3. Hardware

3.2 Input and output devices

1 **(c)** Describe how the microprocessor can determine when to sound the clock alarm.

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.....[3]

(d) The LCD (liquid crystal display) on the clock face is back-lit using blue LEDs (light emitting diodes). The brightness of the clock face is determined by the level of light in the room. The amount of light given out by the LEDs is controlled by a control circuit.

Describe how the sensor, microprocessor and LEDs are used to maintain the correct brightness of the clock face.

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.....[3]

(e) Modern LCD monitors and televisions use LED back-lit technology.

Give **two** advantages of using this new technology compared to the older cold cathode fluorescent lamp (CCFL) method.

1 .....

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2 .....

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[2]

2 The majority of mobile phones use touch screens. Three common technologies are used by different mobile phone manufacturers.

Choose one of the following mobile phone technologies:

- resistive
- capacitive
- infrared

Chosen technology .....

(i) Describe how your chosen technology works to allow a user to make selections by touching the screen.

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.....[2]

(ii) Give **one** benefit and **one** drawback of your chosen technology when used on mobile phone touch screens.

Benefit

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Drawback

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[2]

3 Four input devices, four descriptions and four applications are shown below.

Draw a line to connect each input device to its correct description. Then connect each description to its correct application.

Input device	Description	Application
barcode reader	copies paper documents and converts the text and pictures into a computer-readable form	voice recognition
microphone	reads labels containing parallel dark and light lines using laser light or LEDs; the width of each line represents a binary code	reading passports
pH sensor	detects changes in acidity levels; data is often in analogue form	automatic stock control
scanner	device that allows audio signals to be converted into electric signals; these can be interpreted by a computer after being converted into digital form	monitor soil in a greenhouse

[6]

4 **(a)** Street lighting is controlled automatically. A light sensor and a microprocessor are used to decide when to switch each street light on or off.

Describe how the sensor, microprocessor and light interact to switch the street light on or off.

Include in your answer how the microprocessor stops the street lights being frequently switched on and off due to brief changes in the light intensity.

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.....[5]

(b) Name **three** different sensors (other than light and pH) and describe an application for each of these sensors.

A different application is needed for each sensor.

Sensor 1 .....

Application .....

.....

Sensor 2 .....

Application .....

.....

Sensor 3 .....

Application .....

.....

[6]

5 (a) Four hardware items are shown in the table below.

For each hardware item:
- name a suitable application
- state how it is used in the application

Give a different application in each case.

Hardware item	Application	How the hardware item is used
Barcode reader	.....	.....
Microphone	.....	.....
Touch screen	.....	.....
Infrared sensor	.....	.....

[8]

(b) Describe **two** differences between Blu-ray discs and DVDs.

1 .....

.....

2 .....

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[2]

(c) Describe **two** differences between DVD-R and DVD-RAM.

1 .....

.....

2 .....

.....

[2]

6 **(a)** Inkjet printers and laser printers are two common types of printer.

Describe the features and principles of operation of each type of printer.

(i) Inkjet printer

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..... [4]

(ii) Laser printer

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..... [4]

(b) Another type of printer is the 3D printer.

Describe 3D printing.

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..... [3]

7 A passenger logs onto an airline website and types in the reference number for their flight. Once the passenger accesses their account they can choose their seat and also print out a boarding pass which contains a unique barcode. This barcode is scanned at the airport check-in desk.

Name **one** input and **one** output device found at the check-in desk and give a reason for your choice.

Input device .....

Reason .....

.....

Output device .....

Reason .....

.....

[4]

8 A security system uses sensors, a camera and a microprocessor to capture images of each person entering a large shopping mall.

(a) Describe how the sensors, camera and microprocessor interact to identify certain people entering the mall.

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[5]

(b) Each image taken requires 1 MB of storage. If the camera captures an image every 5 seconds over a 24 hour period, how much storage is required?

Give your answer in **gigabytes** and show all your working.

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[2]

(c) The shopping mall has over 100 cameras. At the end of each day all these cameras send their images, captured over the last 24 hours, to a central computer.

Explain why the mall uses dedicated fibre optic cable rather than transmitting the data over the local broadband network.

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[2]

9 The steps to print a document using a laser printer are shown in the table below.

Put each step in the correct order. The first step has been done for you.

Step	Order
As the printing drum rotates, a laser scans across it; this removes the positive charge in certain areas	
The printing drum is coated in positively-charged toner; this then sticks to the negatively-charged parts of the printing drum	
The paper goes through a fuser which melts the toner so it fixes permanently to the paper	
The printer driver ensures that the data is in a format that the laser printer can understand	**1**
A negatively-charged sheet of paper is then rolled over the printing drum	
Data is then sent to the laser printer and stored temporarily in the printer buffer	
The toner on the printing drum is now transferred to the paper to reproduce the required text and images	
The printing drum is given a positive charge	
Negatively-charged areas are then produced on the printing drum; these match exactly with the text and images to be printed	

[8]

10 **(a)** Name an application which makes use of the following sensors. A different application should be used in each case.

