01		**2 marks for AO1 (recall)** **1 mark: C:** ROM is commonly used to store start-up instructions **1 mark: D:** ROM is non-volatile **If more than two lozenges shaded then marks are not awarded.**	2

02		**4 marks for AO1 (understanding)** 1 mark for each correct point that explains how a Hard Disk Drive operates, up to a maximum of 4 marks. **Examples Include**: • A HDD can contain multiple platters (disks); • A disk/disks that move/spin • Each platter is divided into sectors; • The disks are spun at a very high speed (approximately 7,200 rpm to 10,000 + rpm); • Read\write heads (move across the disk to) read and write data; • There is one read\write head for each side of a platter ie two heads per platter; • Data is written to\read from the disk by magnetising\polarising\sensing microscopic regions on the disk; • Data is organised in concentric rings called tracks; • There is a small circuit board on the drive that controls the reading and writing of data; • Data is transferred from and to the disk via a cable/electrical current being passed; • The intersection of sectors and tracks are called blocks; • Data is read 1 block at a time; **NE** Storing binary, or 1s and 0s without reference to magnetising	4

<table>
<tr>
<td>03</td>
<td>1</td>
<td>3 marks for AO1 (recall), 3 marks for AO1 (understanding)

Max 3 marks for stating the components.
Max 1 description mark for each component stated.

<table>
<tr><td>Control Unit;</td><td>Decodes instruction;
Controls the fetching and writing of data;</td></tr>
<tr><td>Arithmetic Logic Unit/ ALU;</td><td>Executes mathematical instructions;
Executes logical instructions;
Compares values held in registers;</td></tr>
<tr><td>Clock;</td><td>Controls the number of instructions carried out each second;
Allows the CPU to synchronise operations;

R. allows the computer to display the time</td></tr>
<tr><td>Bus;</td><td>Used to transfer data / instructions from one component of the CPU to another;

A. Variations such as Control bus, Address bus, Data bus</td></tr>
<tr><td>(L1) Cache;</td><td>Very fast memory;
Memory close/on CPU;
Stores frequently used instructions/data;</td></tr>
<tr><td>Register;</td><td>Special purpose (small) memory location (on CPU);
Used for specific purpose in Fetch-Execute Cycle;</td></tr>
</table>

R. RAM/ROM/IAS.</td>
<td>6</td>
</tr>
</table>

<table>
<tr>
<td>03</td>
<td>2</td>
<td>Mark is for AO1 (recall)

decode;

I. Minor spelling errors or hyphenated word
I. Case</td>
<td>1</td>
</tr>
</table>

04		**3 marks for AO1 (understanding)** 1 mark for each valid reason given up to a maximum of 3 marks. **<u>Examples include</u>**: • To allow sharing of files; • To backup files from a PC; • To allow remote access of files/access from anywhere; • To allow access from any computer/device (with internet access); • To give access to a larger amount of storage capacity; • To allow concurrent access\collaboration; • Can purchase a cheaper (lower spec) computer; • Cloud storage is automatically backed up by the host; • May be more fault tolerant/resilient than local storage; **R**. Relative cost, unless statement is qualified.	3

05		**2 marks for AO1 (recall)** **A** Arithmetic logic unit; **B** Control unit; **If more than two lozenges shaded then marks are not awarded.**	2

06		**1 mark for AO1 (recall)** **B** Secondary storage is non-volatile; **If more than one lozenge shaded then mark is not awarded.**	1

07		**4 marks for AO1 (understanding)** Max of four marks. • Disk rotates (at high speed); • Laser head moves across (radius of) disk; • Laser shines onto the disk; • Tiny indentations/pits/bumps reflect light differently (to lands/flats)//Different colour of dye reflects or blocks laser light; • Reflected light is interpreted into 1s and 0s representing data stored on disk; • Data is stored on a single spiral track (rather than concentric tracks); **R.** Reference to pits and lands corresponding to ones and zeros unless combined with a description of how they reflect light.	4

