Types and components of computer systems.

Chapter 1

Components of a computer system.

Basic components, including hardware (both external and internal) and software (both application and system) are all introduced in ICT lesson.

A good analogy is to compare computers with books: the actual pages and ink used on the pages of a book are equivalent to the hardware used to make up computers; the words written on the pages are equivalent to the software. Without the words, book is useless. Similarly, without software, computers would be of little use to any of us.

What are hardware and software?

- Hardware is a general term for the physical components that make up a computer system: the keyboard, mouse, printer etc. Hardware can be either EXTERNAL or INTERNAL.
- Software is a general term for the programs that control the computer system. There are two types of software: APPLICATION and SYSTEM.

Hardware components

Feedback is where the output of a system is fed back into the input of the system in order to influence the overall result.

Input

- Tracker Ball
- Touch Pad
- Light Pen
- Joystick
- Scanner
- Touch Screen
- Graphics Tablet
- Mouse
- Keyboard
- Barcode Reader
- QR Reader
- Microphone
- Camera
- Optical Mark Reader

Process

- Sorting
- Searching
- Calculations
- Graphing

Output

- Printer
- Monitor / VDU
- Speakers
- Alarm

Storage

Information often needs to be stored on the system for use at a later date.

Internal hardware components

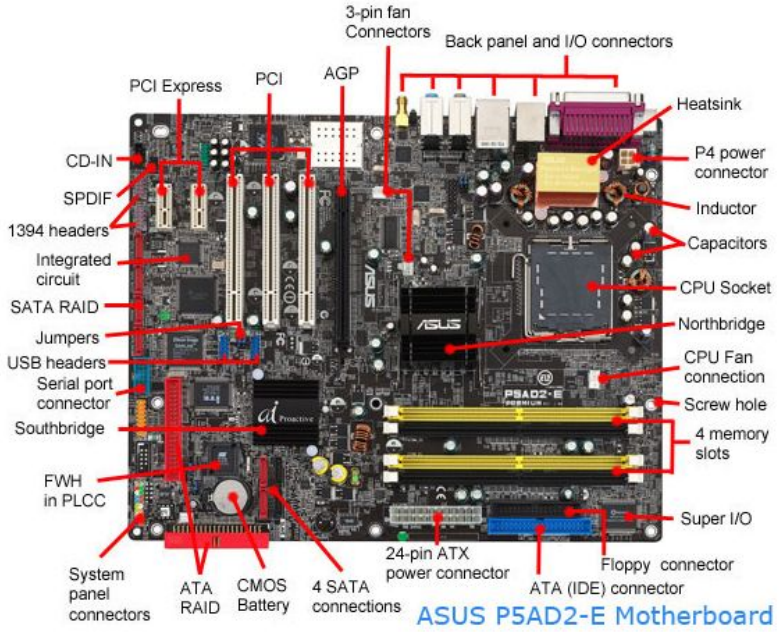
- CPU (makes complex calculations and logical decisions, executing computer programs, send instruction to other parts of the computer)
- Motherboard (the processor and other computer hardware to function and communicate with each other)
- Random access memory (RAM – internal chip where data is temporarily stored when running applications.)
- Read-only memory (ROM – to store instruction for your computer to start up when you switch on. The contents of can’t be changed)

Internal hardware components

- Video card (the computer to send graphical information to video)
- Sound card (provides a computer with the ability to produce sounds)
- Internal hard disk / solid disk drive (to store data, files (text, photo, music))

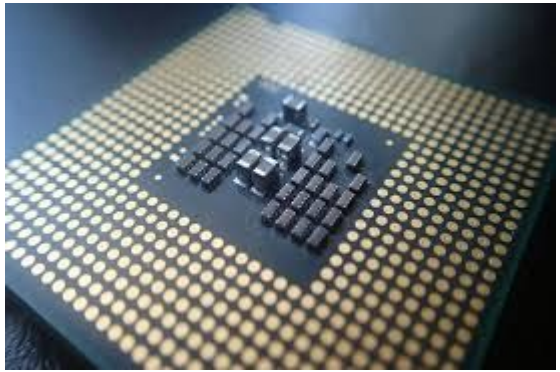
Motherboard

The **motherboard** is a printed circuit board and foundation of a computer that is the biggest board in a computer chassis. It allocates power and allows communication to and between the CPU, RAM, and all other computer hardware components.



