Knowledge Organiser: Memory and Storage

Primary Memory

Primary memory holds data and programs that are currently in use. **Memory** is the component of the computer that holds **data**, **programs** and **instructions** that are currently in use. Primary memory is built inside the computer. This gives the **processor** fast access to the data and

ROM—Read Only Memory

Read only memory (ROM) is **non-volatile** primary **memory**. Its contents are **not lost** when the computer is turned off. ROM can be read from, but not written to, hence the term 'read only'. This makes ROM ideal for storing **instructions** and **data** that are needed for the computer to run. The **BIOS (Basic Input Output System)** is an example of a program that is stored

RAM—Random Access Memory

Random access memory (RAM) is **volatile** primary memory. Once the computer is switched off, the **data** and **instructions** held in RAM are lost. RAM is used to hold data and instructions that are currently in use. In a modern PC, RAM is used to hold the **operating system** and any open documents and **programs** that are running.

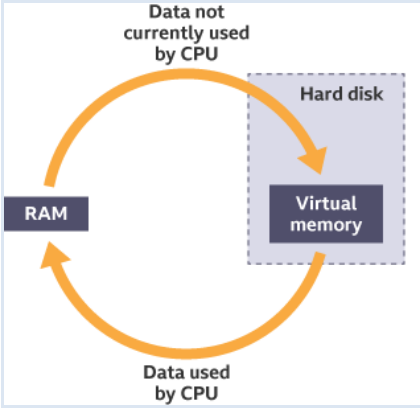
The more RAM a computer has, the more data and programs it can hold simultaneously. RAM can also be upgraded easily, unlike other types of primary memory.

Cache Memory

Cache memory is a type of high-speed **random access memory (RAM)** which is built into the **processor**. **Data** can be transferred to and from cache memory more quickly than from RAM. This allows for faster processing as the processor does not have to wait for the data and instructions to be fetched from RAM. The more cache memory a computer has, the faster it runs.

Memory

Virtual Memory



Virtual memory is used when the computer has no more available random access memory (RAM).

When this happens, part of the computer's **secondary storage**, such as the **hard disk**, can be used to store data temporarily.

Virtual memory enables data that is in RAM and not currently being used to be transferred to the hard disk. This frees up room in RAM for other programs and data. This process is known as **swapping**.

Using virtual memory makes a computer run slower, as the processor has to wait while data is swapped between hard disk and RAM.

Glossary

BIOS	Basic input output system - the basic firmware that is embedded in the computer ROM chip used to start a computer.
Cache	A piece of temporary memory. It can refer to a part of the RAM, storage disk, CPU, or an area for storing web pages.
Flash	Non-volatile memory that can be read from and written to. It is suitable for secondary storage.
Non Volatile Memory	A form of computer memory that stores data even when not powered.

Flash Memory

Flash memory is non-volatile memory than can be read from and written to. **Flash memory** is a special type of memory. It can be written to and overwritten just like **random access memory (RAM)**. However, unlike RAM, it is **non-volatile**, which means that when the computer's power is switched off, flash memory will retain its contents.

Flash memory is fast to access and write to, although not as fast as when reading from or writing to RAM. It requires little power and contains no moving parts, making it an ideal storage medium for many modern devices, such as tablets, smartphones and digital cameras.

Flash memory is also used as external **secondary storage**, for example in USB memory sticks and solid-state drives.

Knowledge Organiser: Storage

Storage—Volatile and Non– Volatile

Computers use primary **memory** such as random access memory **(RAM)** and **cache** to hold **data** that is being processed. However, this type of memory is **volatile**, which means it loses its contents when the computer is switched off. Secondary storage is needed to keep programs and data indefinitely. **Secondary storage** is **non-volatile**, long-term storage. It is used to keep programs and data indefinitely.

Magnetic Storage

Magnetic devices such as **hard disk drives** use magnetic fields to magnetise tiny individual sections of a metal spinning disk. Each tiny section represents one **bit**. A magnetised section represents a **binary** '1' and a demagnetised section represents a binary '0'. These sections are so tiny that disks can contain **terabytes (TB)** of data. As the disk is spinning, a read/write head moves across its surface.

Optical Devices

Optical devices use a **laser** to scan the surface of a spinning disc made from metal and plastic. The disc surface is divided into tracks, with each track containing many flat areas and hollows. The flat areas are known as lands and the hollows as pits.

When the laser shines on the disc surface, lands reflect the light back, whereas pits scatter the laser beam. A sensor looks for the reflected light.

Reflected light (lands) represents a binary '1', and no reflection (pits) represents a binary '0'.

Storage

Solid State Devices

Solid state devices use **non-volatile** random access memory **(RAM)** to store data indefinitely. They tend to have much faster access times than other types of device and, because they have no moving parts, are more durable. This sort of memory is expensive, solid state devices tend to be smaller in capacity than other types.

For example, a solid-state drive that holds 256 **GB** might be of a similar cost to a hard disk with several terabytes capacity. They also consume little power and durable and portable.

Factors to Consider for suitable storage media

- Cost - what is the cost per gigabyte (GB)?
- Capacity - how much data can the medium hold?
- Speed of access - how quickly can data be transferred to and from the medium?
- Portability - how portable is the medium? Does it need to be portable?

Glossary

Key Vocabulary

Binary	A number system that contains two symbols, 0 and 1. Also known as base 2.
Bit	The smallest unit of data in computing represented by a 1 in binary.
Cache	A piece of temporary memory. It can refer to a part of the RAM, storage disk, CPU, or an area for storing web pages.
Data	Units of information. In computing there can be different data types, including integers, characters and Boolean. Data is often acted on by instructions.
Embedded system	A special purpose computer built into another device.
GB	Gigabyte (GB) - a measurement of file size or storage capacity, 1,024 megabytes, or 1 billion bytes.
General Purpose Computer	A computer designed to be able to carry out a wide range of instructions.
Hard Disk Drive	A device used to store large amounts of data.
Laser	An intense beam of light that is monochromatic and coherent (in phase).
Media	Physical devices that are used to transfer data.
Memory	The part of a computer that stores data.
Non Volatile Memory	A form of computer memory that stores data even when not powered.
RAM	Random access memory. This is volatile memory that is constantly being written to and read from. It does not retain its contents without a constant supply of power. When a computer is turned off, everything stored in its RAM