

Topic 5: Computer Hardware	Do I understand how to ...
	<ul style="list-style-type: none"> <li>• explain the purpose of the central processing unit (CPU);</li> <li>• describe the role of the following components of the CPU: the arithmetic logic unit (ALU), control unit and immediate- access store;</li> <li>• describe the role the following play in the fetch- execute cycle: program counter, memory address register (MAR), memory data register (MDR), instruction address register (IAR) and ALU;</li> <li>• describe the impact of clock speed, cache size, and number of cores on CPU performance;</li> <li>• describe the characteristics, typical uses, and advantages and disadvantages of the following input, output and storage devices: <ul style="list-style-type: none"> <li>– microphone;</li> <li>– mouse;</li> <li>– graphics digitiser;</li> <li>– touch screens;</li> <li>– speakers;</li> <li>– printers (laser and 3D);</li> <li>– hard disc drive (HDD);</li> <li>– high definition (HD) storage media; and</li> <li>– solid state drive (SSD);</li> </ul> </li> <li>• explain the purpose of random access memory (RAM), read only memory (ROM) and cache.</li> </ul>

5 John has purchased a laptop computer.

(a) The table below shows some of the technical specification for the laptop.

Operating system	Windows 10 (64-bit)
Processor	- Intel® Core™ i5-7200U Processor - Dual-core - 2.5 GHz / 3.1 GHz (Turbo Boost) - 3 MB cache
RAM	8 GB DDR4 - 2133 SDRAM
Storage	128 GB SSD

(i) Complete the following table, about the processor components, by inserting the appropriate values from the table above.

Processor component	Value
Clock speed	2.5 GHz / 3.1 GHz [1]
Cache size	3 MB [1]
Number of cores	2 [1]

(ii) How does the clock speed impact on the performance of the central processing unit?

- Influences the speed at which CPU executes commands (1) [1]  
OR - The greater the clock speed the greater the processing power (1)  
OR - The higher the clock speed the more instructions can be carried out / better performance.



(iii) Describe the characteristics of the storage device provided with John's laptop.

- Solid state drive (SSD) - No moving parts.
- Non-volatile - Flash memory. [2]

(b) The system software on the laptop manages resources.

(i) Apart from allocating memory, list **two** other resources that are managed by system software.

1. Data storage
2. Processor time [2]
3. Hardware
4. Software

(ii) Explain how memory is allocated by system software when a user wants to access data held on a hard disk.

- A free space in memory.
- The free space is allocated to the program.
- The program is transferred back out of main memory when no longer required. [3]

(c) Computer systems use different modes of processing. Complete the following paragraph, using the phrases listed below, to explain the modes of processing.

airline booking systems

batch processing

real-time processing

billing systems

Collecting groups of similar data over time and processing the data together is called batch processing. This type of processing is suitable for billing systems. Processing data immediately as it is collected is called real-time processing. This type of processing is suitable for airline booking systems. [4]

[Turn over



5 (a) The following is a section of the specification for John's computer system.

- Windows 10 (64-bit)
- Intel® Core™ i7-8700 Processor
- 3.2 GHz / 4.6 GHz (Turbo Boost)
- 12 MB cache
- 16 GB DDR4 (2400 MHz)
- 2 TB HDD, 7200 rpm
- 256 GB SSD

(i) How much RAM does the computer have?

16GB [1]

(ii) What is the purpose of ROM in a computer system?

- Read only memory.  
- Non-volatile - permanent when computer is turned off. [2]

(iii) Give one advantage of John's computer having a Solid State Drive.

- Large storage capacity  
- Plug and play. [1]  
- Faster than traditional hard drive.

The operating system on John's computer includes a utility application.

(b) What is the function of the following two tasks carried out by utility software?

1. Disk defragmenting

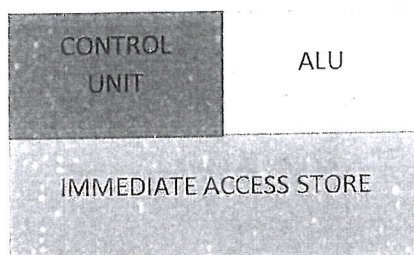
- Rearrange data as large files are often fragmented.  
- Speeds up time to access data.

2. Task scheduling

- Timeslicing to get maximum use of processor.  
- Creates appearance of no interruptions, [4]  
allowing autorun tasks (eg backup schedule, virus check schedule)



- (c) John describes the Central Processing Unit (CPU) as the brain of the computer.



- (i) What do the letters ALU stand for?

Arithmetic and Logic Unit [1]

- (ii) What is the role of the Control Unit in the CPU?