Temperature .....

.....

Magnetic field .....

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Motion .....

.....

[3]

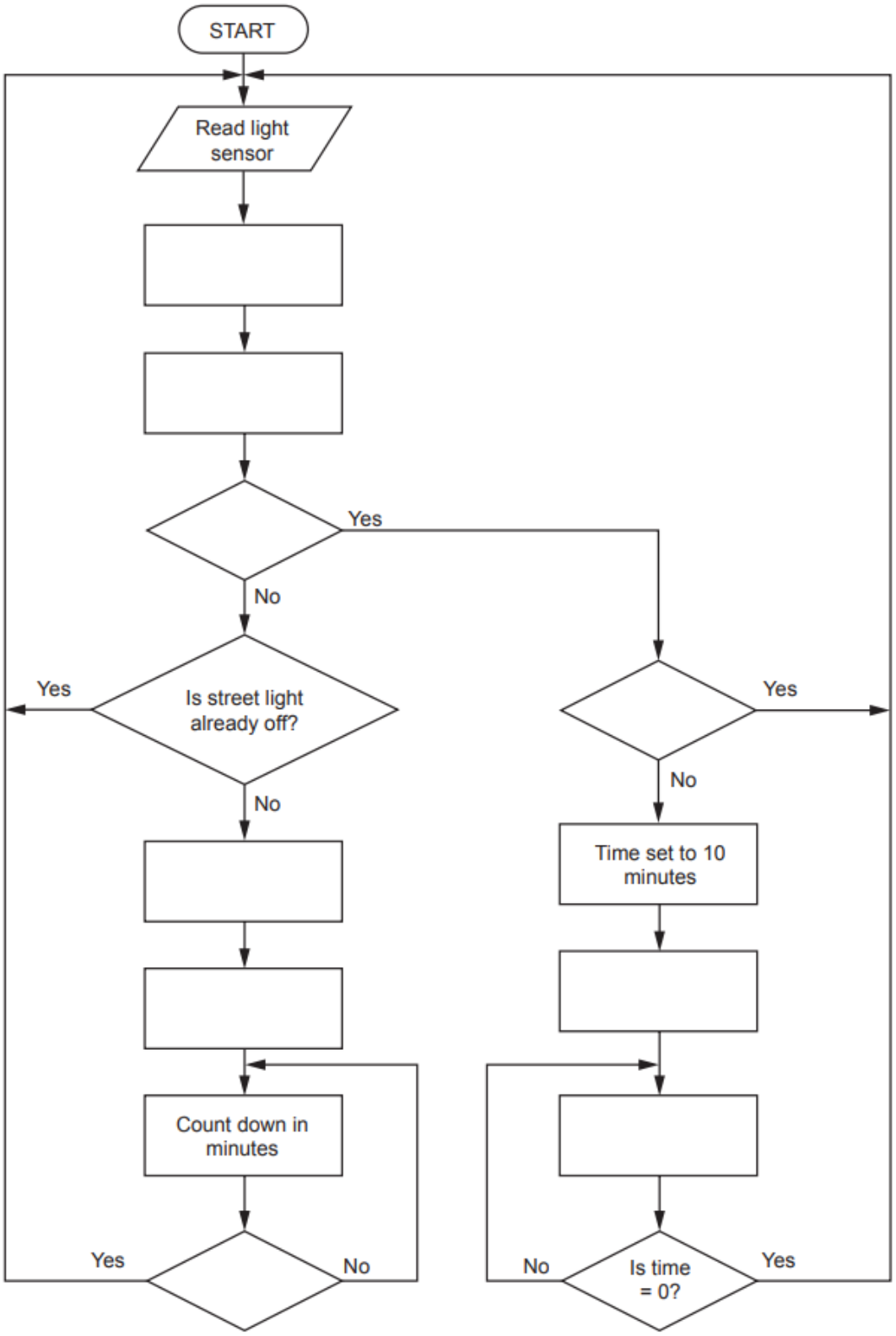
(b) The flowchart on the opposite page shows how a light sensor and microprocessor are used to switch a street lamp on or off. When the sensor reading is <= 50 light units, the lamp is turned on automatically.

Several of the instructions have been omitted from the flowchart.

Using **item numbers only** from the list below, complete the flowchart:

Item number	Instruction
1	Count down in minutes
2	Is light reading <= 50?
3	Is street lamp already on?
4	Is time = 0?
5	The microprocessor compares the sensor reading with stored values
6	The sensor reading is sent to the microprocessor
7	Switch the street lamp off
8	Switch street lamp on
9	Time set to 10 minutes

[5]


START
Read light sensor
Yes
No
Yes
Is street light already off?
No
Count down in minutes
Yes
No
Yes
No
Time set to 10 minutes
No
Is time = 0?
Yes

11 Sensors and a microprocessor monitor a car exhaust for high temperature and high carbon monoxide (CO) levels.

(a) Describe how the sensors and microprocessor are used to monitor the temperature and CO levels and warn the driver if either is out of range.

