ANSWERS HARDWARE

Answer 1

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>1 mark for first three rows, 1 mark for the touchscreen being both.
<table>
<tr><th>Device</th><th>Input</th><th>Output</th></tr>
<tr><td>LCD Monitor</td><td></td><td>✓</td></tr>
<tr><td>Microphone</td><td>✓</td><td></td></tr>
<tr><td>Keyboard</td><td>✓</td><td></td></tr>
<tr><td>Touchscreen</td><td>✓</td><td>✓</td></tr>
</table></td><td>2</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(b)(i)</td><td>1 mark for 1 correct entry
2 marks for 2 correct entries
3 marks for 3 correct entries
4 marks for 5 correct entries

1 The object is designed using Computer Aided Design (CAD) software

2 C (The software splits the object into slices)

3 E (The data about the slices is sent to the printer)

4 The solid plastic is melted and transferred to the nozzle

5 A (A stepper motor moves the nozzle into position)

6 D (The nozzle extrudes the molten plastic)

7 The steps 5 to 6 repeat until the layer is complete

8 B (A fan cools the layer)

9 The steps 4 to 8 are repeated for each subsequent layer</td><td>4</td></tr>
<tr><td>2(b)(ii)</td><td>1 mark per bullet point. Max 3 for RAM, max 2 for ROM

RAM
• Stores currently running parts of the 3D printer software
• Stores the data about the layers being printed // contents of buffer
• Stores current progress of printing
• Stores the data about the printer, e.g. Plastic levels, nozzle position

ROM
• Stores the operating software for the 3D printer // OS for the 3D printer
• Stores the boot-up/start-up instructions for the 3D printer</td><td>4</td></tr>
</table>

Answer 2

Question	Answer	Marks
1(a)	**1 mark** for each correct term The resistive touchscreen has two layers with **a gap / an air gap** between the layers. When a finger touches the screen, the **top layer** moves to touch the **bottom layer**; this creates a point of contact. The **horizontal** and **vertical** position of this point is calculated.	**4**

Answer 3

Question	Answer	Marks
2(a)	**1 mark** for each appropriate term The printer uses a **laser (beam)** and a rotating **mirror** to draw the contents of the page on the photosensitive drum as **an electrostatic** charge. The **toner** is attracted to this charge.	**4**

Question	Answer	Marks
2(b)	**1 mark** per bullet point. **Max 2** for RAM, **max 2** for ROM RAM • Stores currently running parts of the printer software • Stores the data being printed // contents of buffer • Stores current progress of printing • Stores the data about the printer, e.g. toner levels ROM • Stores the printer operating software // OS for the printer • Stores the boot-up/start-up instructions for the printer • Printer fonts stored in ROM	**4**

Answer 4

Question	Answer	Marks
4(a)(i)	**1 mark** per bullet point to **max 3** • The microphone has a diaphragm / ribbon (accept equivalent) • The incoming sound waves cause vibrations (of the diaphragm) • …causing a coil to move past a magnet (dynamic microphone) // changing the capacitance (condenser microphone) // deforms the crystal (crystal microphone) etc. • An electrical signal is produced	3
4(a)(ii)	**1 mark** per bullet to **max 3** • The revolving drum is initially given an electrical charge • A laser beam (bounces off moving mirrors) scans back and forth across the drum • ...discharging certain points (i.e. 'drawing' the letters and images to be printed as a pattern of electrical charges) • The drum is coated with oppositely charged toner (which only sticks to charged areas) • The drum rolls over electro-statically charged paper // Electro-statically charged paper is fed (towards the drum) • The 'pattern' on the drum is transferred to the paper • The paper is passed through the fuser to seal the image • The electrical charge is removed from the drum // the excess toner is collected	3

Question	Answer	Marks

4(c)	**1 mark** per bullet to **max 4**
	
	• DRAM has to be refreshed / charged and SRAM does not require a refresh
	• DRAM uses a single transistor and capacitor and SRAM uses more than one transistor
	• DRAM stores each bit as a charge and in SRAM each bit is stored using a flip-flop/latch
	• DRAM requires higher power consumption under low levels of access, (which is significant when used in battery-powered devices because it requires more circuitry for refreshing) // SRAM uses less power (no need to refresh)
	• DRAM less expensive to purchase (requires fewer transistors) // SRAM is more expensive to buy (as it requires more transistors)
	• DRAM has slower access time/speed (because it needs to be refreshed) // SRAM has faster access times
	• DRAM can have higher storage/bit/data density // SRAM has lower storage/bit/data density
	• DRAM used in main memory and SRAM used in cache memory
		4