The central processing unit (CPU)

Part of the computer that interprets and executes the commands from the computer hardware and software. It is normally part of the computer motherboard.



Read-only memory (ROM)

- Memory used to store information that needs to be permanent. It is often used to contain configuration data for a computer system.
- These chips cannot be altered and can only be read from it. One of the main advantages is that the information stored on the ROM chip is not lost even when power to the computer is turned off. It is often referred to as non-volatile memory
- ROM also contains some coding known as the boot file. This code tells the computer what to do when it first start up (BIOS (Basic input-output system)

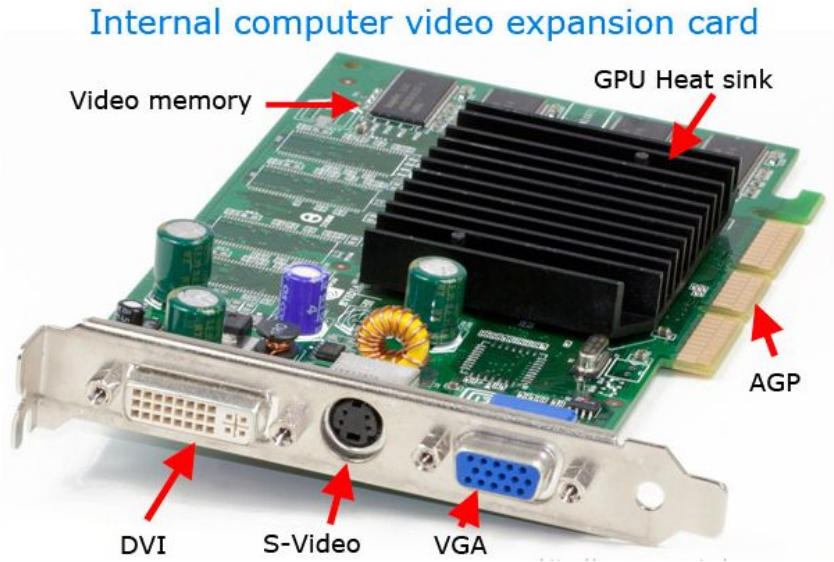
Random access memory (RAM)

Iternatively referred to as **main memory**, **primary memory**, or **system memory**, **RAM** (**random-access memory**) is a hardware device that allows information to be stored and retrieved on a computer. RAM is a volatile memory and requires power to keep the data accessible. If the computer is turned off, all data contained in RAM is lost.

Internal hard disk drive (HDD), Solid state drive (SSD)

Computer's main internal storage, this is where the applications software, disk operating system and files are stored. It is known as secondary storage, which is non-volatile and so data is not lost when the computer is turned off.

Graphics card



Alternatively known as a **display adapter**, **graphics card**, **video adapter**, **video board**, or **video controller**, a **video card** is an expansion card that connects to a computer motherboard.

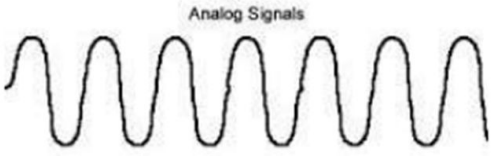
It is used to create a picture on a display; without a video card, you would not be able to see this page. More plainly, it's a piece of hardware inside your computer that processes images and video, some of the tasks normally handled by the CPU.

Sound card

Alternatively referred to as an **audio output device**, **sound board**, or **audio card**.

A **sound card** is an expansion card or IC for producing sound on a computer that can be heard through speakers or headphones. Although the computer doesn't need a sound card, it's included on every machine as either in an expansion slot or built into the motherboard (onboard).

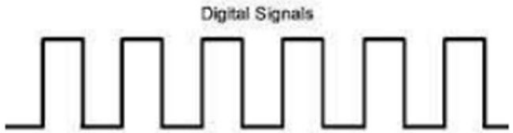
Analogue and digital data



Data collected from Sensors is in Analogue

ADC - Analogue-to-digital converter

Analogue Signal now can be understood by computers.

