



4.1.1 Von Neumann & Harvard

1 (a) A microwave has a CPU that is based on Von Neumann architecture .

(i) State **two** features of the Von Neumann architecture.

[2 marks]

- Control unit
- Arithmetic logic unit
- Registers within the CPU
- Instructions and data stored in the same area of memory
- Instructions and data stored in the same format
- A single set of buses/ same buses for instructions and data

(ii) Describe **one** feature, **not** part of the standard Von Neumann architecture, which contemporary CPUs may have in order to improve performance.

[2 marks]

- Two separate areas of memory
- ... one for instructions and one for data/ instructions and data can be accessed concurrently
- Different sets of buses
- ... one for instructions and one for data/ instructions and data can be accessed concurrently
- Pipelining
- ... while one instruction is executed, the next can be decoded and the one after that fetched
- Use of cache
- ... which stores frequently used instructions/data
- Multiple cores
- ... each core acts as a separate processing unit.





2 Different computing devices in Arnold's home use different processor architectures.

(a) One processor architecture is the Harvard architecture.

(i) Describe the Harvard architecture.

[2 marks]

- Separate memory for data and instructions
 - Different sets of buses for instructions and data // instructions and data can be accessed concurrently
 - Instruction memory may be ROM
-