Answer 5

Question	Answer	Marks
2(a)(i)	**1 mark** per device to **max 2** e.g. • Trackpad/touchpad • microphone • touchscreen • scanner	**2**
2(a)(ii)	**1 mark** per device to **max 2** e.g. • printer • speakers • touchscreen	**2**
2(a)(iii)	Magnetic hard disk drive // solid state drive	**1**
2(a)(iv)	**1 mark** per bullet point to **max 3** • The ball touches horizontal and vertical rollers • When the ball rotates / moves • … one or both of the rollers rotate as well • Each roller connects to a shaft which spins a disk with holes • **Infrared** beams shine through the holes in the disks • As the ball moves the roller the beam is broken by the space between the holes • ... creating pulses of light • The **distance and/or speed** of the mouse is determined from the rate of the pulses • … by an on-board processor chip // by driver software in the computer	**3**

Answer 6

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(a)(i)</td><td>1 mark for touchscreen being both
1 mark for remaining 3 devices

<table>
<tr><th>Device</th><th>Input</th><th>Output</th></tr>
<tr><td>Touchscreen</td><td>✓</td><td>✓</td></tr>
<tr><td>Webcam</td><td>✓</td><td></td></tr>
<tr><td>Microphone</td><td>✓</td><td></td></tr>
<tr><td>Fingerprint scanner</td><td>✓</td><td></td></tr>
</table></td><td>2</td></tr>
<tr><td>6(a)(ii)</td><td>1 mark for any 1 correct letter in the correct position
2 marks for any 2 correct letters in the correct positions
3 marks for any 3 correct letters in the correct positions
4 marks for 5 correct letters in the correct positions

C An electric current is sent to the speaker.

E The electric current passes through the coil.

The current in the coil creates an electromagnetic field.

A Changes in the audio signal cause the direction of the electrical current to change. This determines the polarity of the electromagnet.

D The electromagnet is repelled by, or attracted to the permanent magnet.

The movement of the coil causes the diaphragm to vibrate.

B The vibration creates sound waves.</td><td>4</td></tr>
<tr><td>6(b)(i)</td><td>To store files / software long term</td><td>1</td></tr>
<tr><td>6(b)(ii)</td><td>1 mark per bullet point to max 3

• No moving parts
• Solid state memory is non-volatile

• Makes use of blocks / arrays of
• … Semiconductors // NAND gates // NOR gates // transistors // integrated circuits
• SSD Controller manages the components
• Uses a grid of columns and rows that has two transistors at each intersection
• One transistor is called a floating gate
• The second transistor is called the control gate
• Memory cells store voltages which can represent either a 0 or a 1
• Essentially the movement of electrons is controlled to read/write
• Not possible to overwrite existing data // it is necessary to first erase the old data then write the new data in the same location</td><td>3</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(c)</td><td>1 mark per bullet point to max 2

• RAM stores currently running parts of files / programs / processes / OS

• ROM stores boot up instructions / OS kernel // data permanently // store the firmware for the tablet</td><td>2</td></tr>
</table>

Answer 7

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)(i)</td><td>1 mark per input device to max 2

e.g.
• Barcode scanner / Infra-red scanner
• Pressure sensor
• RFID / chip reader
• Bank note scanner
• Pin / key pad
• Magnetic strip reader</td><td>2</td></tr>
<tr><td>1(a)(ii)</td><td>1 mark per output device to max 2

e.g.
• Speaker
• Printer
• LCD screen</td><td>2</td></tr>
<tr><td>1(a)(iii)</td><td>1 mark for at least two statements in the correct position, 2 marks for all four statements in correct position.