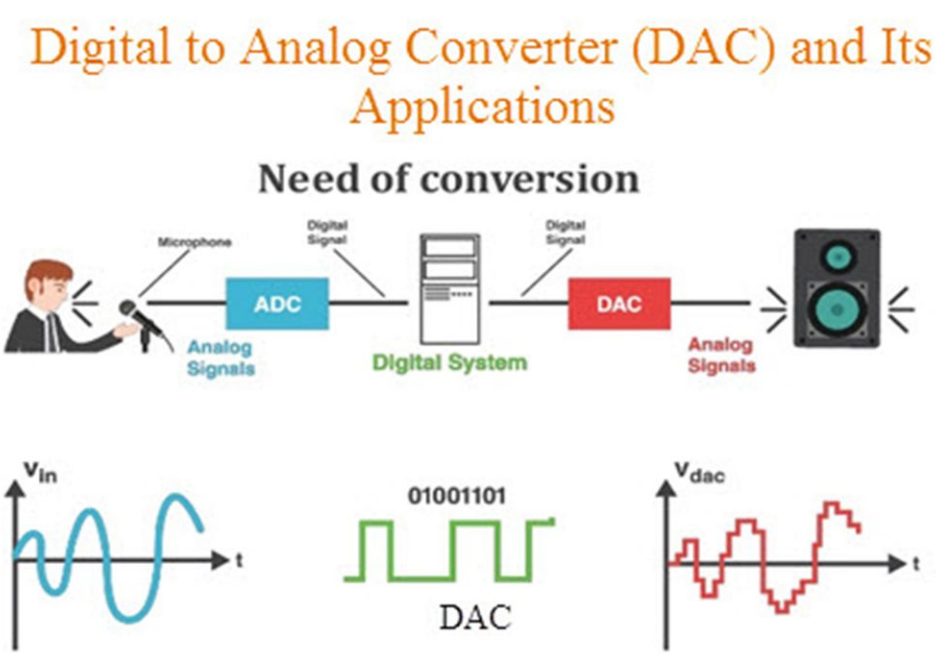


All natural signals are analogue, such as the human voice, animal sounds and notes played by instruments.

Digital data is based on binary form. In order for these to be recorded and processed by a computer they need to be converted into digital signals (bits 1,0)

Converter


Analog to Digital Converters
001101110


Digital to Analog Converter (DAC) and Its Applications
Need of conversion
Microphone
Digital Signal
Digital Signal
ADC
DAC
Analog Signals
Digital System
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DAC
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Software

Software is a general term for the programs that control the computer system. (set of instructions that make a computer system work)

There are two types of software: APPLICATION and SYSTEM.

Applications software

Programs that allow the user to **do specific tasks.**

- Word processing (manipulate text documents...)
- Spreadsheet (organize and manipulate numerical data)
- Database management system (organize, manipulate and analyse data)
- Photo editing (manipulate digital photographs stored)
- Video editing (manipulate videos to produce an edited video)
- Presentation (show and create slide)
- Graphics manipulation (bitmap and vector images to be changed)
- Control and measuring (computer or microprocessor to interface with sensors)
- Web browser (to show web page)
- Apps (runs on mobile phones or tablets)
- Computer aided design (CAD - to make 3D environment)

Systems software

Programs that allow the **hardware to run properly** and allow the user to **communicate with the computer.** (essential to keep the computer working)

- Operating system (os) (running in the background of a computer system.)
- Utilities (Manage, maintain and control computer resources. Antivirus, disk repair ...)
- Compiler (translates a program written in high-level language into machine code. Source code ➜ Object code)
- Interpreter (translates a program written in high-level language into machine code line by line)
- Linkers (one or more object files produced by a compiler and combines them into a single program.)
- Device driver (one or more hardware devices to communicate with the computer's operating system)

User interfaces

It controls what users see on the screen.

