0 1 When the processor writes data to the main memory it will make use of the address, control and data buses.

Explain how **each** of these buses will be used during this **write** process.

[4 marks]

0 2 . 1 Some buses in a computer system have to be bidirectional, meaning data or instructions can travel both ways.

Explain why the data bus in a computer system must be bidirectional.

[2 marks]

0 2 . 2 State **two** differences between how the Harvard and von Neumann architectures operate.

[2 marks]

Difference 1 _____

_____

_____

Difference 2 _____

_____

_____

0 3 . 1 Describe the role of main memory in the execution of computer programs.

[2 marks]

0 3 . 2 Identify the bus that would need to be changed **and** state the change needed so that the maximum amount of memory addressable by the processor would be doubled.

[2 marks]

Bus to change _____

Change needed _____

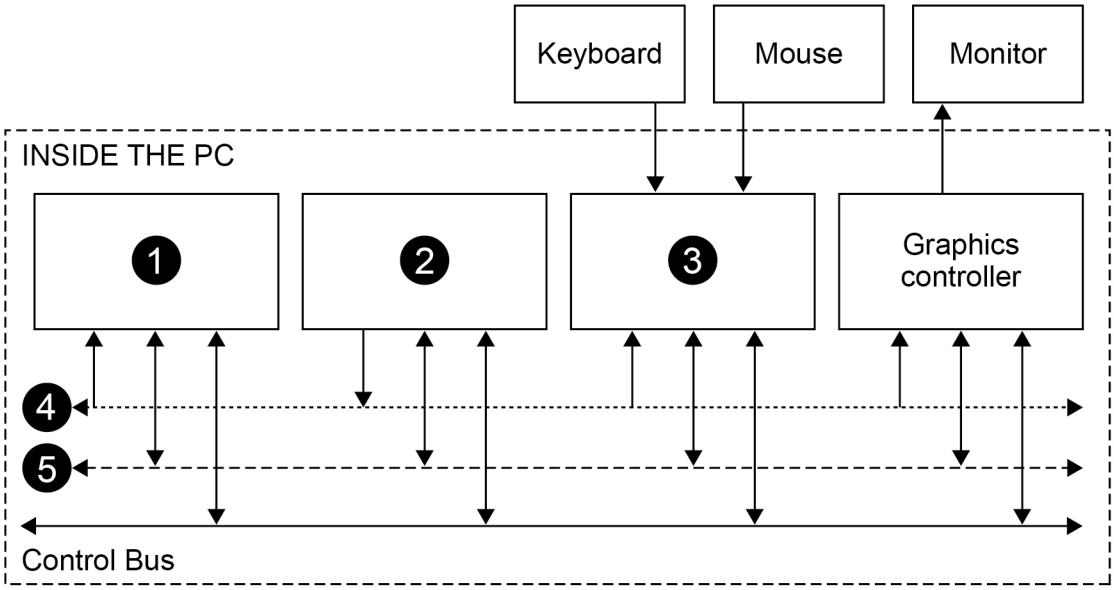
0 4 A particular computer system uses a 32-bit address bus and a 32-bit data bus. Each addressed memory location can store one byte of data.

0 4 . 1 What is the maximum amount of memory, in bytes, that could be accessed?

[1 mark]

0 5 . 1 **Figure 1** shows how some of the components inside a computer are connected together. The computer uses the von Neumann architecture. Some of the names of components have been omitted from **Figure 1** and replaced with the numbers ❶ to ❺

Figure 1



Complete **Table 1** by writing in the **Component Number** column the numbers from **Figure 1** that correspond to the **Component Names**.

[2 marks]

Table 1

Component Name	Component Number (1–5)
Address Bus	
Data Bus	
Main Memory	
Processor	
USB I/O Controller	

0 5 . 2 A tablet computer uses the Harvard architecture. Describe **two** advantages of using the Harvard architecture compared to the von Neumann architecture.

[2 marks]

Advantage 1 _____

_____

_____

Advantage 2 _____

_____

_____

0 6 . 1 Below is a definition of a term relating to the architecture of a computer system:

> Machine code instructions stored in main memory are fetched and executed serially by a processor that performs arithmetic and logical operations.

Shade **one** lozenge to indicate which term this defines.

[1 mark]

A The Harvard architecture ⬭

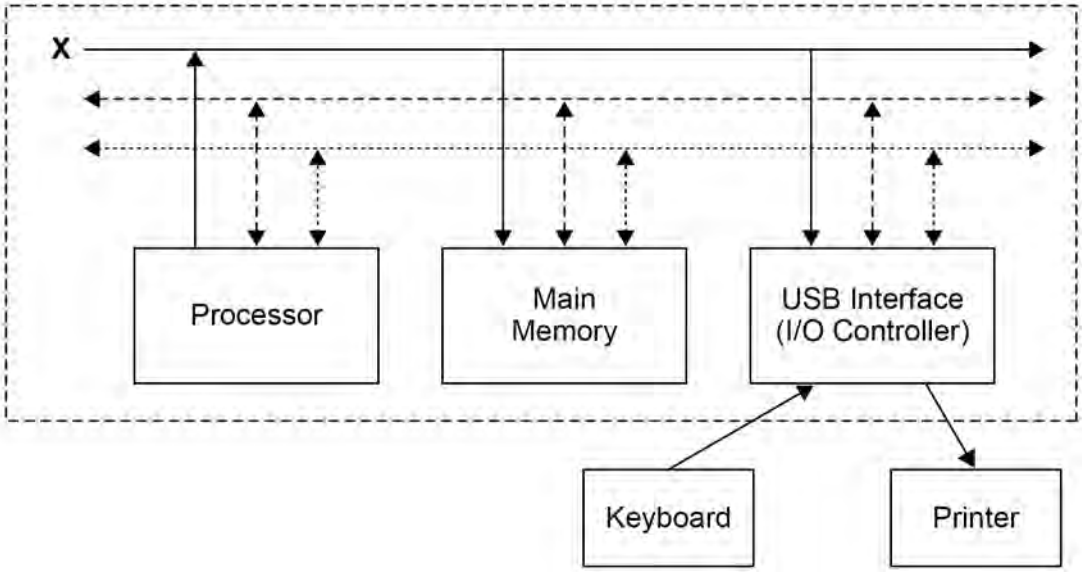
B The processor instruction set ⬭

C The stored program concept ⬭

D The von Neumann architecture ⬭

0 7 **Figure 1** shows the organisation of part of a simple computer system.

Figure 1



0 7 . 1 State the name of the bus labelled **X** in **Figure 1**.

[1 mark]

0 7 . 2 The data bus inside the computer uses synchronous parallel data transmission.

Describe what synchronous transmission is.

[1 mark]

0 7 . 3 Peripherals, such as a keyboard or printer, are connected to the computer using a USB (Universal Serial Bus) connection. USB uses synchronous serial data transmission.

Explain why serial transmission has been chosen to communicate with peripherals connected to the computer **and** why parallel transmission is used by the data bus inside the computer.

[3 marks]

0 7 . 4 The USB interface inside the computer is an example of an I/O controller.

Describe the role of an I/O controller.

[2 marks]

0 7 . 5 The computer's address bus uses 36 wires/lines and each main memory location can hold a 16-bit data value.

In gibibytes, express the maximum amount of main memory that could be installed in the computer, assuming that the CPU could access all of the memory using the address bus.

You should show your working.

[2 marks]

Answer _____ gibibytes

0 7 . 6 State an example of how the control bus is used when the processor stores data into main memory.

[1 mark]