1 B …. ….. (The screen has a layer that stores an electrical charge)
2 When the user touches the screen
3 A ……. (Charge is drawn to the point of contact)
4 C ……. (There is a change in the electrostatic field)
5 The coordinates of the point of contact can be calculated
6 D ……. (These coordinates are sent to the touchscreen driver)</td><td>2</td></tr>
<tr><td>1(b)(i)</td><td>1 mark per bullet point to max 2

• To store the files needed to boot the system
• To store parts of the self- checkout machine operating system
• To store the self-checkout machine software
• To store the intermediate data / running total for items purchased</td><td>2</td></tr>
<tr><td>1(b)(ii)</td><td>1 mark for at least one correct row, 2 marks for all three correct rows

<table>
<tr><th>Statement</th><th>SRAM</th><th>DRAM</th></tr>
<tr><td>More expensive to make</td><td>✔</td><td></td></tr>
<tr><td>Requires refreshing (recharging)</td><td></td><td>✔</td></tr>
<tr><td>Made from flip-flops</td><td>✔</td><td></td></tr>
</table>
</td><td>2</td></tr>
</table>

Answer 8

Question	Answer	Marks
7(a)	**1 mark** for each input device to **max 2** e.g. • (Handheld) remote controller • Joystick / Games pad / joypad • Accelerometer • Microphone • Suitable sensor **1 mark** for output e.g. • Motor/vibrator in joystick • Speaker • Screen/monitor /TV	3
7(b)(i)	**1 mark** for each difference to **max 2** • RAM is volatile and ROM is non-volatile • RAM can change and ROM (usually) can't be changed • ROM is read only, RAM is read/write	2
7(b)(ii)	**1 mark** for example e.g. • Current game • Currently running processes • Current graphics/sound	1
7(b)(iii)	**1 mark** for an example e.g. • Start-up instructions / boot program • Kernel of Operating System	1

Answer 9

Question	Answer	Marks
7(a)	**1 mark** per bullet to **max 4** • **Resistive** (screen) consists of two charged plates • Pressure causes the plates to touch • Completing the circuit • Point of contact registered • Coordinates used to calculate the position • **Capacitive** (screen) made from materials that store electric charge • When touched charge transferred to the finger • Sensors at the (screen) corners detect the change • Point of contact registered • Coordinates used to calculate the position	4
7(b)(i)	**1 mark** for suitable device e.g. • Speaker • Headphones	1

Question	Answer	Marks
7(b)(ii)	**1 mark** for naming input device **1 mark** for use in this scenario, for **max 2 devices** e.g. • Microphone • ...visitor says commands / search criteria for the computer to respond to • Keyboard • ...visitor types key words to look for • Mouse • ...visitor controls cursor to navigate / select • Trackpad • ...visitor uses finger to control cursor to navigate / select	4
7(c)	**1 mark** for device (Internal) hard drive / solid state drive **1 mark** per bullet. **Max 2 marks** for each reason, **max two** reasons e.g. **Hard drive** • Large capacity... • to store videos / images / sound files with large file sizes • Reasonably fast access speed... • Users will not have to wait for videos to load • Inexpensive per unit storage... • If a large number of needed for different exhibits, the cost can be kept low • Does not need to be moved ... • So moving parts unlikely to be damaged • Slower degradation of data ... • So will last longer / be more reliable under heavy use **Solid state** • Large capacity... • To store videos/images/sound files with large file sizes • Fast access speed... • Users will not have to wait for videos to load • Reliable... • Can be dropped/damaged and will likely still work / no moving parts • Quiet... • No moving parts	5

Question	Answer	Marks
7(d)	**1 mark** for a correct reason for RAM, **1 mark** for a correct reason for ROM RAM • Currently running data / video / music / images / software ROM • Boot up instructions / OS kernel	2

Answer 10

Question	Answer	Marks
1(a)	**1 mark** per bullet point to **max 3** • The microphone has a diaphragm • The incoming sound waves cause vibrations • … causing a coil to move past a magnet (dynamic microphone) // changing the capacitance (condenser microphone) • An electric current is generated / changed	3

Answer 11

6(c) — **1 mark** per row — **5**

Statement	DRAM	SRAM
Does not need to be refreshed as the circuit holds the data while the power supply is on		✓
Mainly used in cache memory of processors where speed is important		✓
Has less complex circuitry	✓	
Requires higher power consumption under low levels of access, which is significant when used in battery-powered devices	✓	
Requires data to be refreshed occasionally so it retains the data	✓	