- Manages the execution of instructions.  
- Fetch/Execute cycle. [2]

- (d) Match the terms provided with the correct statements about the CPU and fetch-execute cycle.



Term	Statement
<u>Clock speed</u> [1]	Indicates the speed at which the CPU can operate measured in gigahertz.
<u>Program counter</u> [1]	Stores the memory location reference (address) of the next instruction to be fetched.
<u>Memory Data Register</u> [1]	Temporarily stores data being transferred to and from memory.

[Turn over]

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5 All computer systems contain a CPU.

(a) What do the letters CPU stand for?

Central Processing Unit [1]

(b) List two registers used in the Fetch-Execute Cycle.

1. Memory Address Register
2. Memory Data Register [2]
3. Instruction Register 4. Program Counter

The speed that the CPU operates at is measured in cycles per second. One cycle per second equals one Hertz.

(c) How many instructions will a CPU with a clock speed of 4 GHz carry out per second?

Instructions per second	Tick (✓)
4 billion	✓
4 million	

[1]

(d) How does the clock speed impact on a computer's performance?

- The operating frequency of the CPU determines how fast the CPU can process instructions.
- The faster the clock speed, the more instructions can be processed. [2]

[Turn over]



6 Describe the functions of the following network resources.

1. A switch

- Organises communication between file server + PC.
- Allows 2 computers connected to a switch to send data to each other.

2. A router

- Joins 2 or more networks together.
- Works out the best route for data to travel.

[4]

7 John runs a small joinery business. He uses the following devices in the office:

- a laser printer
- a PC with a hard disk drive, a large screen and speakers.

(a) List **two** features of a typical laser printer.

1. High quality print.
2. High speed, large print volume.

[2]

(b) John is going to change his PC to one which has a solid state drive. Describe the advantage of using a solid state drive instead of a hard disk drive.

- No moving parts, therefore faster data retrieval.
- Consumes less power.
- More resilient against damage.

[2]



- 4 The Central Processing Unit (CPU) consists of the following main components: the Control Unit, the Arithmetic Logic Unit and the Immediate Access Store.

What role do the following components perform in the CPU?

The Arithmetic Logic Unit

- Processes all the data inside the CPU.
- Performs all mathematical operations/calculations, eg add, subtract, multiply, divide.
- Executes all logical operations, eg, true, false, greater than, less than equal to.

The Immediate Access Store

- Stores programs (temporarily) while they are being used.
- Stores data (temporarily) while they are being used.
- Essential to the fetch-execute cycle.

[4]



5 Computers make use of different hardware components.

- (a) For each row in the table below choose the term that best matches the description. (Not all terms will be used.)

Arithmetic and Logic Unit      Control Unit      Program Counter      Cache

Description	Term
A small amount of high-speed memory close to the processor	Cache
Responsible for fetching and decoding instructions	Control Unit
Carries out calculations and comparisons	Arithmetic and logic unit

[3]

- (b) Using the words supplied below, complete the following sentence about the Central Processing Unit (CPU). (Not all words will be used.)

Memorise      Processing      Manage

The main purpose of the CPU is to manage [1] the functions of a computer by processing [1] data and instructions.



Elsie is producing a table to help her understand the differences between RAM and ROM.

- (c) Complete the table below by placing a tick (✓) in the row under the correct heading.

Statement	RAM	ROM
The memory is non-volatile		✓
Data is read only and cannot be changed		✓
Data will be lost when the computer is turned off	✓	
Stores current data and instructions that are being used	✓	

[4]

- (d) What do the letters IAS stand for?

Immediate Access Store [1]

[Turn over]

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8 The CPU is sometimes called the brain of the computer.

(a) Expand the acronym CPU.

Central Processing Unit

[1]

(b) Identify the main purpose of the CPU.

Every piece of information that is stored or processed goes through the CPU.

[1]

(c) The terms given below are parts of the CPU. Complete the table by matching each part of the CPU to the statement which best matches the role it carries out.

ALU	Control Unit	Immediate Access Store
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Statement	Part of the CPU that carries out this role
Holds programs and data currently in use	<u>Immediate Access Store</u>
Performs calculations and logical operations	<u>ALU</u>
Tells input and output devices how to carry out instructions	<u>Control Unit</u>

[3]

(d) Use the words given below to complete the paragraph to describe the role played by each of the registers when executing a program.

Memory Address Register	Memory Data Register	Program Counter
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When a computer program is running the Program Counter holds the address of the next instruction. The location of the next item of data to be fetched is stored in the Memory Address Register. When a data item is fetched from memory it is stored in the Memory Data Register.

[3]

Examiner Only	
Marks	Re-mark

