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|---|---|---|---|
| **1** | **1** | **Mark is for AO1 (knowledge)**<br><br>System Software;<br><br>**R**. More than one lozenge shaded | **1** |
| **1** | **2** | **Mark is for AO1 (knowledge)**<br><br>**Mark as follows:**<br><br>Processors **A.** CPU;<br>Memory / Memories **A.** RAM;<br>I/O devices (among competing processes) **A.** examples;<br><br>**A.** Hardware<br><br>**Max 1** | **1** |
| **1** | **3** | **Mark is for AO1 (knowledge)**<br><br>The role of the operating system is to hide the complexities of the hardware from the user;<br><br>**A.** other reasonable answers that are not resource management. | **1** |

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| 2 | 1 | **Mark is for AO1 (knowledge)**<br><br>The electronic / electrical / physical / mechanical components of the computer system;<br>**NE.** Tangible without further explanation. | 1 |

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| 2 | 2 | **Mark is for AO1 (knowledge)**<br><br>Instructions / code / programs; | 1 |
| 2 | 3 | **Marks are for AO1 (understanding)**<br><br>System software is software that controls/manage the operation of (some aspects of) the computer system // software which enables user to operate a computer // system software is required to operate a computer;<br><br>Application software is for carrying out tasks that are user-oriented / that the user would want to do even if they did not have a computer system; | 2 |
| 2 | 4 | **Marks are for AO1 (knowledge)**<br><br>**1 mark** for Compiler checked<br>**1 mark** for Operating system checked<br><br>**R**. Award 0 marks if more than two lozenges shaded | 2 |

| Qu | Pt | Marking Guidance | Marks |
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| 3 | 1 | **Mark is for AO1 (knowledge)**<br><br>Software is the name given to programs / code / instructions that are executed; | 1 |

| Qu | Pt | Marking Guidance | Marks |
|---|---|---|---|
| 3 | 2 | **Marks are for AO1 (knowledge)**<br><br>Operating systems / OS;<br>Utility programs;<br>Libraries;<br><br>**A.** Specific examples of utilities (such as virus checker, disk defragmenter) unless the student has already given the type utilities as a response.<br>**R.** Interpreters, compilers, assemblers.<br><br>**MAX 2** | 2 |

| Qu | Pt | Marking Guidance | Marks |
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| 4 | 1 | **Marks are for AO1 (knowledge) and AO1 (understanding)**<br><br>**Mark as follows:**<br><br>**AO1 (knowledge) – 1 mark: Max 1 mark** for explaining the term<br><br>Provides routines that can be included/used in a program;<br><br>**AO1 (understanding) – 1 mark: Max 1 mark** for a reason/need for library<br><br>Improves the speed of development // reduces workload // requires (writing of) less code;<br>Improves reliability;<br>Provides operations that the programmer may not know how to code themselves; | 2 |

| Qu | Pt | Marking Guidance | Marks |
|---|---|---|---|
| 5 | 1 | **Mark is for AO1 (Knowledge)**<br><br>(Main) memory (**A**. RAM);<br>Secondary storage (**A.** example of secondary storage device);<br>I/O devices (**A.** example I/O device);<br><br>**R**. Processors.<br>**R.** File system.<br>**R.** Scheduling. | 1 |

| Qu | Pt | Marking Guidance | Marks |
|---|---|---|---|
| 6 | 1 | **Mark is for AO1 (knowledge)**<br><br>C (Programming language translator); | 1 |

| Qu | Pt | Marking Guidance | Marks |
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| 6 | 2 | **Marks are for AO1 (knowledge)**<br><br>Processor // microprocessor // central processing unit // CPU;<br><br>Main memory // random access memory // RAM;<br>**A.** Memory controller<br><br>Secondary storage // backing store;<br>**A.** HDD // SSD<br><br>Cache;<br>**A.** Cache controller<br><br>Power supply unit // battery management // PSU;<br><br>**R.** Software-implemented resources (eg scheduler, virtual memory, file management)<br><br>**Max 2** | 2 |

| Question | | | Marks |
|---|---|---|---|
| 7 | | **Marks are for AO1 (understanding)**<br><br>The binary file cannot be easily read by a person (so the game data is hidden more from the user);<br>No need for string / data type conversion routines;<br>File size likely to be smaller (as not all the stored data is text);<br><br>**A.** Might make the program code easier to understand (as less need for string conversion routines);<br><br>**N.E.** binary file cannot be read<br><br>**Max 2 marks** | **2** |