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.....[5]

12 Name a suitable output device for each of the following applications. A different device should be used for each application.

Application	Suitable output device
Production of one-off photographs of very good quality	.....
High volume colour printing of advertising flyers	.....
Production of an object, which is built up layer by layer; used in CAD applications	.....
Converting electrical signals into sound	.....
Showing enlarged computer output on a wall or large screen	.....

[5]

13 Four input devices are shown in the table below.

Give an application which makes use of each device and state a reason why the device is appropriate for that application.

Your application must be different in each case.

Input device	Application and reason
Light sensor	Application ..... Reason ....
Keyboard	Application ..... Reason ....
Barcode reader	Application ..... Reason ....
Touch screen	Application ..... Reason ....

[8]

14 **(a)** Five sensors and five applications are shown below.

Draw a line to link each sensor to its most appropriate application.

Sensor	Application
Light sensor	Monitor the pollution levels in a river
Moisture sensor	Control the switching off and on of street lights
Gas sensor	Detect intruders breaking into a building
pH sensor	Monitor the amount of water left in clothes in a dryer
Pressure sensor	Monitor acidity levels in the soil in a greenhouse

[4]

(b) Automatic doors in a building are controlled by the use of infrared sensors and a microprocessor.

Describe how the sensors and the microprocessor are used to automatically open a door as a person approaches.

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.....[4]

15 **(a)** Name the following type of barcode:

.....[1]

(b) The barcode in **part (a)** contains the denary value 2 6 4 0

Convert this value to hexadecimal.

.....

.....

Write the value as a 12-bit binary number.

[4]

(c) An airport uses the type of barcode shown in **part (a)** to advertise local places of interest.

Describe how a visitor landing at the airport could use these barcodes to help plan their visit.

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.....[3]

16 Motion sensors are used in a security system to detect intruders.

Name **three** other sensors that could be used in the following applications.

Give a different type of sensor for each application.

Application	Sensor
controlling street lights	
monitoring a river for pollution	
controlling traffic lights	

[3]

17 **Six** descriptions and **six** devices are shown below.

Draw a line to link each description to the correct device.

Description	Device
Allows a user to write on a surface using a pen; text and drawings are then captured electronically and stored for later use.	Digital Light Projector
Converts sound into an electrical signal/voltage.	Inkjet printer
Uses thermal bubble and piezoelectric technology to produce a hard copy.	Interactive whiteboard
Uses a bright white light source and micro mirrors (on a chip) to produce an image to be shone onto a wall or screen.	Laser printer
Converts a hard copy document into an electronic form to be stored as a file on a computer.	Microphone
Uses negatively charged images on a rotating drum and positively charged toner to output a hard copy.	Scanner (2D)

[5]

18 A security light is controlled by sensors and a microprocessor.

Describe how the sensors and microprocessor interact to switch on the security light when an intruder is detected.

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.....[6]

19 Describe the differences between a barcode and a Quick Response (QR) code.

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.....[3]

20 A supermarket has a system that allows customers to check out their own shopping.

Identify and describe the purpose of **two** input devices and **one** output device used in this system.

Input device 1 .....

Purpose .....

.....

.....

Input device 2 .....

Purpose .....

.....

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Output device 1 .....

Purpose .....

.....

.....

[6]

21 The processes in a chemical factory are monitored by sensors connected to a microprocessor.

(a) Identify **two** different sensors used in this application. Give an example of how each sensor could be used in the chemical factory.

Sensor 1 .....

Use .....

.....

Sensor 2 .....

Use .....

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[4]

(b) Describe how the sensors and a microprocessor are used to monitor a process.

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..... [5]

22 The diagram shows **five** output devices and **five** descriptions.

Draw a line between each output device and its description.

Output Device	Description
Inkjet printer	Flat panel display that uses the light modulating properties of liquid crystals.
LCD screen	Flat panel display that uses an array of light-emitting diodes as pixels.
2D cutter	Droplets of ink are propelled onto paper.
LED screen	Electrically charged powdered ink is transferred onto paper.
Laser printer	High powered laser that uses the x-y plane.

[4]

23 Airline boarding passes can be read from a smartphone instead of a printout.

Identify what type of barcode **A** is an example of. Explain how the data stored in this type of barcode is read.

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.....[4]

24 A cold store is kept at a constant low temperature using a sensor, a microprocessor and a cooling unit.

Explain how the sensor and microprocessor will maintain a constant low temperature.

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.....[6]

25 Describe the operation of a 2D scanner and a 3D scanner.

2D .....

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3D .....

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[6]

26 Anna has a farm that grows fruit.

She has a system that monitors the conditions for growing the fruit.

Sensors are used in this system.

(a) Explain what is meant by the term **sensor**.

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.....[2]

(b) State **two** sensors that could be used in this system and describe how they could be used.

Sensor 1 .....

Use .....

.....

.....

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Sensor 2 .....

Use .....

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[6]

27 A supermarket uses a barcode scanner to read the barcodes on its products.

(a) Describe how the barcode scanner reads the barcode.