Answer 12

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)(i)</td><td>
<table>
<tr><td>1</td><td>A laser beam and a rotating mirror are used to draw an image of the page on the photosensitive drum.</td></tr>
<tr><td>2</td><td>C // The image is converted on the drum into an electrostatic charge.</td></tr>
<tr><td>3</td><td>Electrostatic charge attracts toner.</td></tr>
<tr><td>4</td><td>The charged paper is rolled against the drum.</td></tr>
<tr><td>5</td><td>D // The oppositely-charged paper picks up the toner particles from the drum. After picking up the toner, the paper is discharged to stop it clinging to the drum.</td></tr>
<tr><td>6</td><td>A // The paper passes through a fuser, which heats up the paper. The toner melts and forms a permanent image on the paper.</td></tr>
<tr><td>7</td><td>B // The electrical charge is removed from the drum and the excess toner is collected.</td></tr>
</table>
C in the correct place 1
DA, 1
AB 1
</td><td>3</td></tr>
<tr><td>2(a)(ii)</td><td>Inkjet printer</td><td>1</td></tr>
<tr><td>2(b)</td><td>Hard disk drive // HDD 1
Solid state drive //SSD // flash memory 1
One from:
Hard disk
Inexpensive per unit of storage 1
Larger storage capacity than flash drive 1

Solid state storage
No moving parts / noise 1
Robust 1
Low latency // Fast read/write time 1</td><td>3</td></tr>
</table>

Answer 13

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>One mark for each pair of rows
<table><tr><th></th><th colspan="2">Type of printer</th></tr><tr><th></th><th>Laser</th><th>Inkjet</th></tr><tr><td>Impact printer</td><td></td><td></td></tr><tr><td>Non-impact printer</td><td>✓</td><td>✓</td></tr><tr><td>Line printer</td><td></td><td>✓</td></tr><tr><td>Page printer</td><td>✓</td><td></td></tr></table>1
1</td><td>2</td></tr>
<tr><td>2(b)(i)</td><td>Five from:
The print head contains a large number of very small nozzles 1
Ink is fed to each nozzle from a reservoir 1
The print head fires droplets of ink onto the paper 1
The print head moves horizontally across the paper 1
Either:
Tiny resistors create heat inside each nozzle 1
The heat vaporises ink to create a bubble 1
When the bubble pops the ink is deposited on the page 1
The collapsing bubble creates a partial vacuum in the nozzle 1
And ink is drawn from the reservoir ready for printing the next dot 1
Or:
There is a piezo crystal at the back of the ink reservoir of each nozzle 1
The crystal vibrates when it receives a tiny electric charge 1
Ink is forced out of the nozzle by the inward vibration 1
The outward vibration creates a partial vacuum in the nozzle 1
Replacement ink is pulled into the reservoir 1</td><td>Max 5</td></tr>
<tr><td>2(b)(ii)</td><td>Two from:
The (print head) stepper motor is connected to the print head by a belt 1
The (print head) stepper motor moves the print head across the paper 1
The (parking) stepper motor parks the print head assembly when not in use 1
The (paper feed)stepper motor turns the rollers that provide the paper feed // The (paper feed)stepper motor moves the paper in small increments 1</td><td>Max 2</td></tr>
<tr><td>2(c)(i)</td><td>Two from:
External hard drive // External HDD 1
External flash drive // External SSD 1
Pen drive 1</td><td>Max 2</td></tr>
</table>

Question	Answer	Marks
2(c)(ii)	**One** from: *(External) Hard drive* Inexpensive per unit of storage 1 Larger storage capacity than flash drive 1 **Or:** *Pen drive // (External) flash drive* No moving parts / noise 1 Low latency // fast access times 1 Robust 1	**Max 1**

Answer 14

Question	Answer	Marks
5(a)(i)	**Three marks** from: ø Diaphragm / cone ø (Voice) coil of wire ø Spider / Suspension ø (Permanent) Magnet ø Basket ø Dust cap ø Outer frame	**3**
5(a)(ii)	**Four marks** from: ø Takes an electrical signal and translates it into physical vibrations to create sound waves ø An electric current in the coil creates an electro-magnetic field ø Changes in the audio signal causes the direction of the electric current to change ø The direction of the current determines the polarity of the electro-magnet // changing the direction of the current changes the direction of the polarity of the electro-magnet ø The electro-magnet is repelled by or attracted to the permanent magnet ø Causing the coil to vibrate ø The movement of the coil causes the cone / diaphragm to vibrate ø That vibration is transmitted to the air in front of the cone / diaphragm as sound waves ø The amount of movement will determine the frequency and amplitude of the sound wave produced	**Max 4**
5(b)(i)	**One mark** from: ø External hard disk drive // SSD ø External CD / DVD drive ø Pen drive ø Blu-ray drive	**1**
5(b)(ii)	**Two marks** from: ø Additional secondary file storage // storing files ø Backup of files ø Archiving of files ø Transfer files to second computer	**Max 2**

