3. Hardware

3.3 Data storage

1 Five storage devices are described in the table below.

In column 2, name the storage device being described.

In columns 3, 4, or 5, tick (✓) to show the appropriate category of storage.

1	2	3	4	5
Description of storage device	**Name of storage device**	**Category of storage**		
		Primary	**Secondary**	**Off-line**
optical media which use one spiral track; red lasers are used to read and write data on the media surface; makes use of dual-layering technology to increase the storage capacity				
non-volatile memory chip; contents of the chip cannot be altered; it is often used to store the start up routines in a computer (e.g. the BIOS)				
optical media which use concentric tracks to store the data; this allows read and write operations to be carried out at the same time				
non-volatile memory device which uses NAND flash memories (which consist of millions of transistors wired in series on single circuit boards)				
optical media which use blue laser technology to read and write data on the media surface; it uses a single 1.1 mm polycarbonate disc				

[10]

2 A remote-controlled model car contains RAM, ROM and a solid state drive. The car receives radio signals from its remote control. It can only receive radio signals of a certain frequency. The manufacturer sets this frequency and the owner cannot change it. The owner of the model car can input their own sequence of movements from an interface underneath the car.

(a) Describe the purpose of each of the three types of memory supplied with the car.

RAM .....

.....

ROM .....

.....

Solid state drive .....

.....

[3]

(b) The owner needs to be able to enter their own sequence of movements for the model car.

Name a suitable input device.

Input device .....

.....

Give a reason for your choice of device.

.....

.....

.....

[2]

(c) Explain why the model car uses a solid state drive rather than another type of secondary storage.

.....

.....

.....

.....

[2]

3 A security system records video footage. One minute of video requires 180 MB of storage. The recording system can store several hours of video footage.

(a) Name and describe a suitable storage device for this recording system.

.....

.....

.....

..... [2]

(b) Calculate how much storage would be needed for 2 hours of video footage.

Show your working and give the answer in Gigabytes (GB).

.....

.....

.....

..... [2]

4 **(a)** Four examples of optical storage media are:

- DVD-RW
- DVD-RAM
- CD-ROM
- Blu-ray disc

The table below shows four features of optical storage media.

Tick (✓) the appropriate boxes in the table to indicate which of the features apply to each example of optical storage media.

	Single track	**Many concentric tracks**	**Blue laser used to read/ write data**	**Red laser used to read/ write data**
DVD-RW				
DVD-RAM				
CD-ROM				
Blu-ray disc				

[4]

(b) Solid state drives (SSD) are replacing hard disc drives (HDD) in some computers.

(i) Give **three** reasons why this is happening.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(ii) Explain why many web servers still use hard disc drive (HDD) technology.

.....

.....

.....

.....

.....[2]

5 There are **six** descriptions in the table below.

Complete the table below by writing the correct storage device or media in the box next to each description.

Description	Storage device or media
Non-volatile memory that can only be read from and not written to.	
Optical storage media that allows very high storage capacity by using blue/violet laser technology.	
Volatile memory that stores data, programs and the parts of the operating system that are currently in use.	
Optical storage media that uses a single spiral track and uses dual layer technology, allowing high data storage capacity.	
Device that stores data by controlling the movement of electrons within a microchip; there are no moving parts.	
Optical storage media that uses concentric tracks allowing writing and reading to take place at the same time.	

[6]

6 Modern Liquid Crystal Display (LCD) monitors use Light-Emitting Diode (LED) backlit technology.

Give **four** benefits of using LED technology.

1 .....

.....

.....

2 .....

.....

.....

3 .....

.....

.....

4 .....

.....

.....

[4]

7 Complete the paragraph by choosing **six** correct terms from the list.

- Optical
- On-line
- RAM
- HDD
- Primary
- SSD
- Secondary
- ROM
- Off-line

A computer has two different types of memory. ..... memory is not directly accessed by the CPU, but it allows a user to store data that can easily be accessed by applications. Two examples of this type of memory are ..... and ..... . The second type of memory is ..... memory. This memory is directly accessed by the CPU. It allows the processor to access data and instructions that are stored in this memory. Two examples of this memory are ..... and ..... .

