MODULE B · OCR J277 1.2, 1.3.1 · CAMBRIDGE 0478 3.3, 1.3

Memory and storage

RAM and **ROM**, **virtual memory**, **secondary storage** and its three types, **choosing storage**, **the cloud**, **data units** and **file sizes**. Spec versions as checked in November 2026.

01 Primary storage: RAM and ROM (B1)

Primary storage Main memory, directly accessed by the CPU; holds data and instructions in use.

RAM Volatile; read and write; OS, programs and data currently in use.

ROM Non-volatile; read only; start-up instructions (BIOS) that load the OS.

Why both ROM keeps start-up instructions with no power; RAM is fast, changing working memory.

Cache GCSE only: OCR also counts it as primary storage (Cambridge: CPU, 3.1). Small, very fast, frequently used data/instructions.

02 Virtual memory (B2)

What Part of secondary storage (HDD/SSD) used as extra RAM when RAM is full.

How Data not in use moves to virtual memory, freeing RAM; moved back into RAM when needed.

Drawback Secondary storage is slower to access than RAM; lots of swapping slows the computer.

Fix More RAM, so less virtual memory and less swapping.

Pages IGCSE only Pages of data are transferred between RAM and virtual memory.

03 Secondary storage (B3)

What Non-volatile, long-term storage of files, programs and the OS.

Why needed RAM is volatile and too small; secondary is large and cheap per GB.

Access Not directly accessed by the CPU: data is loaded into RAM first.

04 Three types (B4)

Magnetic HDD, magnetic tape. Moving parts.

Optical CD, DVD, Blu-ray. Laser reads the disc.

Solid state SSD, SD card, USB memory stick. Flash, no moving parts.

Device / medium Device reads/writes (DVD drive); medium holds data (DVD disc).

05 How each type works (B4) IGCSE only · OCR: characteristics only, no component parts

01
Magnetic

Spinning platters divided into **tracks and sectors**. A read-write head uses an **electromagnet** to magnetise tiny areas; reads by sensing them.

02
Optical

A **laser** creates and reads **pits and lands**; they reflect light differently and the changes are read as data.

03
Solid state

Flash memory, **NAND or NOR**. Transistors as **control gates and floating gates**; trapped electrons store each bit with no power.

06 Choosing storage (B5) · OCR-led

Capacity How much it holds. Magnetic: high and cheap.

Speed Read/write speed. Solid state, then magnetic; optical slowest.

Portability Easy to carry. Solid state: small, light.

Durability Survives knocks and heat. Solid state: no moving parts.

Reliability Stores and returns data correctly over time.

Cost Per gigabyte. Magnetic and optical are cheap.

Exam rule Link every reason to the scenario.

07 Cloud storage (B6)

- **Cloud**

  Provider's remote servers (real hardware) over the internet. Access and share anywhere, more space on demand, provider backs up. Needs internet; provider controls security; ongoing cost; less control.

- **Local**

  Your own device or drive. Works offline, you control it. Limited capacity; you make your own backups.

The Cloud GCSE only Remote service provision: storage, software and processing.

08 Units of data (B7)

Bit / nibble / byte 1 binary digit / 4 bits / 8 bits.

OCR GCSE only KB = 1,000 bytes; MB, GB, TB, PB each 1,000 of the one before. 1,024 also accepted.

Cambridge IGCSE only KiB = 1,024 bytes; MiB, GiB, TiB, PiB, EiB each 1,024. Must use 1,024; answer in the unit asked.

Converting To a bigger unit, divide; to a smaller unit, multiply.

09 File sizes (B8)

Image colour depth x width (px) x height (px)

Sound sample rate (Hz) x duration (s) x bit depth. IGCSE: "sample resolution".

Text GCSE only bits per character x number of characters. Also sets of files; metadata allowance.

Then bits ÷ 8 = bytes, then ÷ 1,000 (OCR) or ÷ 1,024 (IGCSE).

OCR example 300 x 200 x 8 = 480,000 bits = 60,000 bytes = 60 KB.

IGCSE example 128 x 64 x 8 = 65,536 bits = 8,192 bytes = 8 KiB.

01
Give **both sides**: RAM is volatile, ROM is non-volatile. RAM holds only what is **currently in use**.

02
Virtual memory is slower because **secondary storage is slower to access than RAM** and data must move back into RAM.

03
Say what solid state is faster at: **reading and writing data**. It does not last forever.

04
File sizes: **divide by 8** before 1,000 or 1,024, and show every step of working.