Answer 15

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(a)</td><td>1 mark for each correct row
<table>
<tr><th>Application</th><th>Input device</th><th>Output device</th></tr>
<tr><td>Capture the text from a paper document, in order that the text can be word-processed</td><td>Flatbed scanner / Digital camera</td><td></td></tr>
<tr><td>Producing a replica of a small plastic component from a washing machine</td><td></td><td>3D Printer</td></tr>
<tr><td>A museum has interactive information facilities throughout the building</td><td>Touch screen / touch pad / microphone etc.</td><td>Touch screen / speakers etc.</td></tr>
</table></td><td>3</td></tr>
<tr><td>6(b)</td><td>1 Mark per bullet to max 4

∞ The hard disk has one or more platters made of aluminium or glass
∞ Each surface of the platter/disk is ferrous-oxide which is capable of being magnetised
∞ The platters/disks are mounted on a central spindle
∞ The disks are rotated at high-speed
∞ Each surface of the disk has a read/write head mounted on an arm positioned just above the surface
∞ Electronic circuits control the movement of the arm and hence the heads
∞ The surface of the platter/disk is divided into concentric tracks and sectors
∞ One track in one sector is the basic unit of storage called a block
∞ The data is encoded as a magnetic pattern for each block
∞ When writing to disk, a variation in the current in the head produces a variation in magnetic field on the disk
∞ When reading from disk, a variation in magnetic field produces a variation in current through the head</td><td>4</td></tr>
</table>

Answer 16

Question	Answer	Marks
5(a)(i)	**Three marks** from: - Diaphragm / cone - (Voice) coil of wire - Spider / Suspension - (Permanent) Magnet - Basket - Dust cap - Outer frame	3
5(a)(ii)	**Four marks** from: - Takes an electrical signal and translates it into physical vibrations to create sound waves - An electric current in the coil creates an electro-magnetic field - Changes in the audio signal causes the direction of the electric current to change - The direction of the current determines the polarity of the electro-magnet // changing the direction of the current changes the direction of the polarity of the electro-magnet - The electro-magnet is repelled by or attracted to the permanent magnet - Causing the coil to vibrate - The movement of the coil causes the cone / diaphragm to vibrate - That vibration is transmitted to the air in front of the cone / diaphragm as sound waves - The amount of movement will determine the frequency and amplitude of the sound wave produced	Max 4
5(b)(i)	**One mark** from: - External hard disk drive // SSD - External CD / DVD drive - Pen drive - Blu-ray drive	1
5(b)(ii)	**Two marks** from: - Additional secondary file storage // storing files - Backup of files - Archiving of files - Transfer files to second computer	Max 2

Answer 17

2 (a) Any **two** from:

- DRAM has to be refreshed / charged
  // SRAM does not request a refresh
- DRAM uses a single transistor and capacitor
  // SRAM uses more than one transistor to form a memory cell
  // SRAM has more complex circuitry
- DRAM stores each bit as a charge
  // SRAM each bit is stored using a flip-flop / latch
- DRAM uses higher power(because it requires more circuitry for refreshing)
  // SRAM uses less power (no need to refresh)
- DRAM less expensive (to purchase / requires fewer transistors)
  // SRAM is more expensive (to buy as it requires more transistors)
- DRAM has slower access time / speed (because it needs to be refreshed)
  // SRAM has faster access times
- DRAM can have higher storage / bit / data density
  // SRAM has lower storage / bit / data density
- DRAM used in main memory
  // SRAM used in cache memory

[2]

Answer 18

4 (i) Keyboard
Any **two** from:

- Uses switches and circuits to translate keystrokes into signals the computer can understand
- The key matrix is a grid of circuits / three layers of plastic underneath the keys
- Each circuit is broken beneath the key / middle layer contains holes
- When key pressed, a circuit is made / completed and a signal is sent
- Processor compares location of signal from key matrix to a character map stored on ROM
- A character code for each key press is saved in a keyboard buffer [2]