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[4]

(b) Explain how the barcode system could help the supermarket manage its stock.

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[3]

(c) An infrared touch screen is used to view and navigate the supermarket stock system.

Explain how the infrared touch screen detects a user's touch.

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[4]

(d) The supermarket uses secondary storage and off-line storage to store data about its stock.

Explain what is meant by secondary storage and off-line storage.

Secondary storage .....

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Off-line storage .....

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[4]

28 A business wants to use a biometric security system to control entry to the office.

The system will use a biometric device and a microprocessor.

Explain how the biometric security system will make use of the biometric device and the microprocessor to control entry to the office.

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[6]

29 An advertisement in a magazine displays this barcode:

(a) Identify this type of barcode.

..... [1]

(b) Explain how the data stored in this barcode is read.

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..... [4]

30 Alexandra has a new mobile device.

It has a touch screen that uses capacitive technology.

(a) Describe how a capacitive touch screen registers Alexandra's touch.

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..... [4]

(b) Alexandra is wearing gloves because it is cold.

She presses an icon on her touch screen but her action is not registered.

(i) Explain why the touch screen will not register her touch.

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..... [2]

(ii) Alexandra does not want to remove her gloves.

Explain how Alexandra could use her mobile device whilst still wearing gloves.

.....

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..... [2]

31 A factory uses a security system to control a security light. The system uses a sensor and a microprocessor.

Explain how the security system makes use of the sensor and the microprocessor to control the security light.

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..... [6]

32 A train station uses large touch screens to allow passengers to search for train information and buy tickets.

(a) State **three** benefits of using a touch screen in the train station.

Benefit 1 .....

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Benefit 2 .....

.....

Benefit 3 .....

.....

[3]

(b) The touch screens at the station use resistive touch technology.

Describe how resistive touch technology works.

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..... [4]

33 Two examples of output devices are a 3D printer and a 3D cutter.

(a) The table contains **four** statements about 3D printers and 3D cutters.

Tick (✓) to show which statements apply to each output device, some statements may apply to both output devices.

Statement	3D printer (✓)	3D cutter (✓)
Outputs a physical 3D product		
Uses a high powered laser to create the output		
Creates 3D prototypes		
Uses layers of material to create the output		

[4]

(b) Identify the software used to create the computerised designs for 3D printing.

..... [1]

(c) A Digital Light Projector (DLP) is another example of an output device.

Describe how a DLP displays an image.

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..... [3]

34 A sports stadium uses a pressure sensor and a microprocessor to monitor the number of people entering the sports stadium. For the counter to increment the weight on the pressure sensor must exceed 5 kg.

Explain how the system uses the pressure sensor and the microprocessor to monitor the number of people entering.

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..... [5]

35 **(a)** Karina is taking her Computer Science examination. She has **three** questions to answer about output devices.

(i) For the first question she writes the answer:

"It is a high powered laser that cuts materials such as thin metals or wood."

Identify the output device that Karina is describing.

.....[1]

(ii) For the second question she writes the answer:

"The screen is made up of blocks of red, green and blue pixels. The screen uses layers of different types of liquid."

Identify the output device that Karina is describing.

.....[1]

(iii) For the third question she writes the answer:

"It is responsible for powering and moving a motor in machinery, such as a robot arm in a factory."

Identify the output device that Karina is describing.

.....[1]

(b) Karina correctly answers another examination question about some more output devices.

Five different terms have been removed from her answer.

Complete the sentences in Karina's answer, using the list given. Not all terms in the list need to be used.

- 3D
- digital light projector
- inkjet
- interactive whiteboard
- laser
- rotating
- scanning
- sliding
- speaker
- thermal bubble

An ..... allows a user to write on a surface using a pen, the text and drawings can then be captured and stored for later use. An ..... printer produces a hard copy of a document using ..... and piezoelectric technology. A ..... printer uses a ..... drum, and positive and negative charges, to produce a hard copy of a document.

[5]

36 A system uses pH sensors and a microprocessor to help monitor pollution in a river.

The pH of the water should be between 6 and 8. The system outputs an alert if the pH of the water is not in this range.

Explain how the system uses the pH sensors and the microprocessor to help monitor the pollution.

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.....[5]

37 There are **six** output devices and **six** descriptions shown.

Draw a line to connect each output device to the most appropriate description.

Device	Description
Laser Printer	Uses a high-intensity beam of light shone through three layers of changing pixels
LCD Projector	Uses millions of micro mirrors to reflect light through a lens
Digital Light Projector (DLP)	Uses plastic, resin or powdered metal to generate a physical output
Inkjet Printer	Uses a static electric charge on a rotating drum to generate a physical output
3D Printer	Uses liquid ink to generate a physical output
2D Cutter	Uses a high-power laser to generate a physical output

[5]

38 **Five** descriptions of different input or output devices are given in the table.

Complete the table by stating the **name** of each input or output device.