08		**2 marks for AO1 (recall)** A computer system: • with a dedicated/specific purpose or function; • built in to a physical product/device/machine; **A.** a (computer) system with firmware/software inside a product/device; **A.** reference to 'system' if relevant examples are given for clarification; **NE.** a specific example eg. "like in a washing machine" without further qualification.	2

09

4 marks for AO1 (understanding) 8 marks for AO2 (apply)

12

Level	Description	Mark range
4	Evidence of a **clear understanding** is shown through **discussion** of the devices' properties. Comparisons are well supported by valid technical explanations for the advantages **and** disadvantages. Explanations are clear and accurate, using correct and detailed technical language **throughout**.	10–12
3	Evidence of a **more developed understanding** is shown through **comparisons** of the devices' properties. Comparisons are supported by explanations that give valid technical reasons for the advantages **and/or** disadvantages. Technical language is used accurately in **most** cases.	7–9
2	Evidence of **some understanding** is shown by making **brief comparisons** of the devices' properties. Comparisons are supported by simple descriptions of the advantages **and/or** disadvantages. There is **some** use of technical language although its use is sometimes inaccurate.	4–6
1	Evidence is shown of **limited understanding** through a **simple identification** of which device's properties are better or worse than the other. **Limited** supporting statements are provided. There is **no** use of technical language, or if there is it is used inaccurately.	1–3
No creditworthy material		0

Guidance:

There are 5 different properties that can be compared between the devices: cores; clock speed; cache; RAM; HDD/SSD.

Possible comparisons	Device A	Device B
Core	Quad (4) core • More cores than B. • Can process more commands in same time than dual core.	Dual (2) core • Less cores than A. • Can process fewer commands in same time than quad core.
Clock Speed	1.6 GHz CPU • Lower clock speed than B. • Would process fewer instructions per second than B **if it had the same number of cores.** • Combined with the quad core processor this equates to raw power of 6.4 billion instruction per sec – theoretically worse than B. • Slower processor so more energy efficient.	3.9 GHz CPU • Higher clock speed than A. • Would process more instructions per second than A **if it had the same number of cores.** • Combined with the dual core processor this equates to raw power of 7.8 billion instructions per sec – so theoretically better than A. • Faster speed means more power consumption/less efficient. • So may run hotter.
Cache	8 MB cache • More cache than B. • Theoretically CPU A will have to wait less time to get instructions. • Despite less raw speed this may mean A is overall faster than B.	2 MB cache • Less cache than A. • Because it has less cache than A there might be bottlenecks. This might negate B's overall better raw speed than A.
RAM	16 GB RAM • More RAM than B. • Potential boost to A as more programs and data will be held in memory, reducing time to read from secondary storage.	4 GB RAM • Less RAM than A. • More likely to require use of virtual memory. • Increased access of secondary storage may be balanced by use of faster SSD.
Secondary Storage	2 TB Hard Disk Drive (HDD) • More storage than B. • Slower access than SSD. • Less resilient, as mechanical. • May be more suitable for large media files.	250 GB Solid State Drive (SSD) • Much less storage than A. • SSDs more resilient. • SSDs faster. • because uses flash memory. • Less useful for storing large files, eg media. • More energy efficient as no motor.
Overall comparison	Overall, not much difference in processing speeds but A more suitable for non-mobile device processing lots of media and B fairly powerful mobile computer but with limited storage space.	

Qu	Part	Marking guidance	Total marks
10		**3 marks for AO1 (recall)** **B** Control unit; **D** Memory; **H** Shared bus; **R.** if more than three lozenges shaded.	3
11	1	**3 marks for AO1 (understanding)** A **maximum of 3 marks** can be awarded. Example mark points include: • it stores instructions whilst a program is being executed; • it stores data whilst a program is being executed; • each unique memory location in memory holds one value; • every memory location has a unique address; • once data has been stored in memory it can be found again later (when it's needed); • data and instructions are replaced in memory as needed;	3
11	2	**2 marks for AO1 (understanding)** A **maximum of 2 marks** can be awarded. Example mark points include: • RAM is volatile // the contents of RAM are lost when the power is removed // secondary storage is non-volatile // the contents of secondary storage are not lost when the power is removed; • RAM capacities are (usually) lower than secondary storage capacities; • generally (the contents of RAM can be read/written) faster than secondary storage // RAM is physically closer to the CPU; **R.** references to cost **R.** references to physical size	2

