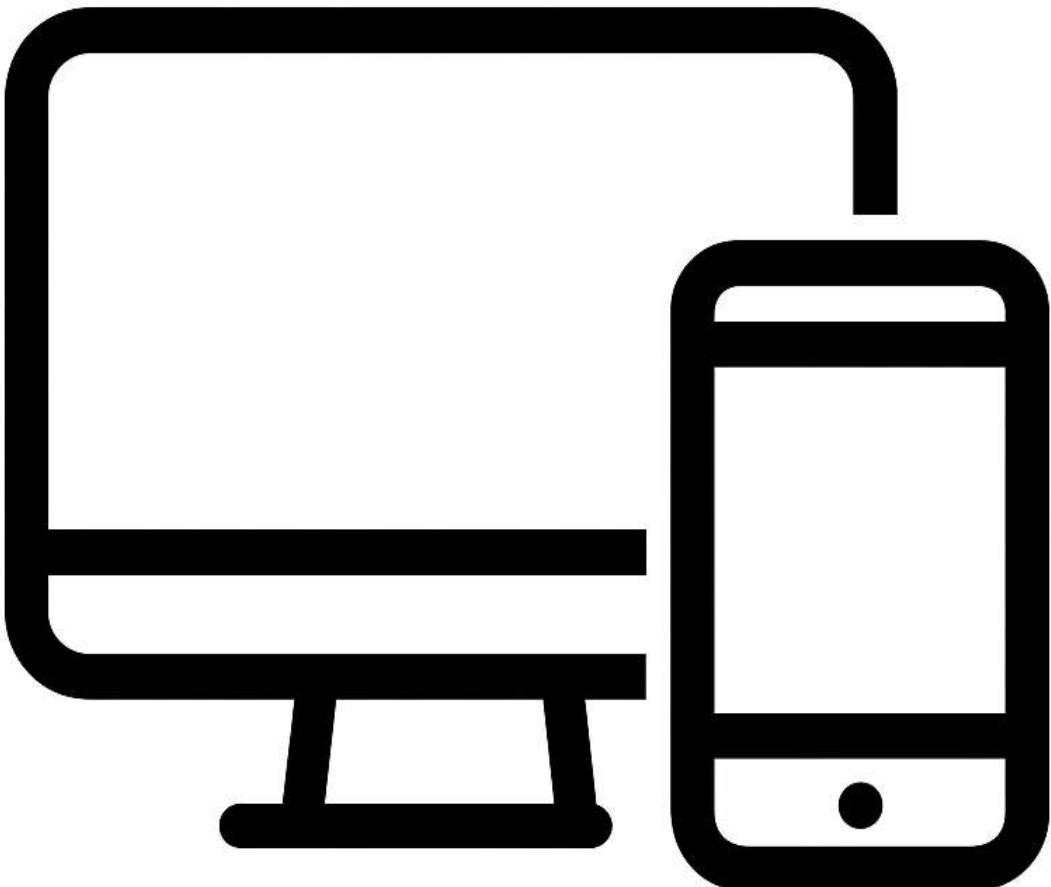


0417 IGCSE ICT THEORY

Summary Sheet

Assessment Test Prep



Prepared by:

The ReviseRoom Educator Team

**Check the checklist before you
view the notes**



Chapter 1 – Types and Components of Computer Systems

Hardware:

- **Definition:** The physical components that make up a computer system.
- Can be external or internal

Motherboard:

- **Definition:** A printed circuit board found in all computers.
- Allows processors and other hardware to function and communicate with each other.

CPU:

- **Definition:** Central Processing Unit interprets and executes the commands from the computer hardware and software.
- Mounted on the motherboard
- Also called microprocessor
- Made up of CU and ALU
- Control Unit (CU) control input and output devices
- Arithmetic and logic (ALU) carries out calculations and logical decisions.