(ii) Optical Disc
Any **two** from:

- Drive motor is used to spin the disc
- Tracking mechanism moves the laser assembly
- A lens focuses the laser onto the disc
- Laser beam is shone onto disc to read / write
- Surface of disc has a reflective metal layer / phase change metal alloy
- Track(s) on the disc have sequence of pits and lands / amorphous and crystalline state
- Reflected light in then encoded as a bit pattern [2]

(iii) Optical mouse
Any **two** from:

- Laser / light shines onto a surface
- Through a (polished) ring at the base
- The light is reflected from the surface through the ring
- Sensor detects reflected light
- Capturing details / photograph of surface (under the ring)
- At about 1500 times per second
- As the mouse moves the sensor detects changes in the surface detail / photograph
- Which are translated into movement (change of x and y co-ordinates)
- The processor/software updates the position of the cursor on the screen [2]

(iv) Scanner
Any **two** from:

- Main component of a scanner is a CCD array
- CCD is a collection of light sensitive diodes
- Laser beam / light is shone onto the source document/barcode
- The scanned image reaches the CCD through mirrors and lenses
- Sensors detect levels of reflected light
- Brighter light results in greater electrical charge
- Light intensity is converted (by software) to a digital value [2]

Answer 19

3 **ONE** mark for each letter in the correct place.

Then **ONE** mark for any pair of letters in the correct order, but not in the correct place

1	The application program executes a statement to read a file.
2	G
3	The operating system begins to spin the hard disk, if it is not currently spinning.
4	F
5	D
6	H
7	C
8	B
9	A
10	E

[8]

Answer 20

6 (a) **ONE** mark for each difference from the bullet points below.

- RAM loses content when power turned off / volatile memory / temporary memory
  ROM does not lose content when power turned off / non-volatile memory / permanent memory
- Data in RAM can be altered / deleted / read from and written to
  ROM is read only / cannot be changed / altered / deleted
- RAM stores files / data / operating system currently in use
  ROM is used to store BIOS / bootstrap / pre-set instructions [2]

(b) **THREE** from:

- DRAM has to be refreshed / charged
  // SRAM does not request a refresh
- DRAM uses a single transistor and capacitor
  // SRAM uses more than one transistor to form a memory cell
  // SRAM has more complex circuitry
- DRAM stores each bit as a charge
  // SRAM each bit is stored using a flip-flop/latch
- DRAM uses higher power (because it requires more circuitry for refreshing)
  //SRAM uses less power (no need to refresh)
- DRAM less expensive (to purchase / requires fewer transistors)
  // SRAM is more expensive (to buy as it requires more transistors)
- DRAM has slower access time / speed (because it needs to be refreshed)
  // SRAM has faster access times
- DRAM can have higher storage / bit / data density
  // SRAM has lower storage / bit / data density
- DRAM used in main memory
  // SRAM used in cache memory

[3]