Qu	Part	Marking guidance	Total marks
12		**2 marks for AO1 (understanding)** • RAM is cheaper (per byte); • Typically, the capacity of cache memory is not enough to store both data and programs.	2

Qu	Part	Marking guidance	Total marks
13	1	**2 marks for AO1 (understanding)** Maximum of **two** marks from: • enables user to access their data from more places/devices; • enables user to more easily share data with others (can make parts of their cloud storage publicly available) // To allow sharing of files; • increases the amount of potential storage available; • reduced cost of computing devices for users as no need for as much built-in secondary storage // Can potentially purchase a cheaper (lower spec) computer; • to allow concurrent access/collaboration; • cloud storage is automatically backed up by the host; **R.** Relative cost, unless statement is qualified.	2

Qu	Part	Marking guidance	Total marks
13	2	**2 marks for AO2 (apply)** Maximum of **two marks** from: SSDs are (relatively) expensive // have higher cost per (giga)byte; SSDs (typically) have lower capacity (than magnetic hard drives); **2 marks** if a valid point is made along with a suitable valid expansion **A.** magnetic hard drives (usually) have higher write/erase cycles (which can make them more suitable for hard disk recording, eg music, video) **A.** SSDs have limited write/erase cycles // SSDs degrade over time	2

Qu	Part	Marking guidance	Total marks
14	1	**Mark is for AO1 (recall)** Physical / electrical / electronic Component(s) / part(s) / element (of a computer system);	1

Qu	Part	Marking guidance	Total marks
14	2	**3 marks for AO1 (recall)** **Maximum 1 mark** for each component **Clock** Regulates the timing and speed of (computer) operations // sends out a regular electronic pulse / timing signal; **Control Unit** Coordinates the actions of the CPU // decodes instructions // sends control signals; **A.** controls the flow of data through the CPU **Register** Holds data used when executing an instruction // holds the result of executing an instruction // holds an instruction (CIR) // holds a memory address (MAR);	3

Qu	Part	Marking guidance	Total marks
14	3	**Mark is for AO1 (understanding)** The processor with two cores may be able to process **two** instructions / tasks / processes in parallel / at the same time / simultaneously;	1

Qu	Part	Marking guidance	Total marks
14	4	**Mark is for AO1 (recall)** Non-volatile memory retains data when power is lost / does not lose its contents when power is lost;	1

Qu	Part	Marking guidance	Total marks
14	5	**Mark is for AO1 (understanding)** RAM; Cache; Register; **A.** examples such as DRAM, SRAM	1

Qu	Part	Marking guidance	Total marks
14	6	**2 marks for AO1 (understanding)** Storing data / files; When the computer is turned off // on a long-term basis // using non-volatile storage; **A.** to (temporarily) store data in virtual memory // (to implement) demand paging // to buffer processes	2

Qu	Part	Marking guidance	Total marks
15	1	**2 marks for AO1 (understanding)** Data required (by an instruction) may be fetched from main memory // (An instruction) may load / fetch / get data from main memory; Result (of instruction) may be stored in main memory // (An instruction) may store a value in main memory; **R.** references to information	2

Qu	Part	Marking guidance	Total marks
15	2	**2 marks for AO1 (understanding)** **1 mark** for each stage described. **Fetch stage** The (next) instruction is fetched from the memory (to the CPU); **Decode stage** The instruction is decoded (to work out what it is);	2

Qu	Part	Marking guidance	Total marks
16	1	**1 mark for AO1 (recall) and 1 mark for AO2 (apply)** 1000 × 4 // 4000;;× **1 mark for AO1:** identifying that there are 1000 megabytes in a gigabyte; **1 mark for AO2:** multiplying by 4; **A.** 1024 × 4 // 4096;; **Maximum 1 mark:** If final answer not correct.	2

