SSD)** – faster, durable storage.

- (iii) **USB Flash Drive** – portable storage.
- (iv) **RAM (Random Access Memory)** – temporary storage for active processes.
- (v) **CD/DVD** - store digital data such as music, videos, software, or documents.
- (vi) **Memory card** - store digital data such as photos, videos, music, and documents.
- (vii) **Smart card** - contains an embedded microchip used to store and process data securely.
- (viii) **Floppy disk** - saves and transfer small amounts of data.
- (ix) **Tape** – store data

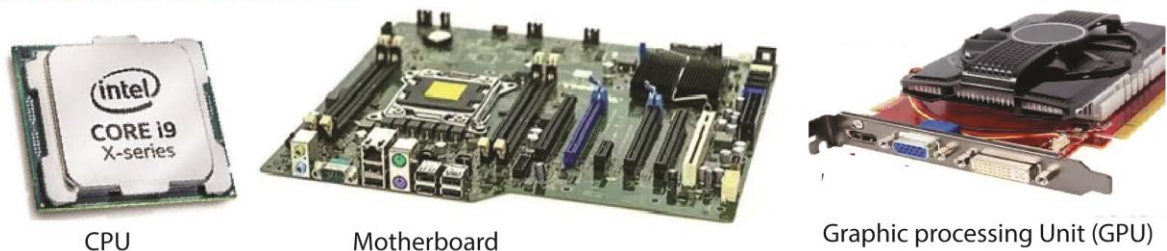
Examples of Storage devices



(iv) Processing Devices

Processing devices are devices that perform calculations and execute instructions.

Examples of Processing devices



- (i) **Central Processing Unit (CPU)** – the “brain” of the computer, handles all instructions.
- (ii) **Motherboard** – main circuit board connecting all components.
- (iii) **Graphics Processing Unit (GPU)** – handles image and video rendering.

(v) Communication Devices

These enable data exchange between computers or networks.

- (i) **Network Interface Card (NIC)** – connects computer to a network.
- (ii) **Modem** – converts signals for internet access.
- (iii) **Router** – directs data between networks.

- (iv) **Wi-Fi Adapter** – enables wireless connectivity.

Examples of Communication Devices



Network Interface Card (NIC)



Modem



Router

Summary Table of computer hardware components

Category	Function	Examples
Input Devices	Enter data into computer	Keyboard, Mouse, Scanner
Output Devices	Display results to user	Monitor, Printer, Speakers
Storage Devices	Store data	HDD, SSD, RAM, USB
Processing Devices	Execute instructions	CPU, GPU, Motherboard
Communication Devices	Exchange data	NIC, Modem, Router

Task

Assemble a computer system from hardware components ensuring correct connections and configurations.

Steps to Assemble a Computer System

- (i) **Prepare Workspace**
 - Clean, static-free surface.
 - Use an anti-static wrist strap to avoid damaging components.
- (ii) **Install the Motherboard**
 - Place the motherboard inside the case.
 - Secure it with screws on standoffs (to prevent short circuits).
- (iii) **Install the CPU (Processor)**
 - Open the CPU socket latch.
 - Align the CPU with the socket (triangle markers help).
 - Lock it in place.
 - Apply thermal paste (if not pre-applied).
 - Attach the CPU cooler/fan.

(iv) Insert RAM (Memory)

- Open RAM slots.
- Align RAM sticks with notches.
- Press firmly until they click into place.

(v) Install Storage Devices

- HDD/SSD: mount in drive bays or M.2 slot.
- Connect SATA or NVMe cables to motherboard.

(vi) Install Power Supply (PSU)

- Secure PSU in the case.
- Connect 24-pin ATX cable to motherboard.
- Connect 8-pin CPU power cable.
- Connect power cables to GPU, drives, and fans.

(vii) Install Graphics Card (if needed)

- Insert GPU into PCIe slot.
- Secure with screws.
- Connect power cables from PSU.

(viii) Connect Case Components

- Front panel connectors (power button, reset, USB, audio).
- Case fans to motherboard headers.

(ix) Final Checks

- Ensure all cables are firmly connected.
- Verify CPU cooler and case fans are installed correctly.
- Close the case.

(x) Power On & Configure BIOS

- Connect monitor, keyboard, and mouse.
- Power on system.
- Enter BIOS/UEFI to check hardware recognition.
- Set boot order (e.g., USB or SSD).

(xi) Install Operating System

- Use bootable USB/DVD.
- Follow installation steps.
- Install drivers for motherboard, GPU, and peripherals.

Quick Checklist

Component	Connection
CPU	Socket + cooler
RAM	DIMM slots
Storage (HDD/SSD)	SATA/NVMe to motherboard
GPU	PCIe slot + PSU cables
PSU	24-pin ATX + 8-pin CPU + GPU power
Case Fans	Fan headers on motherboard
Front Panel	Power/reset/USB/audio connectors

Routine maintenance activities of computer

Keeping a computer in good condition requires **regular maintenance** to ensure smooth performance, prevent failures, and extend its lifespan. Here are the key activities:

Hardware Maintenance

- **Dust cleaning** – remove dust from CPU, keyboard, monitor, and fans to prevent overheating.
- **Check cables and connections** – ensure power and data cables are firmly attached.
- **Inspect peripherals** – test mouse, keyboard, printer, and other devices for proper functioning.
- **Cooling system check** – verify fans and heat sinks are working to avoid overheating.
- **Battery care (laptops/UPS)** – check battery health and replace if necessary.