GUI (Graphical user interface) - Icons, point, mouse, windows (WIMP)

CLI (Command line interface) - Type specific commands

Dialogue based interface - Say specific commands

Gesture based

GUI VERSUS CLI

GUI	CLI
A type of user interface that allows users to interact with electronic devices through graphical icons and visual indicators	An interface for the user to issue commands in the form of successive lines of text or command lines to perform the tasks
Graphical User Interface	Command Line Interface
Even a beginner can easily handle	User should have good knowledge of commands

GUI VERSUS CLI

GUI	CLI
Requires more memory as it contains a lot of graphical components	Does not require more memory
Slower	Fast
There are customizable options to change the appearance	It is not possible to change the apperance
More flexible	Not much flexible

Гэрийн даалгавар

Сурах бичгийн 2-7 хуудсыг дуустал уншиж, ICT хичээлийн дэвтэрт цэвэрхэн, цэгцтэй байдлаар тэмдэглэл (mindmap байж болно) хөтлөх

Types of computer

Chapter 1

Devices	Advantages	Disadvantages	Main uses
Tablets	Quick to turn on Portable Easy to use Lots of apps to choose from Ability to transfer data	Can be expensive Not all have expandable memory. Some lack cellular connectivity or have expensive contracts Amount of battery life Speed of data transfer and compatibility	Portable entertainment Web browsing Games Reading Email Video calls
Smartphones	Pocket sized Can make calls, and send texts and emails 3G/4G connectivity to access the web from most places Lost of apps available Ability to transfer data	Small screen can make reading difficult Web browsing can drain the battery quickly Typing on a small touch screen may be slow Amount of battery life Speed of data transfer and compatibility	Multifunctional device you can easily keep with you

Devices	Advantages	Disadvantages	Main uses
Laptops	Excellent for work functions Full-size keyboard Very large storage capacity	Larger and heavier than a tablet or smartphone Slower to start than tablets Amount of battery life	Using applications software of all types
Personal computers	Easy to upgrade Usually have a larger screen than a laptop	Not portable Take up a lot of space	Work and home applications Watching tv and films

Devices	Advantages	Disadvantages	Main uses
Smartwatch	Use like smartphones Weather forecasts Fitness and health-monitoring capability GPS	Uncomfortable to wear	Link to smartphones using Bluetooth technology
Mainframe	Several CPUs Very fast processor speeds Support multiple operating system Huge amounts of storage capacity Huge internal memories	Take up a lot of space	Used for a large, very powerful, computer system. Run commercial applications, such as banking and insurance, where huge amounts of data need to be processed

Impact of emerging technologies

Chapter 1

Artificial intelligence (AI)

AI refers to computer systems that are able to perform tasks that would normally be carried out by humans or where a task is too dangerous or boring and repetitive to be done by humans.
Therefore AI needs to be able to react like humans.

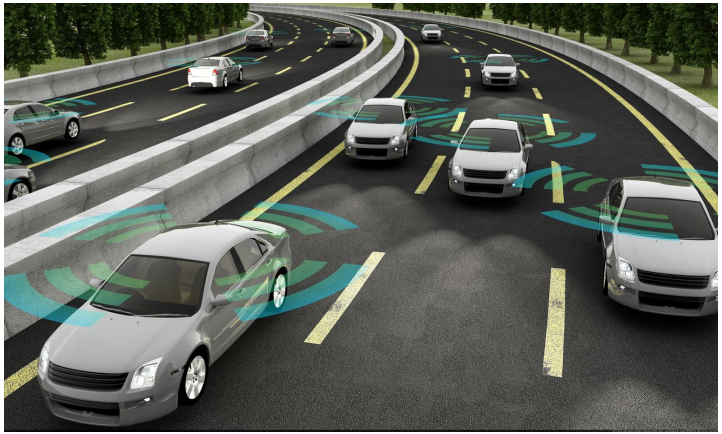
Some of other examples of emerging technologies (at book) include aspects of AI.

Driverless cars

They are probably safer because there isn't a driver to make the errors that cause accident!

Would be able to travel 24 hours a day; the journey would not need to include rest time for the driver either, or food breaks. Result in reduces costs.

Some people may lose their jobs.