[6]

8 Give **two** examples of primary, secondary and off-line storage.

Primary

Example 1 .....

Example 2 .....

Secondary

Example 1 .....

Example 2 .....

Off-line

Example 1 .....

Example 2 .....

[6]

9 **(a)** Optical storage media can be used to store data.

Describe how the data is read from a Compact Disc (CD).

.....

.....

.....

.....

.....

.....

.....

.....[4]

(b) Kamil wants to store a 16-bit colour image file. The image size is 1000 pixels.

Calculate the size of the file.

Give your answer in **bytes**. Show your working.

Working .....

.....

.....

.....

Answer ..... **bytes**

[2]

(c) Describe the differences between primary and secondary storage.

.....

.....

.....

.....

.....

.....

.....

.....[4]

10 Storage devices and storage media can be categorised as primary, secondary or off-line.

Write **primary**, **secondary** or **off-line** next to each storage device or medium to indicate its most suitable category.

HDD .....

RAM .....

ROM .....

CD-ROM .....

SSD .....

DVD-RAM .....

[6]

11 **(a)** A computer has 2048 MB of RAM.

How many GB of RAM does the computer have?

Show your working.

.....

.....

.....

.....GB [2]

(b) Describe **one** item that is stored in RAM.

.....

.....

.....[2]

(c) Explain **three** ways that RAM is different to ROM.

1 .....

.....

.....

2 .....

.....

.....

3 .....

.....

.....

[3]

12 Identify **three** similarities between CDs and DVDs.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

13 **(a)** **Five** storage devices or media are listed in the table.

Tick (✓) to show whether each storage device or media is an example of **primary**, **secondary** or **off-line** storage.

Storage device or media	Primary (✓)	Secondary (✓)	Off-line (✓)
External HDD			
RAM			
Internal SSD			
ROM			
DVD			

[5]

(b) Users can store their data on optical storage media.

Explain how data is written to optical storage media.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) A sports events company uses a digital camera attached to a drone (small flying system), to video their events from the sky.

The video is stored as it is captured, on a device that is attached to the drone.

(i) Circle the most suitable type of storage to store the video.

Optical Magnetic Solid state

[1]

(ii) Explain the reasons for your choice in **part (c)(i)**.

.....

.....

.....

..... [2]

14 A computer uses RAM and ROM to store data.

(a) The table contains three statements about RAM or ROM.

Tick (✓) to show whether each statement describes **RAM** or **ROM**.

Statement	RAM (✓)	ROM (✓)
Stores the programs and data that are currently in use		
Used to boot up the computer when power is turned on		
Contents are retained when power is turned off		

[3]

(b) Circle the storage category that includes both RAM and ROM.

Primary Secondary Off-line

[1]

(c) Explain what is meant by off-line storage.

.....

.....

.....

.....[2]

15 A law company holds a lot of sensitive data about its clients.

(a) It currently requires employees to enter a username and a password to log-in to an account. Each password must be 8 letters.

The company wants to increase the security of the log-in system.
Identify **two** improvements the company could use to make the log-in system more secure.

Explain how each improvement increases security.

Improvement 1 .....

.....

Explanation .....

.....

.....

Improvement 2 .....

.....

Explanation .....

.....

.....

[4]

(b) The law company wants to purchase a new file server.

The company can purchase a server with either solid state storage or magnetic storage. After discussion, it decides to purchase a file server with magnetic storage.

Explain why the company chose magnetic storage rather than solid state storage.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) The law company also uses optical storage.

Give **three** different examples of optical storage.

1 .....

2 .....

3 .....

[3]

16 A finance company uses off-line storage to archive their accounts.

(a) Explain what is meant by off-line storage.

.....

.....

.....

..... [2]

(b) The computers in the finance company use both primary and secondary storage.

(i) Give **one** example of primary storage.