Qu	Part	Marking guidance	Total marks
16	2	**All marks AO1 (understanding)** Lighter; Smaller; Uses less power; More robust; Generates less heat; Quieter; **Max 2**	2
16	3	**2 marks for AO2 (apply)** Using just solid state would cost much more; Can get higher storage capacity by including magnetic hard disk;	2
16	4	**All marks AO1 (understanding)** On a hard disk binary data represented by tiny magnetised regions; where the magnetic orientation in one direction represents 0, and the other direction represents 1; When reading data the read/write head is moved (to be over correct track); and the platter/disk spins round; A whole sector/block read in one go (by the read/write head); **Max 4**	4

Qu	Part	Marking guidance	Total marks
16	5	**All marks AO2 (apply)**	9

Level	Description	Mark Range
3	Answer demonstrates a **sustained line of reasoning** with a **substantiated** explanation for the recent large growth in the use of cloud storage that includes **both** technological and social reasons. There is a **logically structured** consideration of the advantages and the disadvantages associated with the use of cloud storage - including **relevant** points covering **at least two** of legal, ethical and environmental issues.	7-9
2	Answer includes an explanation for the recent large growth in the use of cloud storage that includes **both** technological and social reasons. There is a **logically structured** consideration of the advantages and the disadvantages associated with the use of cloud storage - including **one or two relevant** points related to legal, ethical and environmental issues.	4-6
1	The answer includes either a description of some of the reasons for the recent large growth in the use of cloud computing and/or brief consideration of the advantages and/or disadvantages associated with using cloud storage.	1-3
No creditworthy answer		0

		Guidance - Indicative Response (reasons for growth) Higher bandwidth mobile networks (eg 4G); Increased availability of mobile devices; Reduction in cost of large capacity storage devices; Improvements in network security; People have a higher level of trust in cloud storage; Improvements in web browser software; Increased availability of supercomputers (for cloud processing); Companies have managed to develop business models based on cloud computing that allow them to make a profit; **Guidance - Indicative Response (advantages of cloud storage)** Enables user to access their data from more places/devices; Enables user to more easily share data with others (can make parts of their cloud storage publically available); Increases the amount of storage available; Reduced cost of computing devices for users as no need for as much built-in secondary storage; **Guidance - Indicative Response (disadvantages of cloud storage)** Increased security risks; Relies on access to high-bandwidth network connection; Could potentially cost more due to ongoing costs; Reliance on company providing the cloud service; Increased chance of others accessing personal data (data privacy issues);	

Qu	Part	Marking guidance	Total marks
17	1	**1 marks for AO1 (understanding)** **C** Data and instructions; **R.** If more than one lozenge shaded	1
17	2	**3 marks for AO1 (understanding)** **Description** / **Letter** Sends a continuous series of electronic pulses – D; Decodes the current instruction – C; Completes calculations – B; **Mark as follows:** **1 mark:** one row correct; **2 marks:** two rows correct; **3 marks:** all rows correct;	3

Question	Part	Marking guidance	Total marks
18	1	**6 marks for AO1 (understanding)** **Note for examiners:** • points from **all three** components must be included for 6 marks • points from at least **two** components must be included for 4 marks. **Maximum of 6 marks** from: **Control unit** MP1. Decodes instructions; MP2. Coordinates/directs the execution of instructions; MP3. Sends (control) signals to other components // Controls the transfer/flow of instructions and data (in the CPU) // Coordinates/directs the fetch execute cycle; **R.** messages for signals MP4. Coordinates the I/O devices; **A.** examples of control signals **Clock** MP5. Sends a regular (electrical) signal/pulse; MP6. Synchronises operations/components; MP7. Influences the number of instructions carried out each second; **Cache** MP8. Makes retrieving data/instructions from the computer's memory more efficient; MP9. Stores data/instructions for faster access (by the processor); MP10. Stores frequently used data/instructions // data/instructions likely to be used in the near future;	6

Question	Part	Marking guidance	Total marks
18	2	**3 marks for AO1 (recall)** **Maximum of 3 marks** from the following: MP1. Increase the clock speed; MP2. Increase the number of processor cores; MP3. Increase the cache size; MP4. Changing the type of cache memory (eg L3 to L1); **A.** increase data bus width, increase word size	3