Answer 21

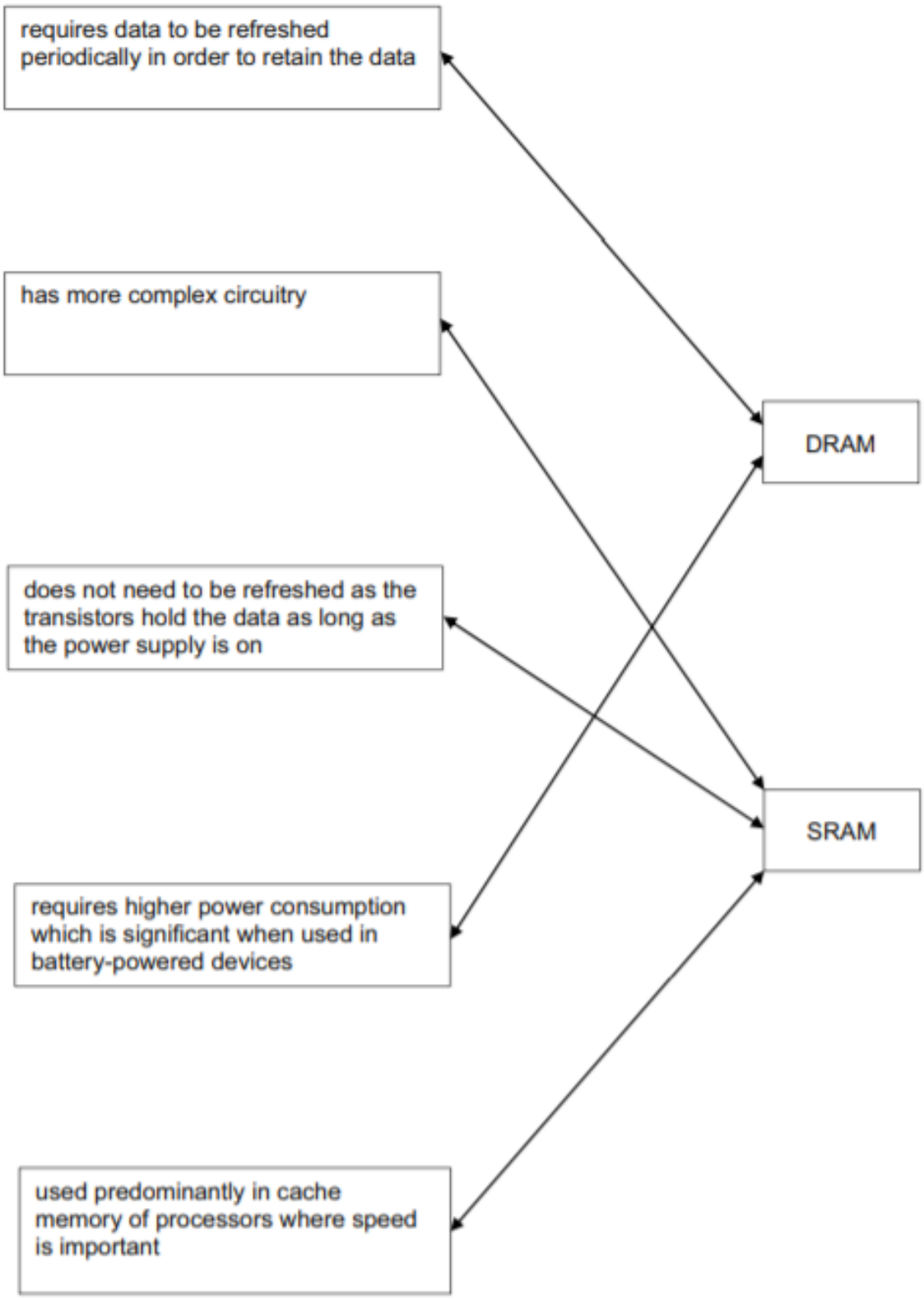
6 (a)

Description of use	Input or output device
input of credit card number into an online form	**Keyboard/keypad/numberpad**
selection of an option at an airport information kiosk	**touch screen**
output of a singe high quality photograph	**ink jet printer**
output of several hundred high quality leaflets	**laser printer**
input of a hard copy image into a computer	**scanner**

[5]

Answer 22

4 (a)



[5]

(b) maximum of **two marks** for RAM and maximum of **two marks** for ROM

RAM

- loses contents when power turned off/volatile memory/temporary memory
- stores files/data/operating system currently in use
- data can be altered/deleted/read from and written to
- memory size is often larger than ROM

ROM

- doesn't lose contents when power turned off/non-volatile memory/permanent memory
- cannot be changed/altered/deleted/read only
- can be used to store BIOS/bootstrap [3]

(c) **one** mark for DVD-RAM, **one** mark for flash memory.

DVD-RAM

- data is stored/written using lasers/optical media
- DVD-RAM uses phase changing recording, in which varying laser intensities cause targeted areas in the phase change recording layer to alternate between an amorphous and a crystalline state.
- uses a rotating disk with concentric tracks
- allows read and write operation to occur simultaneously

flash memory

- most are NAND-based flash memory
- there are no moving parts
- uses a grid of columns and rows that has two transistors at each intersection
- one transistor is called a floating gate
- the second transistor is called the control gate
- memory cells store voltages which can represent either a 0 or a 1
- essentially the movement of electrons is controlled to read/write
- not possible to over-write existing data; it is necessary to first erase the old data then write the new data in the same location [2]

Answer 23

1 **(a)** Hard disk – magnetic (storage media)

DVD-RW – optical (storage media)