| Q | | Marks | |
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| 8 | 1 | **Mark is AO1 (knowledge)**<br><br>**1 mark:** Lozenge for “Utilities” shaded.<br><br>**R.** if more than one lozenge shaded | **1** |
| 8 | 2 | **All marks AO1 (knowledge)**<br><br>Allocate processors/cores to processes // schedule processes // decide which process to carry out when;<br><br>Allocate memory/RAM to processes // moving data into and out of RAM / to a paging file for virtual memory // ensuring processes can only write to memory that they have been allocated;<br><br>Allocate I/O devices to processes // manages communication between processes and I/O devices // automatic installation of drivers for new I/O devices; **A.** examples of devices (but no more than one mark) **NE.** manages I/O devices<br><br>Allocate space on a storage device to files // organising files into directories // determines where on a device to save a file // recognising storage devices when they are connected; **A.** defragmentation of disks **NE.** saving a file<br><br>Installation of new software // automatic/managing updating of software;<br><br>**A.** “programs” or “tasks” for “processes”<br><br>**R.** handling interrupts<br>**R.** hides complexity<br><br>**Note:** Students must describe the type of resource management – phrases such as “processor management”, “allocating memory” etc are not enough.<br><br>**Max 2** | **2** |

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| **9** | **1** | **Mark is for AO1 (knowledge)**<br><br>Software (is the programs that) execute(s) on the hardware // hardware is the electrical/physical components that allow the software to execute;<br>**A.** Software controls the operation of the hardware as BOD | **1** |

| Qu | Pt | Marking guidance | Total marks |
|---|---|---|---|
| 10 | 1 | **All marks AO1 (knowledge)**<br><br>**Application Software:** Performs user-oriented tasks // performs tasks that a user would still want to perform if they did not have a computer;<br>**NE.** examples of tasks<br><br>**System Software:**<br>Software used in the management of a computer system;<br>**A.** software that is used to run a computer<br><br>Layer(s) of software that abstract the user from how the computer works;<br>**A.** software that hides complexity of hardware from user<br>**A.** software that provides a virtual machine | **2** |

| Qu | Pt | Marking guidance | Total marks |
|---|---|---|---|
| 10 | 2 | **All marks AO1 (knowledge)**<br><br>**Description (1 mark):** (Software that) performs a non-core / ancillary / specific management function for a computer;<br>**A.** (software that) performs a task that helps manage / configure / maintain a computer<br>**A.** (software that) manages a computer system but is not essential<br>**NE.** (software that) manages a computer<br><br>**Example (1 mark):** Award a mark for a statement of any reasonable example, such as virus checker, disk defragmenter, backup, compression, encryption software etc;<br>**R.** examples that relate to core functions of the operating system<br>**R.** examples that are application software or if the response includes multiple examples, one of which is application software | **2** |

| Question | | | Marks |
|---|---|---|---|
| 11 | 1 | **Mark is AO1 (knowledge)**<br><br>Software used in the management of a computer system // layer(s) of software that abstract the user from how the computer works // software that provides a platform for other software to use;<br><br>**A.** software used to run the computer<br>**A.** software that provides a virtual machine<br>**NE.** software that maintains a computer | **1** |

| Question | | | Marks |
|---|---|---|---|
| 11 | 2 | **Mark is AO1 (knowledge)**<br><br>**B** Bitmap image editors;<br><br>**R.** if more than one lozenge shaded | **1** |

| Question | | | Marks |
|---|---|---|---|
| 11 | 3 | **All marks AO1 (knowledge)**<br><br>To hide the complexities of the hardware from the user;<br>**NE**. virtual machine without description<br>**R.** user interface<br><br>To handle interrupts // to call appropriate interrupt handler (**A.** ISR) when an interrupt occurs;<br><br>To allocate processors/cores to processes // schedule processes // decide which process to carry out when // manage the execution of multiple processes;<br>**NE.** processor management<br><br>To allocate memory/RAM to processes // to determine what areas of memory are used for what purpose // moving data into and out of RAM / to a paging file for virtual memory // ensuring processes can only write to memory that they have been allocated;<br>**NE.** memory management<br><br>To allocate I/O devices to processes // manages communication between processes and I/O devices // automatic installation of drivers for new I/O devices;<br>**A.** examples of devices (but no more than one mark)<br>**NE.** manages I/O devices<br><br>To allocate space on a storage device to files // organising files into directories // determines where on a device to save a file // recognising storage devices when they are connected;<br>**A.** defragmentation of disks<br>**NE.** saving a file<br><br>Installation of new software // automatic / managing updating of software;<br>**A.** "programs" or "tasks" for "processes"<br><br>Manage power consumption / use of battery;<br>**A.** examples of this eg controlling clock speed, brightness of screen<br><br>**Note:** Students must describe – phrases such as "processor management", "allocating memory" etc are not enough.<br><br>**Max 2** | **2** |