Description	Name of device
This is an input device that works by shining a light onto the surface of a document. The light source is automatically moved across the document and the reflected light is captured by mirrors and lenses.	.....
This is an input device where a laser or a light source is moved across an object. The width, height and depth of the object are measured to allow a model to be created.	.....
This is a large input device that is usually fixed to a wall. A user can calibrate the device to make sure the sensors align with a projected image. The user can use either their finger or a special pen to make selections.	.....
This is an output device that uses many small mirrors to reflect light towards a lens. This will display an image.	.....
This is an output device that creates an object by building layer upon layer of material.	.....

[5]

39 Input and output devices are often connected to a personal computer.

(a) Identify **three** input devices that can be connected to a personal computer.

1 .....

2 .....

3 .....

[3]

(b) Identify **three** output devices that can be connected to a personal computer.

1 .....

2 .....

3 .....

[3]

40 **(a)** An office has an automated lighting system. When movement is detected in the office the lights are switched on. If movement is not detected for a period of 2 minutes the lights are switched off. The system uses a sensor and a microprocessor.

Describe how the automated lighting system uses a sensor and a microprocessor.

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..... [6]

(b) A microprocessor uses ROM.

Explain what is meant by ROM.

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..... [3]

41 Remy has a mobile device that has a capacitive touch screen.

Describe how the capacitive touch screen registers Remy's touch.

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..... [4]

42 A museum has an information point.

Visitors to the museum can use the information point to plan their visit to the museum.

The information point allows visitors to access the information using a resistive touch screen.

Visitors can either listen to the information or read it on the screen. They can also select to output a paper copy of the information they require.

(a) Describe how the resistive touch screen registers the visitor's touch.

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..... [4]

(b) The information point has a screen to allow visitors to read information.

Identify **two** other output devices that are present in the information point.

Output device 1 .....

Output device 2 .....

[2]

(c) The information point uses both primary and secondary storage.

Explain what is meant by primary and secondary storage.

Primary .....

.....

.....

.....

Secondary .....

.....

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.....

[4]

43 Andrew wants to produce advertising material for his company.

(a) Andrew can use an **Inkjet printer** or a **Laser printer**.

Draw lines to connect each printer to a correct statement. More than one line may be used to connect to each printer or statement.

Printer	Statement
	Can print in colour
Inkjet printer	
	Uses a charged drum to create the printed item
	Uses powdered toner
Laser printer	
	Creates output line by line using a print head

[2]

(b) Andrew wants to print a single page A4 leaflet. He wants to print 10 000 copies.

State whether he should use an inkjet or a laser printer.

..... [1]

(c) Andrew wants to produce small 3D models of the company logo.

Explain how a 3D cutter could be used to produce the models.

.....

.....

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..... [2]

44 A zoo has an information point.

- Visitors use a menu to select information about animals.
- The menu includes 500 different animals.
- The information is provided only using high definition video with an audio track.

(a) State **one** input device that could be used for the information point.

..... [1]

(b) The output is shown on a monitor.

State **one** other output device that could be used for the information point.

..... [1]

(c) The video files are stored at the information point.

State **one** secondary storage device that could be used.

..... [1]

(d) The zoo decides to introduce Quick Response codes in different places in the zoo. These provide further information about the animals.

Describe how customers obtain the information from the Quick Response codes.

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..... [4]

45 The data from a sensor must be converted from analogue to digital to be processed by a computer.

(a) State what is meant by analogue data.

.....

..... [1]

(b) State what is meant by digital data.

.....

..... [1]

46 Touch screen technologies can be described as resistive or capacitive.

Six statements are given about resistive and capacitive technology.

Tick (✓) to show if the statement applies to **Resistive** or **Capacitive** technology.

Statement	Resistive (✓)	Capacitive (✓)
This touch screen has multi-touch capabilities		
This touch screen cannot be used whilst wearing gloves		
This touch screen is made up of two layers with a small space in between		
This touch screen uses the electrical properties of the human body		
This touch screen is normally cheaper to manufacture		
This touch screen has a quicker response time		

[6]

47 Gerald uses a keyboard to enter a website address into the address bar of his browser.

(a) Describe how Gerald's key presses on his keyboard are processed by the computer.

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..... [4]

48 A library has a system that allows customers to check out the books that they want to borrow.

Each book has a barcode that can be used to identify the book.

(a) **(i)** Identify **two** input devices that may be used in the library's system.

Input device 1 .....

Input device 2 .....

[2]

(ii) Identify **two** storage devices that may be used in the library's system.

Storage device 1 .....

Storage device 2 .....

[2]

(iii) Identify **two** output devices that may be used in the library's system.

Output device 1 .....

Output device 2 .....

[2]

(d) The library often holds events that introduce new authors.

At the events, the library has a Liquid Crystal Display (LCD) screen that displays data, including an image and information about the author.

Describe how an LCD screen operates to display this data.

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..... [5]

49 An image of a smartphone is shown.

(a) Identify **one** input device that is part of the smartphone.

..... [1]

(b) Identify **two** output devices that are part of the smartphone.