Computer assisted translation

- CAT is not the same as machine translation.
- Machine translation is text translation by computer, without any human involvement. However human translators can use CAT software to support them during translation.
- A CAT system creates and manages a translation memory (TM) which means that translators can reuse existing strings of previously translated text. The TM's database keeps collecting content as it is translated. When the TM is large, the translation process is faster.

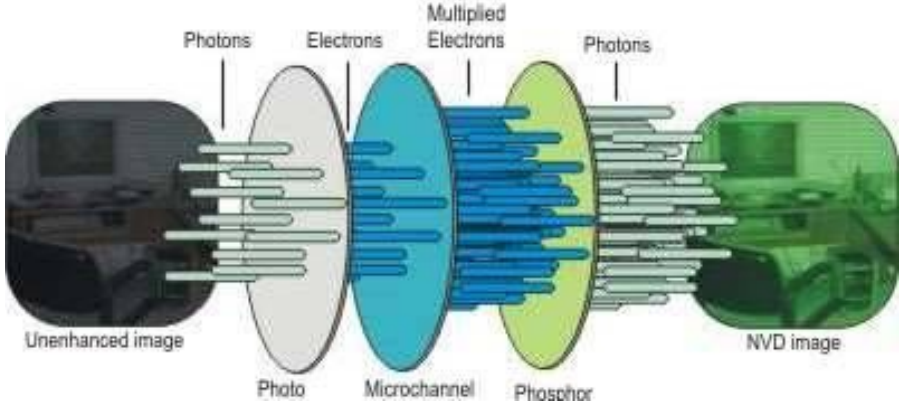
3D and holographic imaging

•Holography refers to the creation of 3D images that can change as the position of the person looking at them changes.

For surgery in hospital

Vision enhancement

There is an implant available that can be placed into the retina of a blind person. They wear glasses that have a video camera mounted on them.



Robotics

•Robots are able to copy the movements and actions of human beings when they perform certain tasks, but to become more useful to us.

Biometrics

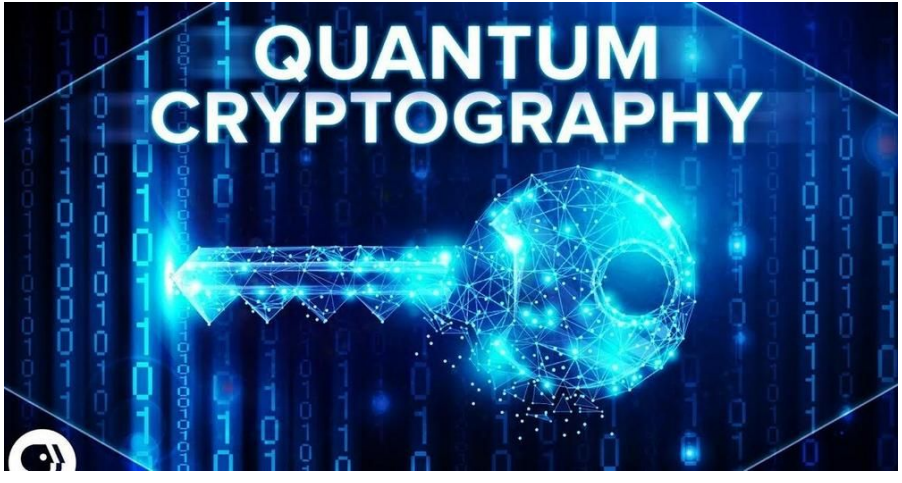
•Provide strong authentication that is unique based on physical traits such as fingerprints, retina scans or DNA, and behavioural traits such as voice patterns or handwriting and signatures.