..... [1]

(ii) Give **two** examples of secondary storage.

1 .....

2 .....

[2]

17 **(a)** Marley wants to store a video he has created for his school project.

He considers using a DVD or a Blu-ray to store the video.

Explain **two** differences between a DVD and a Blu-ray.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[2]

(b) **(i)** Marley also needs to store ten 8-bit colour images in a file for his project.

Each image is 500 pixels wide and 300 pixels high.

Calculate the total file size in megabytes (MB) for all Marley's images.

Show all your working.

.....

.....

.....

.....

.....

.....

.....

File size ..... **MB**

[3]

(ii) Marley prints the images for his project using an inkjet printer.

Describe how the inkjet printer prints an image.

.....

.....

.....

.....

.....

.....

.....

..... [4]

18 Robert has a mobile device that uses RAM, ROM and an SSD.

(a) State what the RAM, ROM and SSD are used for.

RAM .....

.....

ROM .....

.....

SSD .....

.....

[3]

(b) Give **two** reasons why an SSD, rather than a HDD, is used in the mobile device.

Reason 1 .....

.....

Reason 2 .....

.....

[2]

19 **(a)** **Six** statements are given about storage devices.

Tick (✓) to show if the statement applies to hard disk drive (**HDD**) storage or solid state drive (**SSD**) storage.

Some statements can apply to both.

Statement	HDD (✓)	SSD (✓)
It has a limited number of read/write cycles		
It uses magnetic properties to store data		
It has moving parts		
It is non-volatile storage		
It can be used as an external storage device to back up data		
It uses flash memory to store data		

[6]

(b) Optical storage is another type of storage.

Give **two** examples of optical storage.

Example 1 .....

Example 2 .....

[2]

20 **(a)** A clothing shop uses a barcode reader at the checkout.

The checkout is linked to a stock control system. The system monitors stock levels and automatically keeps them above a minimum level.

Explain how the stock control system automatically keeps the stock levels above a minimum level.

.....

.....

.....

.....

.....

.....

.....

(b) The software for the stock control system is stored on a central computer. The computer uses random access memory (RAM), read only memory (ROM) and a hard disk drive (HDD).

The computer is a Von Neumann model computer system with a central processing unit (CPU).

(i) State the purpose of the RAM, ROM and HDD in the central computer.

RAM .....

.....

ROM .....

.....

HDD .....

.....

[3]

(ii) Identify **four** components that are part of the CPU.

Component 1 .....

Component 2 .....

Component 3 .....

Component 4 .....

[4]

21 Alessandro has some important data stored on his computer.

He is concerned about accidental damage to his data.

(a) (i) Identify **three** ways that the data could be accidentally damaged.

1 .....

2 .....

3 .....

[3]

(ii) State what Alessandro could do to make sure that he can retrieve his data if it is accidentally damaged.

..... [1]

(b) Alessandro uses an SSD to store his data.

Describe what is meant by an SSD and how it operates to store data.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) Alessandro also uses off-line storage to store his data.

Three examples of off-line storage are Blu-ray, CD and DVD.

Six statements are given about off-line storage.

Tick (✓) to show if each statement applies to **Blu-ray**, **CD**, or **DVD**.

Some statements apply to more than one example of off-line storage.

Statement	Blu-ray (✓)	CD (✓)	DVD (✓)
A type of optical storage			
Has the largest storage capacity			
Can be dual layer			
Read using a red laser			
Has the smallest storage capacity			
Stores data in a spiral track			

[6]

22 Elle uses both CDs and DVDs to store her school projects.

(a) Give **three** similarities between a CD and a DVD.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(b) State **one** difference between a CD and a DVD.

.....

..... [1]

23 Julia inputs personal data into her computer.

She stores three copies of the data using a hard disk drive (HDD), a solid state drive (SSD) and a USB flash memory drive.

(a) Identify **three** devices Julia can use to input personal data into her computer.

Device 1 .....

Device 2 .....

Device 3 .....