1 .....

2 .....

[2]

(c) All smartphones have a MAC address.

(i) State what is meant by the term MAC address.

.....

..... [1]

(ii) Describe the structure of a MAC address.

.....

.....

.....

.....

..... [3]

(d) A smartphone needs both RAM and ROM.

State why a smartphone needs RAM and ROM.

RAM .....

.....

ROM .....

.....

[2]

(e) Modern smartphones can be secured with a biometric system that is built into the phone.

(i) Identify **two** biometric systems that would be suitable for securing a smartphone.

1 .....

2 .....

[2]

(ii) Explain why modern smartphones are secured with a biometric system.

.....

.....

.....

..... [2]

50 **Four** scenarios are given.

Identify the most suitable sensor for each scenario.

A **different** sensor must be used for each scenario.

Sensor	Scenario
	Detecting when a person is approaching an automatic door system
	Monitoring the pollution level in a river
	Checking if a tropical aquarium is 25 degrees Celsius
	Counting the number of cars that cross a bridge

[4]

51 Benny is a photographer and prints his photos using an inkjet printer.

(a) Benny is printing some photos and the paper gets jammed in the printer.

A signal is sent to alert the computer about the paper jam.

State the name of this type of signal.

..... [1]

(b) Identify **one** benefit and **two** drawbacks of Benny using an inkjet printer, instead of a laser printer, to print his photos.

Benefit .....

.....

Drawback 1 .....

.....

Drawback 2 .....

.....

[3]

(c) **Four** statements are given about printers.

Tick (✓) to show whether the statement applies to an **Inkjet** printer or a **Laser** printer.

Statement	Inkjet (✓)	Laser (✓)
Uses a rotating drum to transfer the image to the paper		
Uses powdered toner		
Uses nozzles to spray droplets on to the paper		
Uses a print head mechanism that moves side to side		

[4]

52 **Six** statements are given about touch screen technology.

Tick (✓) to show if the statement applies to **Capacitive** or **Resistive** touch screen technology.

Statement	Capacitive (✓)	Resistive (✓)
Needs pressure to be applied to create a circuit		
May not register a touch if the user is wearing gloves		
More commonly used in smartphones		
More responsive to a touch		
Needs an electrical field to be changed to register a touch		
Cheaper to manufacture		

[6]

53 **(a)** **Six** hardware devices are shown.

Tick (✓) to show if each hardware device is an **Input**, **Output** or **Storage** device.

Hardware device	Input (✓)	Output (✓)	Storage (✓)
Solid state drive (SSD)			
Sensor			
Headphones			
Microphone			
USB flash drive			
Actuator			

[6]

(b) Genevieve writes a paragraph about a barcode reader.

Using the list given, complete the paragraph. Not all terms in the list need to be used.

- actuators
- binary
- black
- input
- microprocessors
- output
- sensors
- storage
- white

A barcode reader is an ..... device. It shines a light at the barcode and the light is reflected back. The ..... bars in the barcode reflect less light than the ..... bars.

..... are used to capture the amount of reflected light and the different reflections are converted to ..... values.

[5]

54 **Six** statements are given about printers.

Tick (✓) to show whether the statement applies to a **3D** printer, an **Inkjet** printer or a **Laser** printer.

Some statements apply to more than one printer.

Statement	**3D (✓)**	**Inkjet (✓)**	**Laser (✓)**
Uses a moving print head			
Uses liquid ink			
Produces output using materials such as plastic and resin			
Uses piezoelectric or thermal technology			
Uses a rotating drum to transfer the image to the paper			
Uses layer upon layer of material to create the output			

[6]

55 Six devices are shown.

Tick (✓) to show if each device is an **Input**, **Output** or **Storage** device.

Device	**Input (✓)**	**Output (✓)**	**Storage (✓)**
Keyboard			
Sensor			
3D cutter			
2D scanner			
Microphone			
Hard disk drive (HDD)			

[6]

56 Matthew is buying a new television with a display that uses LED technology.

(a) Explain what is meant by LED technology.

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..... [3]

(b) State **three** benefits of LED technology.

Benefit 1 .....

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Benefit 2 .....

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Benefit 3 .....

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[3]

(c) Identify **one other** technology that could have been used for the display.

..... [1]

57 Tammy is buying a new computer that has an LED display.

(a) **Five** statements about LED displays are given.

Tick (✓) to show if each statement is **True** or **False**.

Statement	True (✓)	False (✓)
It is a flat panel display		
It creates images using red, green and blue diodes		
It is not very energy efficient and gives off heat		
It can be used in mobile devices such as smartphones and tablets		
It is a front-lit display		

[5]

58 **Five** hardware devices are given.

Tick (✓) to show if each device is an **Input**, **Output** or **Storage** device.

Device	Input (✓)	Output (✓)	Storage (✓)
Solid state drive (SSD)			
Headphones			
2D cutter			
LCD projector			
Microphone			

[5]

59 Edith is buying a new computer monitor that displays images using LCD technology.

(a) Explain what is meant by LCD technology.