RAM	ROM
Temporary memory device	Permanent memory device
Volatile memory	Non-volatile memory
Can be written and read	Can only be read
Store data, files, programs currently in use	Store BIOS and data needed at the boot up (startup)
Can be increased in size to improve speed	

Video cards:

- **Definition:** Allows the computer to send graphical information to a video display device

Made up of

- A processing unit
- Memory unit (usually RAM)
- A cooling mechanism
- Connections to display unit

Sound cards:

- **Definition:** An integrated circuit board that gives the ability to produce sounds.
- Allows user to record sound input and store it on the computer

Uses two methods to translate digital data into analogue signals

- **FM Synthesis:** mimics musical instruments according to built-in formulas
- **Wavetable Synthesis:** relies on recordings of actual instruments to produce sound

NIC:

- **Definition:** Network Interface Card allows the device to connect to a network.
- Can be wired or wireless
- Each NIC is hard-coded with a unique MAC address code. (MAC = media access control)

HDD/SSD:

- **HDD Definition:** A magnetic drive used to store data and files
- **SSD Definition:** A drive that make use of flash memory to store data and files, with no moving parts, making them faster and more durable than HDD.

Peripherals:

- **Definition:** Any equipment externally connected to the computer

Software:

- **Definition:** A collection of instructions that can be run on a computer. The instructions tell the computer what to do.

There are two types of software

- **Application software:** allows the user to do specific tasks. E.g. Word Processor, Spreadsheet, CAD, Database
- **System software:** allows the hardware to run properly and let user communicate with the computer. E.g. Operating system, Device Driver, Utilities, Linkers, Compilers.

Operating system:

Tasks of an operating system

- Control the operation of the input, output and storage devices
- Manage the loading, running and storage of application programs
- Maintain security of the computer system
- Allow communication between user and computer system

Main user interfaces:

There are two main types of interfaces

- **CLI:** Command line interface requires the user to type in instructions. Used by people and programs that need direct communication with a computer.
- **GUI:** Common GUI is WIMP; windows icons menu and pointing device. Windows create a border to the information. Icon represents files. Menus allow the user to make choices and a Pointing device so that user can select choices. Used by end-user who doesn't have great knowledge about how a computer works.

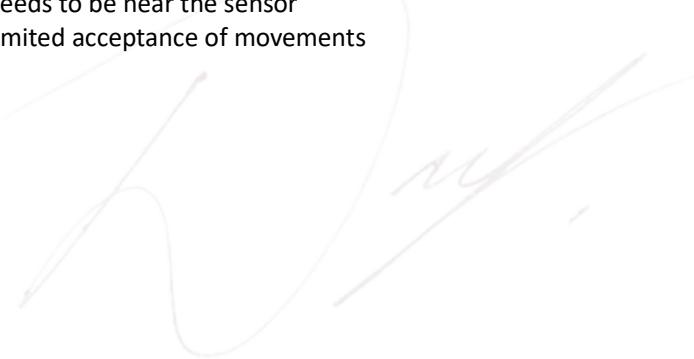
Interface	Advantages	Disadvantages
CLI	The user is in direct communication with the computer.	The user needs to learn a number of commands to carry out basic operations.
	The user is not restricted to a number of predetermined options.	All commands need to be typed in.
	It is possible to alter computer configuration settings.	Each command must be typed in with the correct format.
GUI	User doesn't need to learn any commands.	It uses more computer memory than CLI
	More user-friendly, WIMP and Post-WIMP	The user is limited to the icons provided on the screen

Dialogue-based interface:

- **Uses** the human voice to give commands to computer system
- **Advantages:**
 - Many tasks can be carried out by words only, useful for disabled people
 - While driving, a driver no longer needs to take their hands off the steering wheel
 - Can be used as a security feature (Voice recognition)
- Disadvantages:
 - Unreliable
 - Complex to setup
 - Users need to learn commands

Gesture-based interfaces:

- **Relies** on human interaction by movement of hands, head or even the feet.
- Allows humans to interact with a computer without the need of a mechanical device
- Uses computer vision and image processing
- **Advantages:**
 - No physical contact needed
 - No training needed
 - Replaces mechanical devices
- Disadvantages:
 - Unintentional movements may be detected
 - Needs to be near the sensor
 - Limited acceptance of movements



Types of computers:

- PC/Desktop computers
- Laptop computers
- Tablets
- Phablets
- Smartphones

Type	Advantages	Disadvantages
Desktop/Personal Computer	Always connected to the mains.	Not portable
	Monitors can come in any sizes	Takes up more desk space
	Can be upgraded and parts easily replaced.	Separate components like keyboard, mouse, monitor, speakers etc
	Tend to have a higher specifications than laptop computers	Loose cables which could be trip hazards
Laptop Computer	Portable due to small size and weight	Limited battery life.
	Battery can be recharged.	Difficult to repair and upgrade
	Can connect wireless to internet	Can be stolen or lost
	No loose cables	Some find it difficult to use pointing device.
Tablet Computer	High definition, anti-glare display	Limited memory compared to laptops
	Wireless, 3G/4G & Bluetooth connection	Expensive to use 3G/4G internet
	Data can be backed up	Typing can be more difficult compared to a normal keyboard
	Touch screen technology	Not all files are compatible with tablets.
Smart Phone	Small in size and easier to carry around	Small screens make it difficult to read.
	Can be used whilst on the move using wireless or 3G/4G Connectivity	Battery life is short
	Touch screen technology	Could be misplaced or stolen
		Limited storage/memory compared to other types of computers
		Slow data transfer rates

Emerging technologies:

Artificial Intelligence (AI) Biometric

- Learns by using AI about a person fingerprint on every scan
 - The system recognize the fingerprints even if it is scanned at different angles or positions
 - Match the fingerprints stored on a database
- Use: facial and eye recognition system

Robotics

- Used in car factories to weld car bodies, spray body panels
- Used in surgical procedures
- Mainly used in manufacturing industry

Virtual Reality

- **Definition:** An artificial environment created by software
- User either uses data goggles, sensor suites, data gloves or helmets
- Used in
 - Military Applications
 - Education
 - Healthcare
 - Entertainment
 - Fashion
 - Real Estate
 - Sports

Augmented Reality

- **Definition:** An environment that superimposes a computer-generated image on user's view of the real world.
- Used in
 - Safety and rescue operations
 - Healthcare
 - Entertainment

Chapter 2 – Input and Output devices

INPUT DEVICES

Input device:

- **Definition:** A peripheral device which accepts data and sends it to the CPU.

Keyboards:

- Most keyboards use QWERTY layout
- Typing takes a long time and prone to typing errors
- **Ergonomic Keyboard:** Designed to reduced health-related problems such as RSI
 - **Advantages:**
 - Easy to use
 - Fast data entry
 - **Disadvantages:**
 - Can be difficult to use if user has limited motor movement
- **Concept Keyboard:** Uses icons or phrases

Pointing Devices:

- **Mouse:** To control the pointer on the screen to
 - Select Windows
 - Clicking Icons
 - Menu Options
 - Positioning Pointer
(WIMP)
- **Optical mouse:**
 - Movement is detected by reflected light
 - Robust since it has no moving parts and doesn't pick up dirt
- **Wireless mouse:**
 - Transmit signals to a USB wireless receiver plugged into the computer
- Advantages:
 - Easy to navigate through menu options
 - Quicker to select an option than keyboard
- Disadvantages:
 - Easily damaged
 - Need a flat surface
- **Touch pad:** Integrated into laptops
 - Advantages:
 - No need for a separate mouse
 - Quicker to select an option than keyboard
 - Disadvantages:
 - People with limited motor function find it difficult to use
 - Drag and drop are not easy with a touch pad
- **Tracker ball:** Ball is rotated by user to control the pointer
 - Uses:
 - Used by people with limited motor skills
 - Control rooms
 - Advantages:
 - Easy to use
 - More robust than a mouse
 - Disadvantages:
 - Not supplied with computers as standard

Remote control:

- Used to control the operation of other devices remotely
 - Uses:
 - TV, DVD players, Air conditioner
 - Advantages:
 - Can be operated from a reasonable distance
 - Disadvantages:
 - Easy for the signal to get blocked

Joysticks and driving wheel:

- Whenever the stick is moved, the cursor moves in a similar direction on the screen
 - Uses:
 - Computer games
 - Flight simulations
 - Car-driving simulations
 - Advantages:
 - More realistic control than a mouse
 - Driving experience is nearer to how an actual steering wheel operate
 - Disadvantages:
 - Difficult to control the on-screen pointer with a joystick than with a mouse
 - Movements for steering wheel can be too sensitive, thus gives an unrealistic feel

Touch Screens

- User selects options by touching buttons/icons on the screen
 - Uses:
 - ATMs, POS terminals, public information systems (airports, stations, tourist offices)
 - Mobile phones, tablets, PDAs, satellite navigation systems
 - Interactive whiteboards and computer-based training (CBT)
 - Advantages:
 - Fast data entry and user-friendly (no training needed)
 - Tamper-proof, prevents unwanted input
 - Disadvantages:
 - Limited number of options
 - Screens get dirty easily
 - Frequent use can cause RSI

Scanners

- Used to input hard-copy documents/images into a computer
 - Uses:
 - Scan books, photos, designs (CAD), barcodes at POS
 - Used with OCR software to convert text to editable form
 - Advantages:
 - Images can be stored/edited later
 - Faster than re-typing, fewer errors
 - Can recover damaged documents/photos with software
 - Disadvantages:
 - Quality depends on resolution
 - Scanning can be slow

Digital Cameras

- Store images on memory cards; transfer via card reader, USB, Wi-Fi, or Bluetooth
 - Uses:
 - Take photos for computer transfer or direct printing
 - Upload photos to software (e.g. desktop publishing)
 - Can also record short video clips
 - Advantages:
 - Better quality photos than traditional cameras
 - Easy and fast transfer to computer
 - No developing costs; memory cards store hundreds of photos
 - Disadvantages:
 - Higher resolution requires more memory
 - Compression can reduce quality
 - Users need computer literacy

Video Cameras

- Input moving pictures; DV cameras store compressed frames (Motion JPEG)
 - Advantages:
 - DV format gives very high image quality
 - Disadvantages:
 - Expensive

Microwaves

- Convert sound into digital signals via a computer's sound card
 - Uses:
 - Input speech for multimedia, web pages, voice recognition, VOIP, video conferencing
 - Used as sensors (e.g. burglar alarms)
 - Advantages:
 - Can add voiceovers and record audio directly to applications
 - Faster to dictate text than type
 - Improves safety in voice-activated systems (e.g. in cars)
 - Disadvantages:
 - Voice recognition less accurate than typing
 - Sound files use a lot of memory

Sensors

- Device that inputs continuously changing physical measurements to a computer
- Sensor data (analogue) must be converted to digital using ADC (Analogue-to-Digital Converter); DAC converts digital to analogue if needed
- Used in monitoring and control applications
- Types and Uses:
 - Temperature: washing machines, central heating, greenhouses, ovens
 - Pressure: burglar alarms, washing machines, robotics, environmental monitoring
 - Light: greenhouses, automatic doors, burglar alarms, street lighting control
 - Sound/Acoustic: burglar alarms, monitoring liquid/powder flow in pipes
 - Humidity/Moisture: greenhouses, environmental monitoring, factories (e.g. microchips, paint spraying)
 - pH: greenhouses, chemical processes, environmental monitoring
- Advantages:
 - More accurate than human operators
 - Continuous readings (no breaks)
 - Automatic systems react immediately
 - Useful for dangerous processes (improves safety)
- Disadvantages:
 - Faulty sensors can give incorrect readings

Graphics Tablets

- Used with a stylus to produce freehand drawings
 - Uses:
 - Input freehand drawings and complex characters
 - Computer Aided Design (CAD) work
 - Advantages:
 - Accurate drawing; can record pressure levels
 - Drawings can be modified before input
 - Disadvantages:
 - Expensive compared to a mouse
 - Slower than drawing on paper
 - Menus not user-friendly and touch surface can be easily damaged

Webcams

- Digital camera used to capture and transmit images/video to a computer
 - Uses:
 - Video conferencing
 - Online chatting
 - Advantages:
 - Can be left on and activated when needed
 - Allows face-to-face communication without travel
 - Disadvantages:
 - Lower quality compared to professional cameras
 - Must remain connected to a computer