[3]

(b) Six statements are shown about HDDs, SSDs and USB flash memory drives.

Tick (✓) to show which statements apply to each type of storage. Some statements can apply to more than one type of storage.

Statement	HDD (✓)	SSD (✓)	USB flash memory drive (✓)
it has no moving parts			
it is non-volatile			
it can use NAND gates to store data			
it uses magnetic properties to store data			
it has the smallest physical size			
it has the slowest read/write speeds			

[6]

24 Data storage can be magnetic, solid state or optical.

(a) **Six** statements are given about data storage.

Tick (✓) to show if the statement applies to magnetic, solid state or optical storage. Some statements may apply to more than one type of storage.

Statement	Magnetic (✓)	Solid state (✓)	Optical (✓)
no moving parts are used to store data			
pits and lands are used to store data			
data is stored on platters			
flash memory is used to store data			
parts are rotated to store data			
data can be stored permanently			

[6]

(b) **(i)** Give **one** example of magnetic storage.

..... [1]

(ii) Give **one** example of optical storage.

..... [1]

(iii) Identify which type of storage would be the most suitable for use in a web server and justify your choice.

Type of storage .....

Justification .....

.....

.....

(c) Describe the operation of USB flash memory and how it stores data.

.....

.....

.....

.....

.....

..... [3]

25 **(a)** Tick (✓) **one** box to identify if an internal Solid State Drive (SSD) is an example of primary, secondary or off-line storage. Justify your choice.

Tick (✓)

- ☐ Primary
- ☐ Secondary
- ☐ Off-line

Justification .....

.....

.....

.....

[3]

(b) Describe the operation of an SSD and how it stores data.

.....

.....

.....

.....

.....

.....

.....

..... [4]

26 **(b)** The photographs are also transmitted across a network to cloud storage. A device on the network forwards the data towards its correct destination.

(i) State the name of this device.

..... [1]

(ii) Describe what is meant by cloud storage.

.....

.....

.....

..... [2]

(iii) Give **one** disadvantage of storing the photographs in cloud storage instead of storing them locally.

.....

..... [1]

27 A computer has pages A, B and C that are stored in RAM. Page D needs to be sent to the RAM but the RAM is full.

Page B is **not** needed immediately.

Explain how virtual memory can be used in this scenario.

.....

.....

.....

.....

.....

.....

.....

..... [4]

28 Storage can be described as being magnetic, solid-state or optical.

(a) Give **two** features of magnetic storage.

1 .....

.....

2 .....

.....

[2]

(b) Give **three** features of solid-state storage.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(c) Give **one** example of each type of storage.

Magnetic .....

Solid-state .....

Optical .....

[3]

29 Storage and memory are important components of a computer system.

(a) Primary storage is one type of storage in a computer system.

(i) Tick (✓) **one** box to show which is an example of primary storage.

A compact disk (CD) ☐

B hard disk drive (HDD) ☐

C random access memory (RAM) ☐

D solid-state drive (SSD) ☐

[1]

(ii) Give **one** characteristic of primary storage.

..... [1]

(b) Virtual memory can be created in a computer system.

Complete the description about virtual memory.

Use the terms from the list.

Some of the terms in the list will **not** be used. Some terms may be used more than once.

binary hard disk drive (HDD) hexadecimal operating system

pages random access memory (RAM) read only memory (ROM)

sectors software tracks virtual memory

Virtual memory is used when the ..... is full. It is created by partitioning the ..... . Data is divided into ..... that can be sent from ..... to the ..... to be temporarily stored until they are required.

[5]

30 A company uses cloud storage to store its data.

(a) Tick (✓) **one** box to show which is **not** a characteristic of cloud storage.

A Data is accessed through a network ☐

B Data is stored locally ☐

C Data is stored remotely ☐

D Physical servers are used to store the data ☐

[1]

(b) Explain **two** advantages for the owners of the company of storing its data in cloud storage.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

(c) Explain **one** disadvantage to employees of the company storing data in the cloud.