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..... [3]

(b) State **three** benefits of LCD technology.

Benefit 1 .....

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Benefit 2 .....

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Benefit 3 .....

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[3]

60 A theme park has a game where a player tries to run from the start to the finish without getting wet.

The system for the game uses sensors and a microprocessor to spray water at a player as they run past each sensor.

Describe how the sensors and the microprocessor are used in this system.

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..... [6]

61 Jamelia has a greenhouse that she uses to grow fruit and vegetables. She needs to make sure the temperature in the greenhouse stays between 25 °C and 30 °C (inclusive).

A system that has a temperature sensor and a microprocessor is used to maintain the temperature in the greenhouse. The system will:

- open a window and turn a heater off if it gets too hot
- close a window and turn a heater on if it gets too cold.

Describe how the system uses the temperature sensor and the microprocessor to maintain the temperature in the greenhouse.

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..... [8]

62 A security light system is used by a factory. The light only comes on when it is dark and when movement is detected. The light will stay on for 1 minute before switching off.

Sensors and a microprocessor are used to control the security light system.

(a) Identify **two** sensors that would be used in the security light system.

Sensor 1 .....

Sensor 2 .....

[2]

(b) Describe how the sensors and the microprocessor control the security light system.

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[8]

63 A keyboard is a type of input device that can be used to enter data into a computer.

Complete the paragraph that describes one method of operation for a keyboard, using the most appropriate terms from the given list. **Not** all terms in the list need to be used.

- Binary
- Breaks
- Calculated
- Character
- Circuit
- Current
- Information
- Network
- Press
- Processor
- Signal
- Switch

A keyboard has a key matrix underneath the keys. When a key is pressed, it presses a

..... that completes a ..... . This allows

..... to flow. The location of the key pressed is

..... . The location of the key pressed is compared to a

..... map to find the ..... value for the key that

has been pressed.

[6]

64 An optical mouse is a type of input device that can be used to input data into a computer system.

(a) Complete the paragraph about the operation of an optical mouse, using the most appropriate terms from the given list. **Not** all terms need to be used.

- Ball
- Battery
- LCD
- LED
- Lens
- Magnifies
- Matrix
- Microswitch
- Photoelectric
- Photographic
- Reduces
- USB

An optical mouse shines an ..... from the bottom of the mouse onto a surface. Light bounces straight back from the surface into a ..... cell. This has a ..... that ..... the reflected light to allow detection of smaller movements. When a button on the mouse is clicked, a ..... is pressed. A ..... connection is used to carry the data to the computer.

[6]

(b) Identify **two** other input devices that can be used to enter data into a computer.

1 .....

2 .....

[2]

65 An underground car park has a system that checks the height of vehicles. A vehicle can be no higher than 1.8 metres to enter the car park.

The system also counts the number of vehicles that have entered the car park, so that it can display how many parking spaces are still available.

Each parking space has a red and a green light above it. If a car is parked in the parking space only the red light is on, otherwise only the green light is on.

Sensors and a microprocessor are used to control the system.

(a) Complete the table to identify a suitable sensor for each part of the system.

Task	Sensor
check if a vehicle is too high	
count the vehicles entering the car park	
check if a vehicle is parked in a parking space	

[3]

(b) Describe how the sensor and the microprocessor are used to display the red or green light above the parking space.

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..... [6]

66 Magda has a mobile telephone.

She uses the touch screen on her telephone to send emails to her customers. The touch screen breaks, stopping Magda from using it to type her emails.

(a) Identify **one** other input device that would be built into the mobile telephone that Magda could use to send an email to her customers.

..... [1]

(b) The touch screen operates by using the conductive properties of the object that is used to touch the screen.

State whether the touch screen is a resistive, capacitive or infra-red touch screen.

..... [1]

(c) Magda is listening to music on her mobile telephone when she receives a telephone call. A signal is sent within the telephone to stop the music and output that a call has been received.

Give the name of this type of signal.

..... [1]

67 A washing machine uses sensors and a microprocessor to control the washing cycle of clothes.

(a) A sensor is used in each of the given tasks.

Identify **one** suitable sensor that would be used for each task.

Each sensor given must be different.

Task	Sensor
checking the water is 30 °C	
checking the water acidity level after detergent is added	
checking the weight of the clothes to make sure that the machine is **not** overloaded	

[3]

(b) Describe how the sensor and the microprocessor are used to make sure the water remains at 30 °C.

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..... [6]

68 The paragraph explains the operation of different touch screen technologies.

Complete the paragraph using the list of terms. **Not** all terms in the list need to be used.

- capacitive
- change
- circuit
- conductive
- coordinates
- grid
- heat
- infra-red
- insulating
- light
- manufacture
- pressure
- resistive

In ..... touch screen technology, an electrostatic field is present on the surface of the touch screen. The ..... properties of a user cause a ..... in the field. The ..... of the user's touch can be calculated.

In ..... touch screen technology, a user pushes the top layer of the screen and makes it connect with the bottom layer to complete a ..... .