Flash memory – solid state (memory device) [3]

(b) DVD-RW

- uses a single spiral track
- only allows write OR read operation to occur as separate operations
- requires special packet reading/writing software
- in order to write new data to the disc the existing data must be completely erased
- performance degrades/becomes unreliable after 1000 record/erase cycles
- single sided, 4.7 Gb capacity
- disc rotates at different speeds/constant linear velocity

DVD-RAM

- uses several concentric tracks
- allows simultaneous read/write operations
- requires no special read/write software
- makes use of sectors to store data
- repeatedly read, write and erase/100 000 record/erase cycles possible
- single or double sided, 4.7 Gb capacity per side
- disc rotates at a constant speed/constant angular velocity [4]

Answer 24

2 (a)
- laser/light shines onto a surface
- through a (polished) ring at the base
- the light is reflected from the surface through the ring
- sensor detects reflected light
- capturing details/photograph of surface (under the ring)
- at about 1500 times per second
- as the mouse moves the sensor detects changes in the surface detail/photograph
- which are translated into movement (change of x and y co-ordinates)
- the computer/software updates the position of the cursor on the screen [3]

(b)

Statement	Sequence number
Paper feed stepper motor activated; sheet of paper fed from paper tray	**3**
Printer driver translates data into a suitable format for the printer	**1**
The print head moves across page; ink is sprayed each time the print head pauses for a fraction of a second	**4**
Paper feed stepper motor advances paper a fraction of a cm after each complete head pass	**5**
Printer receives data from the computer and stores the data in the printer's buffer	**2**

[5]

Answer 25

1 (a)

	A	B	C	D
	primary memory storage	**magnetic secondary storage**	**optical secondary storage**	**solid state secondary storage**
DVD – RAM			✓	
ROM	✓			
hard disk		✓		
flash memory				✓

1 mark for each correct tick [4]

(b) (i) A [1]

(ii) B [1]

(iii) C / D (If both ringed here then still award a mark) [1]

(c) 1 mark for a benefit and 1 mark for a drawback

benefit
- faster start up speed (no "spin-up" required)
- no moving parts (so more robust)
- very fast read write seek (latency) times
- doesn't require additional read/write hardware devices (just plugs into USB)
- can store data indefinitely provided that it is periodically refreshed

drawback
- vulnerable to magnetic fields and electrostatic charges
- limited write cycles
- more vulnerable to corruption if used as primary source of saving files
- because it is small, very easy to lose [2]

Answer 26

5 (a) (i) Any **three** from:

- magnetic stripe is read
- number on the magnetic stripe is checked against pre-stored number on computer
- check image of face scanned with database of workers faces
- the camera takes a photo of workers face and converts it to a bit map
- key parts of both images are compared …
- to check if photo on card matches photo originally taken of worker
- system also cross checks 10 digit code with (bit map) image of worker stored on file

[3]

Answer 27

2 **(a)** 1 mark for naming type of media + 1 mark for description/examples

magnetic media
surface coated with magnetic material
magnetic properties altered to represent 1s and 0s
used by hard disks, magnetic tapes, floppy disks

optical media
surface coated with light sensitive material
read/written by lasers
CDs use one spiral track
used by DVD-RAM, CD-R, CDROM, CDRW, blu-ray disc

solid state media
uses millions of tiny transistors
where movement of electrons controlled within a microchip
has no moving parts
used by memory sticks, MP3 players, cameras/mobile phones [6]

(b) (i) Any **two DIFFERENT** points from:

RAM
contents can be altered/written to
holds data/program currently in use
volatile memory/temporary memory/contents lost when switched off
usually has a greater memory capacity than ROM

ROM
contents can be read only/can't be altered
holds bootstrap/BIOS/system data
non-volatile memory/permanent memory/retains contents when switched off [2]

(ii) Any **two** points from:

needs RAM to store instructions given by the user
needs RAM to temporarily store program controlling car
needs RAM to store current radio frequencies to control car

needs ROM to store the factory settings/basic instructions
needs ROM to store radio frequencies (etc.) understood by remote controller
needs ROM to store start up routines when car switched on [2]

Answer 28

(ii) – Bootstrap/boot program / BIOS
– ...because it must be present when the computer is switched on

[2]

(iii) – Loads an operating system ready for use/runs start up sequences (including POST)

[1]