.....

.....

.....

..... [2]

31 A computer has secondary storage.

(a) The table contains statements about secondary storage.

Complete the table by writing the type of secondary storage that applies to each statement. Some types of secondary storage may apply to more than one statement.

Type of secondary storage	Statement
.....	data is stored using pits and lands
.....	data is stored using control gates and floating gates
.....	data is stored using electromagnets
.....	data is stored using a laser
.....	data is stored on a platter that is divided into tracks and sectors

[5]

(b) Explain **two** differences between primary storage and secondary storage.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

32 A computer uses both random access memory (RAM) and secondary storage.

(a) State the purpose of secondary storage.

.....

..... [1]

(b) One type of secondary storage is optical.

Circle **three** examples of optical storage.

read only memory (ROM) secure digital (SD) card compact disk (CD)

hard disk drive (HDD) digital versatile disk (DVD)

Blu-ray disk universal serial bus (USB) drive solid-state drive (SSD)

[3]

(c) Explain why a computer needs RAM.

.....

.....

.....

.....

.....

..... [3]

33 A company uses both solid-state and optical secondary storage.

(a) Explain why a computer needs secondary storage.

.....

.....

.....

..... [2]

(b) Describe **three** differences between solid-state and optical storage.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

3 .....

.....

.....

.....

[6]

34 The table contains statements about types of secondary storage.

Complete the table by writing the correct type of secondary storage for each statement.

type of secondary storage	statement
.....	Pits and lands are created on a reflective surface.
.....	NAND or NOR technology is used.
.....	Platters are spun that are divided into tracks and sectors.
.....	Electromagnets are used to read and write data.
.....	Transistors are used as control gates and floating gates.
.....	A red or blue laser is used to read and write data.

[6]

35 A computer uses both random access memory (RAM) and read only memory (ROM).

(a) Tick (✓) **one** box to show which statement is correct about RAM.

A It is non-volatile storage. ☐

B It stores the bootloader. ☐

C It stores data that is currently in use. ☐

D It is **not** directly accessible by the central processing unit (CPU). ☐

[1]

(b) ROM is a type of primary storage.

State the characteristic of ROM that makes it a type of primary storage.

.....

..... [1]

36 A student has a smartphone.

(a) Identify **two** input devices that can be built into the smartphone.

1 .....

2 .....

[2]

(b) Identify **two** output devices that can be built into the smartphone.

1 .....

2 .....

[2]

(c) The smartphone contains secondary storage.

(i) Explain the purpose of the secondary storage in the smartphone.

.....

.....

.....

..... [2]

(ii) Identify the most suitable type of secondary storage for the smartphone.

Explain your choice.

Secondary storage type .....

Explanation .....

.....

.....

.....

.....

.....

.....

[4]

37 A student has a smartwatch.

(a) The smartwatch has built-in input and output devices.

Identify **two** input devices that can be built into the smartwatch.

1 .....

2 .....

[2]

(b) Identify **one** output device that can be built into the smartwatch.

..... [1]

(c) The smartwatch has read only memory (ROM).

Explain why the smartwatch needs ROM.

.....

.....

.....

..... [2]

(d) The smartwatch uses a text message application that receives data from cloud storage.

(i) Describe what is meant by cloud storage.

.....

.....

.....

..... [2]

(ii) Explain **two** benefits of the application using cloud storage.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

(e) The smartwatch only displays the time and text messages.

A student incorrectly describes this smartwatch as a general-purpose computer.

Explain why the student's description is incorrect.

.....

.....

.....

..... [2]

38 Data can be measured using different units of storage.

(a) Tick (✓) **one** box to show which of the following is the largest unit of data storage.

A tebibyte (TiB) ☐

B pebibyte (PiB) ☐

C mebibyte (MiB) ☐

D gibibyte (GiB) ☐

[1]

(b) A computer has primary storage.

Give **one** example of primary storage.

Explain the purpose of your chosen example.

Example .....

Explanation .....

.....

.....

.....

[3]