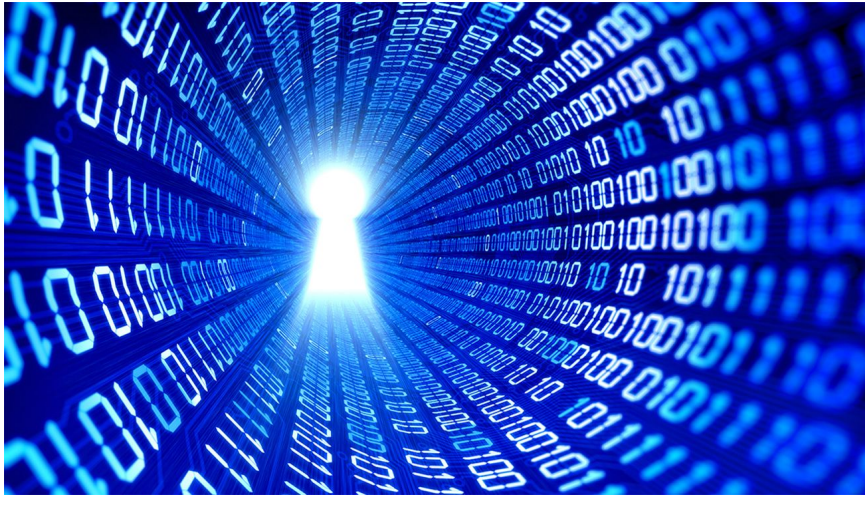
3D printer

•Printers are now able to actually make many different objects in three dimensions, using different materials such as metal, plastic, resin, ceramic, fabrics and more.

Quantum cryptography

- Uses physics to generate a key that relies on the properties of light (photons)
- A photon is a tiny particle of light that is too small to be seen individually.





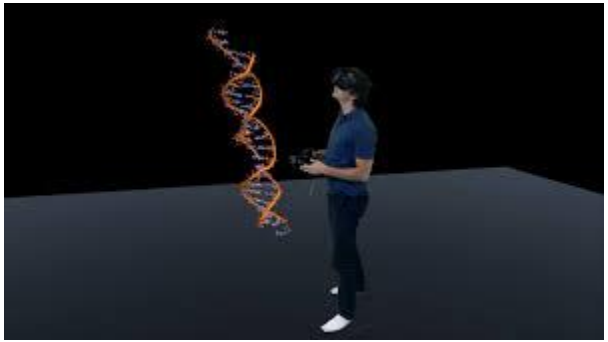
Drones

•A drone is an aerial vehicle crosses the boundaries between robotics, aeronautics and electronics. It's controlled by remote control systems from the ground, you can even control them from smartphone or tablet. A typical drone would be made of light composite materials so that is manoeuvrable and lightweight so that it can fly at high altitudes. Drones can be equipped with infrared cameras and GPS.

•Used by the military, and also for search and rescue, weather analysis, deliveries, spotting poachers etc.

Virtual reality

•Virtual reality is a computer- generated environment, sometimes called a virtual world, where a person can immerse themselves and interact to perform a wide variety of actions.



Augmented reality

Augmented reality (AR) is where technology overlays computer-generated images onto a user's view of the world.

-Creates an interactive experience by enhancing the user's view of the real world with multimedia elements such as text, sound, animations and video.

-Use of a digital camera and sensors to read the surrounding environment. Then uses a method of output to display the augmented reality


Lapras
CP 1060
EXPERT HANDLER

1 A computer consists of hardware and software.

(a) State what is meant by hardware.

.....

..... [1]

(b) State what is meant by software.

.....

..... [1]

(c) There are two types of software.

Name **one** of the two types of software used by a computer.

.....

..... [1]

(d) Name the piece of hardware found in a tablet computer that is both an input and output device.

.....

..... [1]

2 There are many types of data storage.
Tick whether the following statements are examples of read-only memory **(ROM)**, random access memory **(RAM)** or a hard disk drive **(HDD)**.

	ROM (✓)	**RAM (✓)**	**HDD (✓)**
It loses its data when the computer is switched off.			
It is classed as backing storage.			
It stores the start-up instructions of the computer.			
It temporarily stores the current work of the current user.			

[4]

1 There are two types of software: applications and system.

Tick (✓) the most appropriate type of software for each of the following.