Software Maintenance

- **Update operating system** – install the latest patches for security and performance.
- **Update drivers** – keep hardware drivers current for compatibility.
- **Run antivirus scans** – detect and remove malware regularly.
- **Clean temporary files** – delete cache, cookies, and unnecessary files to free space.
- **Defragment hard drive** (for HDDs) – reorganize data for faster access.
- **Backup data** – regularly save important files to external drives or cloud storage.

Network & Security Maintenance

- **Check firewall settings** – ensure protection against unauthorized access.
- **Update passwords** – change regularly to maintain security.

- **Monitor internet connectivity** – troubleshoot slow or unstable connections.
- **Secure Wi-Fi** – use strong encryption (WPA2/WPA3).

Common Computer Troubleshooting Issues & Solutions

Troubleshooting computer problems involves identifying the issue and applying systematic solutions, starting with the simplest checks.

Here are common computer problems and their respective solutions:

1. Computer Will Not Turn On

This is usually a power-related issue.

- **Check power connections:** Ensure the power cable is securely plugged into both the computer and a working wall outlet. If using a power strip or surge protector, bypass it and plug directly into the wall outlet.
- **Verify power source:** Test the outlet with another device (like a lamp). For a laptop, make sure the battery is charged and try connecting with the AC adapter only (if the battery is removable).
- **Listen for sounds/lights:** If there are no lights or fan sounds, the power supply unit (PSU) may be faulty.
- **Disconnect peripherals:** Sometimes a faulty external device (printers, USB drives, etc.) can prevent startup. Disconnect all of them and try powering on again.

2. Slow Performance

Slowdowns can result from insufficient resources or background processes.

- **Restart the computer:** A simple restart clears the system memory (RAM) and ends errant processes.
- **Manage startup programs:** Disable unnecessary applications from running automatically at startup using the Task Manager (**Ctrl + Shift + Esc** on Windows) or Activity Monitor (on Mac).
- **Free up disk space:** A hard drive that is over 85% full can significantly slow down performance. Use built-in tools like Disk Cleanup (Windows) or Storage Management (macOS) to remove temporary files and unused programs.
- **Run a malware scan:** Viruses and malware can consume significant system resources. Run a full scan with reputable antivirus software.
- **Consider hardware upgrades:** If the problem persists, you may need more RAM or an upgrade from an HDD to a solid-state drive (SSD).

3. Computer Freezing or Unresponsive

A frozen computer typically requires you to force-quit applications or force a restart.

- **Force quit an application:** In Windows, press **Ctrl + Alt + Delete** or **Ctrl + Shift + Esc** to open the Task Manager, select the unresponsive application, and click "End task". On a Mac, press **Command + Option + Esc** to open the Force Quit menu.
- **Force a shutdown:** If the whole system is unresponsive, press and hold the power button for 5-10 seconds until the computer completely turns off. Wait a few seconds, then restart it.
- **Boot into Safe Mode:** If freezing is constant, boot into Safe Mode (which loads only essential drivers) to diagnose if a specific driver or software is causing the problem.

4. 4. No Internet Connection

Connectivity problems often stem from network hardware or settings.

- **Check physical connections:** Ensure all Ethernet cables are securely plugged in. For Wi-Fi, make sure wireless capabilities are enabled on your computer.
- **Restart network equipment:** Power cycle your modem and router. Unplug them, wait about 30 seconds, then plug the modem back in. Once it's fully on, plug in the router.
- **Run the troubleshooter:** Use the built-in Windows Network Troubleshooter or Mac's Wireless Diagnostics to automatically identify and fix common issues.
- **Contact your ISP:** If all local troubleshooting fails, the problem may be an outage or issue with your Internet Service Provider.

5. 5. Blue Screen of Death (BSOD) or Crashing

These critical errors are often caused by driver conflicts, faulty hardware, or corrupted system files.

- **Note the error code:** Write down the "stop code" displayed on the screen and search for it online to find specific solutions.
- **Boot into Safe Mode:** This allows you to troubleshoot without non-essential drivers or software running.
- **Update or roll back drivers:** Faulty or outdated drivers are a common cause. Update your graphics, chipset, and network drivers, or roll back recently updated ones in Device Manager.
- **Scan for malware:** Run a full system virus scan.
- **Run system file checker:** Use the Command Prompt command `sfc /scannow` to check for and repair corrupted Windows system files.

6. PC Overheating

Cause: Dust buildup, poor ventilation, or faulty cooling fans.

Solution: Clean dust from vents, ensure proper airflow, replace or repair fans.

7. **Noisy Computer**

Cause: Dust in fans, failing hard drive, or loose components.

Solution: Clean fans, check hard drive health, tighten screws.

Thank You

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