Light Pens

- Pen-shaped input device used on CRT screens to detect light changes
 - Uses:
 - Drawing and selecting objects on CRT screens
 - Small-scale drawing applications
 - Advantages:
 - Greater accuracy than touch screens
 - Small and easy-to-use
 - Disadvantages:
 - Only works with CRT monitors
 - Lag when drawing and less accurate than modern devices
 - Outdated technology

Stylus Pens

- Small pen-shaped tool for touchscreens or monitors
 - Uses:
 - Draw or make selections by tapping on screen

Direct Data Entry (DDE) Devices

Magnetic Stripe Readers

- Read information stored on the magnetic stripe of cards
 - Uses:
 - Credit/debit cards at ATMs or EFTPOS
 - Security cards for building/hotel entry
 - Train and underground tickets
 - Advantages:
 - Fast and accurate data entry
 - Data is secure (hidden from sight)
 - Robust and unaffected by oil or water
 - Disadvantages:
 - Data lost if stripe is damaged
 - Must be in close contact with reader

Contactless Card Readers

- Cards have a chip emitting radio waves
- Allow payments up to a small limit without PIN
 - Advantages:
 - Fast transaction, no PIN required
 - Reduces retailer access to customer data
 - Disadvantages:
 - More expensive than normal cards
 - Possible duplicate charges
 - Transactions limited to small value
 - Payments can be made without cardholder knowing

Chip and PIN Readers

- Used at EFTPOS; card inserted and PIN required
 - Advantages:
 - Secure and robust (chip doesn't need contact with reader)
 - Disadvantages:
 - Transaction cancelled if PIN forgotten
 - Risk of others seeing PIN entry

RFID Readers

- Use radio waves to read data from RFID tags (microchip + antenna)
 - Uses:
 - Livestock tracking, retail, admission passes, libraries
 - Advantages:
 - Tags read from a distance, fast and robust
 - Bidirectional data transfer; multiple tags detected at once
 - Disadvantages:
 - Tag collisions possible
 - Data easy to hack or jam
 - More expensive than barcodes

Magnetic Ink Character Recognition (MICR)

- Reads characters printed in special magnetic ink (e.g. bank cheques)
 - Advantages:
 - Difficult to forge, can read overwritten cheques
 - No manual input reduces errors
 - Disadvantages:
 - Very expensive equipment
 - Only certain fonts supported

Optical Mark Readers (OMR)

- Read marks made with pen or pencil on forms
 - Uses:
 - Exams, surveys, school registration forms
 - Advantages:
 - Fast and accurate (more than OCR)
 - No typing required
 - Disadvantages:
 - Forms must be carefully designed
 - Errors if forms not filled correctly

Optical Character Recognition (OCR)

- Converts scanned text into editable computer-readable form
 - Uses:
 - Passports, identity cards, scanned documents
 - Advantages:
 - Faster than typing
 - Reduces manual input errors
 - Disadvantages:
 - Struggles with handwriting
 - Not always accurate

Barcode Readers

- Read information encoded in barcodes
 - Uses:
 - Supermarkets, library books, luggage handling
 - Advantages:
 - Fast, eliminates typing errors
 - Automatic stock control and itemized receipts
 - Disadvantages:
 - Can only encode numbers
 - Relatively expensive to administer

QR Code Readers

- Read Quick Response codes holding over 7000 digits
 - Advantages:
 - Store more data than barcodes
 - Provide direct links to websites (no typing required)



Output Devices

- Definition: Devices that present processed data to the user, either as soft copy (screen) or hard copy (printed paper).