	Applications (✓)	**System (✓)**
Device driver		
Linker		
Photo-editing software		
Spreadsheet		

[2]

1 Complete the following sentences, using items from the list.

3D printer	**backing storage**	**CPU**	**hardware**	**RAM**
ROM	**scanner**	**software**	**touchscreen**	**wide format printer**

(a) The core component in a computer that controls arithmetic operations is called a

..... [1]

(b) The physical components of a computer are collectively called

..... [1]

(c) The type of memory that is volatile is called

..... [1]

(d) An output device that is also an input device is called a

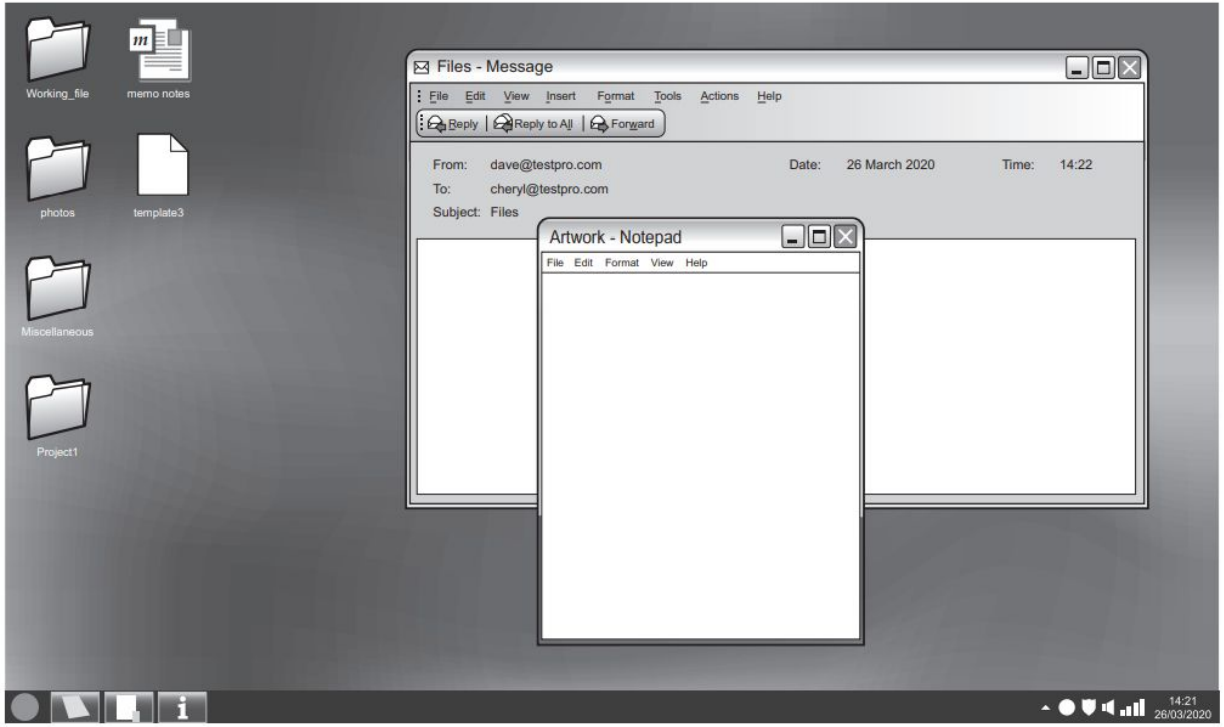
..... [1]

2 Tick (✓) whether the following statements refer to a Command Line Interface (CLI) or a Graphical User Interface (GUI).

	CLI (✓)	**GUI (✓)**
The user has to type in every instruction		
The user does not need to learn any of the instructions		
Each instruction has to be typed in correctly		
The user is in direct communication with the computer		

[2]

2 **(a)** Write down the type of interface shown.



.....

[1]

(b) Write down **two** advantages of using this type of interface.

1.....

.....

2.....

.....

[2]

(c) Tick whether the following examples refer to **VR** or **Robotics.**

	VR (✓)	**Robotics (✓)**
Inserting a car engine into a real car.		
Training a medical student to carry out an operation using a computer simulation.		
Controlling a production line to manufacture pasta.		
Taking a tour of a house before it has been built.		

[2]

Гэрийн даалгавар

- Сурах бичгийн 14-р хуудас хүртэл (summary) унших, тэмдэглэх (1-р бүлэг)
- Exam-style questions хийх