This type of touch screen is cheaper to ..... .

[7]

69 **Five** statements are given about devices.

Tick (✓) to show if each statement applies to a 3D scanner, barcode reader or a Quick Response (QR) code reader. Some statements may apply to more than **one** type of device.

Statement	3D scanner (✓)	Barcode reader (✓)	QR code reader (✓)
uses position and alignment markers for orientation when scanning			
scans the shape and appearance of an object			
uses reflected light from a laser to convert a black-and-white pattern into binary			
can often be built into an Electronic Point Of Sale (EPOS) terminal, for example, a supermarket checkout			
it is an example of an input device			

[5]

70 An electronic game has **three** square mats that are coloured red, green and blue.

The player will see a colour displayed on a screen and has 1 second to hit the mat that matches the colour. If the player hits the correct mat, within 1 second, a counter is incremented. When a player hits an incorrect mat, the game ends.

The game uses sensors and a microprocessor to determine if the player hits the correct mat within 1 second.

Explain how the game uses sensors and a microprocessor to count the number of times a player hits a correct mat within 1 second.

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..... [7]

71 Output devices are used to output data from a computer.

Circle **three** devices that are output devices.

actuator	digital versatile disk (DVD)	keyboard
microphone	mouse	printer
scanner	sensor	solid-state drive (SSD)
speaker		

[3]

72 **(d)** The self-checkout system allows the user to input their library membership number.

Give **two** appropriate input devices that would allow the user to do this.

1 .....

2 .....

[2]

(e) The self-checkout system uses a monitor to display information about the book.

Users who are blind also need to use the self-checkout system.

Give an appropriate output device that would allow a blind user to be given this information.

..... [1]

(f) The self-checkout system uses two types of primary storage.

Circle **two** types of primary storage that would be used in the system.

compact disk (CD)	digital versatile disk (DVD)
hard disk drive (HDD)	random access memory (RAM)
read only memory (ROM)	universal serial bus (USB) flash memory drive

[2]

(g) The self-checkout system is linked to a stock control system that is updated every time a book is borrowed from the library.

A microprocessor is used in the stock control system to update the stock.

Explain the role of the microprocessor in this system and how it is used to update the stock when a book is borrowed.

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..... [3]

73 A student uses a computer and several hardware devices to complete his schoolwork.

The computer has a central processing unit (CPU).

(a) The student uses a keyboard to complete his schoolwork.

Tick (✓) **one** box to show which type of device the keyboard is.

A input ☐

B memory ☐

C output ☐

D storage ☐

[1]

(b) The student uses a printer to print his schoolwork.

Tick (✓) **one** box to show which type of device the printer is.

A input ☐

B memory ☐

C output ☐

D storage ☐

[1]

74 A train station has a ticket inspector who checks each customer's ticket before they are allowed to get on the train.

The train station wants a system that will allow the tickets to be automatically checked.

(a) Identify **two** suitable input devices that can be used to automatically read the tickets.

1 .....

2 .....

[2]

(b) The train driver pushes a button to close the train door when all passengers have boarded the train. The train door will only close when there are no passengers in the doorway.

The system to check there are no passengers in the doorway uses a sensor and a microprocessor.

Explain how the sensor and the microprocessor are used to check whether the train door can be closed.

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..... [6]

75 A mobile telephone has built-in input and output devices.

(a) Give **two** examples of an input device that would be built into a mobile telephone.

1 .....

2 .....
[2]

(b) Give **one** example of an output device that would be built into a mobile telephone.

..... [1]

(c) The data storage in the mobile telephone can be measured using different units of measurement.

(i) State how many bits are equal to a byte.

..... [1]

(ii) State how many kibibytes (KiB) equal a mebibyte (MiB).

..... [1]

(d) The mobile telephone has an operating system.

Describe the purpose of the operating system.

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..... [3]

76 A student has a portable tablet computer.

(a) Identify **two** input devices that could be built into the portable tablet computer.

1 .....

2 .....

[2]

(b) Identify **one** output device that could be built into the portable tablet computer.

..... [1]

(c) Identify **one** type of storage device that could be built into the portable tablet computer.

..... [1]

77 A sensor is an input device that is used to capture data from its surrounding environment.

(a) Circle **three** other input devices.

touch screen hard disk drive (HDD) headphones

speaker microphone actuator

universal serial bus (USB) drive printer keyboard

[3]

(b) Sensors can be used in an automated system.

Give **two** benefits of using sensors in this type of system.

1 .....

.....

2 .....

.....

[2]

(c) The table contains different types of sensors and a use for each.

Complete the table by giving a suitable use for each type of sensor. The first one has been done for you.

type of sensor	use
acoustic	to monitor whether a water pipe has cracked and is leaking and dripping onto the floor
temperature	....
humidity	....
infra-red	....
magnetic field	....

[4]

78 A barcode scanning system uses a check digit to check for errors in data on input.

(a) Explain how the barcode scanning system operates to check for errors.

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..... [4]