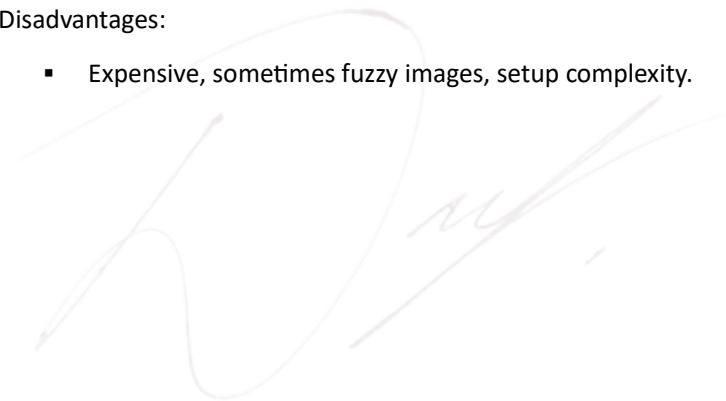
Monitors

- CRT (Cathode Ray Tube) Monitors:
 - Use electron guns to display images via colored phosphor dots (red, green, blue).
 - Uses:
 - Suitable where space is not limited; used with light pens in CAD; multiple users viewing simultaneously.
 - Advantages:
 - Better viewing angles than TFT; compatible with light pens.
 - Disadvantages:
 - Heavy, hot, consume more power, flicker may cause eye strain.
- TFT (Thin Film Transistor) Monitors:
 - Made up of pixels controlled by microprocessors; lighter and consume less power.
 - Uses:
 - Laptops, small office setups.
 - Advantages:
 - Lightweight, less glare, lower radiation, energy efficient.
 - Disadvantages:
 - Poor side viewing angle; sometimes lower image quality than CRT.
- IPS (In-Plane Switching) LCD Monitors:
 - Provide best color accuracy, contrast, and wide viewing angles.
- LCD/LED Monitors:
 - LCD screens backlit by LEDs for brighter, sharper images with whiter light.
 - Advantages:
 - Thin, energy-efficient, long-lasting, vivid colors.

- OLED Monitors:
 - Use organic compounds to produce light without backlighting.
 - Advantages:
 - Thinner, lighter, brighter, less power consumption, wide viewing angle (~170°).
 - Disadvantages:
 - More expensive.

Multimedia Projectors

- Project and enlarge images/video from computers or TV onto a large screen.
 - Uses:
 - Presentations, advertising, home cinema.
 - Advantages:
 - Suitable for large audiences; avoids multiple computers.
 - Disadvantages:
 - Expensive, sometimes fuzzy images, setup complexity.



Printers

- Laser Printers:
 - Use large buffers to print whole documents quickly.
 - Uses:
 - Offices, schools, high-volume printing.
 - Advantages:
 - Fast, high-quality output, handles large jobs.
 - Disadvantages:
 - Expensive, ozone emission, costly color printing.
- Inkjet Printers:
 - Print bit-by-bit, good for low volume and photo-quality printouts.
 - Uses:
 - Small offices, photo printing
 - Advantages:
 - Cheaper than laser, high quality, lightweight, no ozone.
 - Disadvantages:
 - Slow for large jobs, costly cartridges.
- Dot Matrix Printers:
 - Impact printing using inked ribbon.
 - Uses:
 - Noisy/dusty environments, multi-part stationery (e.g., garage workshops).
 - Advantages:
 - Robust, cheap to run, multiple copies.
 - Disadvantages:
 - Noisy, slow, low quality.
- 3D Printers:
 - Create solid objects layer by layer using materials like resin, metal powder, ceramic.
 - Use additive manufacturing; some use lasers or UV light to harden materials.
 - Uses:
 - Prosthetics, aerospace parts, art, fashion, replacements for obsolete parts.
 - Advantages:
 - Rapid prototyping, customization, emerging medical uses.
 - Disadvantages:
 - Potential for counterfeit goods, safety concerns, job displacement.

Speakers

- Convert digital data to analog sound via DAC and amplification.
- Uses:
 - Multimedia presentations, home entertainment, assistive tech for visually impaired, playing downloaded audio.

Control Devices

- Used to convert digital signals from a computer into physical actions or responses.
- Actuators
 - Transducers converting electrical signals to physical motion (e.g., operating motors, pumps).
- Motors
 - Controlled by actuators; used in washing machines, cookers, heating systems, greenhouses, robotic arms, fans, disk drives.
- Buzzers
 - Audible alerts controlled by actuators; used in microwaves, cookers, burglar alarms.
- Lights
 - Controlled by actuators for security lighting and greenhouse illumination.
- Heaters
 - Actuators switch heaters on/off; used in washing machines, ovens, heating systems, greenhouses.



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