1		**Marks are for AO1 (understanding)** • The address of the memory to be written to is placed on the address bus (by the processor); • The data to be written is placed on the data bus (by the processor); • The signal to write is placed on the control bus (by the processor); • The control bus carries a clock signal (to synchronise the memory and processor); • When the write signal is received (by the memory) on the control bus; the data from the data bus is stored; into the location identified by the address bus; **A.** CPU for processor **NE.** Implication that the busses are doing the 'sending' rather than 'carrying' of data / addresses / signals **MAX 2** per bus **MAX 3** if only two buses referenced **MAX 4** marks	4

2	1	**2 marks are for AO1 (understanding)** When data/instructions are needed/fetched they have to be transferred from memory to the processor (using the data bus); (after execution) result/data may need to be transferred back to memory (using the data bus); **A.** responses referring to I/O controllers instead of memory	2
2	2	**2 marks are for AO1 (understanding)** **In the Harvard architecture:** Instructions and data have separate buses; Instructions and data are stored in separate memories // Instructions and data have separate memory/address spaces; **NE.** Places, locations, registers, areas of memory Instruction word size can be different to data word size // Instruction bus width can be different to data bus width; Instructions and data can be fetched simultaneously; **A.** points made in reverse that state how the von Neumann architecture works **MAX 2**	2

Qu	Pt	Marking Guidance	Marks
3	1	**Marks are for AO1 (understanding)** Main memory stores the <u>instructions</u> to be executed (and any data required by those instructions); Main memory returns the instructions / data / value stored in a memory location (specified on the address bus) (using the data bus); Program is transferred from secondary storage into main memory (if program not already in main memory) when program execution is requested; Main memory stores any value / data resulting from the execution of the program; **MAX 2**	2

Qu	Pt	Marking Guidance	Marks
3	2	**Marks are for AO1 (understanding)** The address bus; Width increased by 1;	2