1. **(a)** The following incomplete table contains four network devices and their descriptions.

Complete the table by writing the missing devices and missing descriptions.

Device	Description
.....	Receives and sends data between two networks operating on the same protocol
Wireless Network Interface Card (WNIC)	....
.....	Restores the digital signal so it can be transmitted over greater distances
Wireless Access Point (WAP)	....

[4]

(b) Describe **three** differences between fibre-optic cables and copper cables.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(c) Ethernet uses Carrier Sense Multiple Access/Collision Detection (CSMA/CD).

Describe CSMA/CD.

.....

.....

.....

.....

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.....

.....

..... [4]

2 A company uses cloud computing.

(a) Define cloud computing.

.....

..... [1]

(b) State what is meant by a public cloud and a private cloud.

Public cloud .....

.....

Private cloud .....

.....
[2]

(c) Give **two** benefits and **one** drawback of using cloud computing.

Benefit 1 .....

.....

Benefit 2 .....

.....

Drawback .....

.....
[3]

3 Melinda and her friends set up a peer-to-peer network between their computers to share data.

(a) Describe the key features of a peer-to-peer network.

.....

.....

.....

..... [2]

(b) Describe **two** drawbacks to Melinda and her friends of using a peer-to-peer network.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

(c) Melinda connects her laptop to the internet through her router.

(i) Tick (✓) **one** box in each row to identify whether the task is performed by the router or not.

Task	Performed by router	Not performed by router
Receives packets from devices		
Finds the IP address of a Uniform Resource Locator (URL)		
Directs each packet to all devices attached to it		
Stores the IP and/or MAC address of all devices attached to it		

[2]

(ii) Melinda mainly uses the internet to watch films and play computer games.

Tick (✓) **one** box to identify whether Melinda should connect to the router using a wired or wireless network **and** justify your choice.

Wired	
Wireless	

Justification .....

.....

.....

.....

.....

..... [3]

(d) Melinda sends emails from her webmail account (email account accessed through a website).

Explain whether Melinda is using the internet, or the World Wide Web (WWW), or both.

.....

.....

.....

.....

.....

..... [3]

4. Seth accesses both software and data using cloud computing.

(i) Give **two** benefits of storing data using cloud computing.

1 .....

.....

2 .....

.....

[2]

(ii) Give **two** drawbacks of Seth using cloud computing.

1 .....

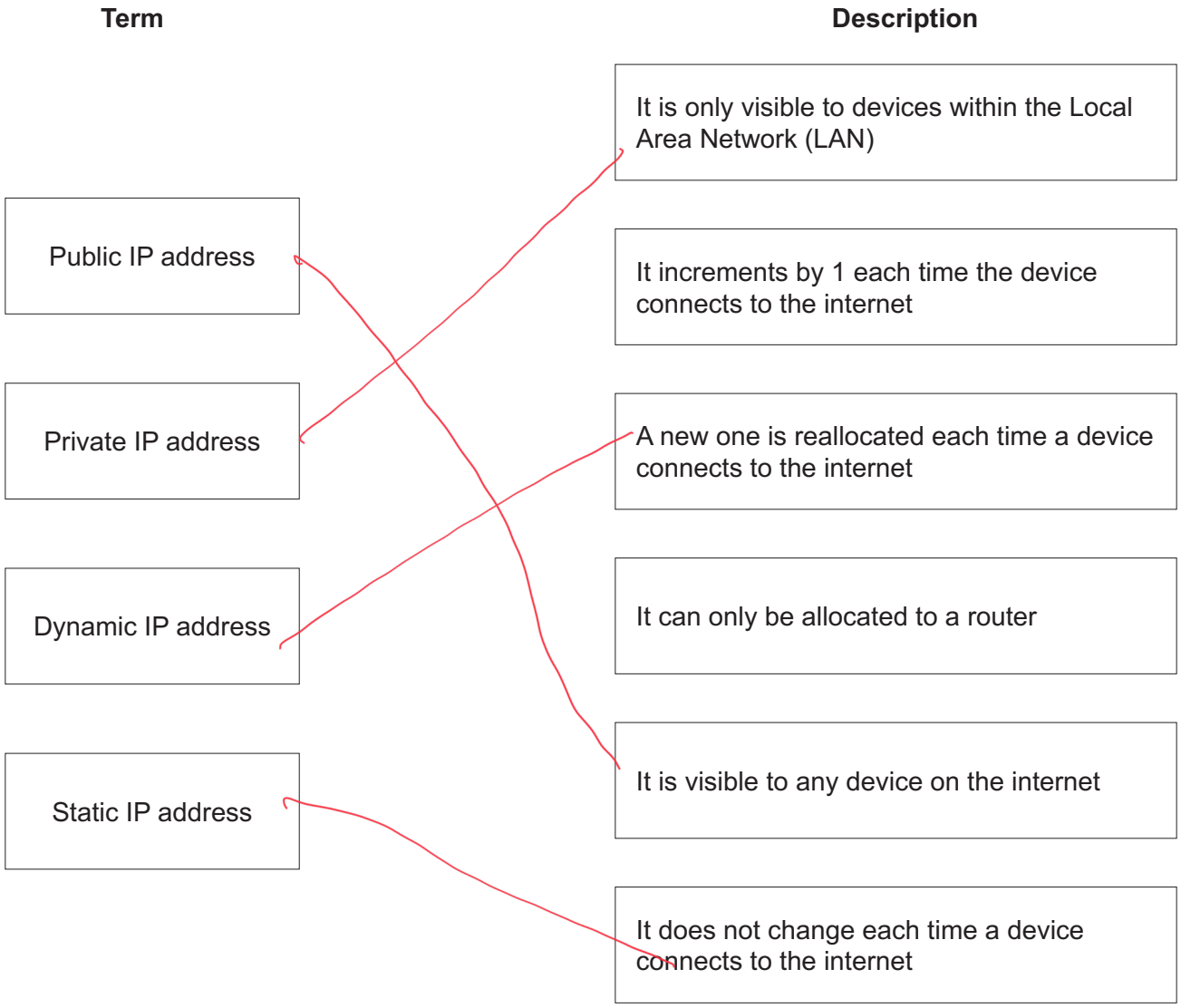
.....

2 .....

.....

[2]

5. Draw **one** line from each term to its **most appropriate** description.



[4]

8 A school is setting up a network within one of its buildings.

(a) State whether the network will be a LAN (local area network) or a WAN (wide area network). Justify your choice.

.....

.....

.....

.....

.....

..... [3]

(b) One classroom in the building has 30 computers. The computers need to be connected to the network. Each computer has a network interface card (NIC).

Identify **two** possible devices that can be used to physically connect the 30 computers to the rest of the network.

1 .....

2 .....
[2]

(c) The school has several laptops. Each laptop has a Wireless Network Interface Card (WNIC).

Describe the functions of a Wireless Network Interface Card.

.....

.....

.....

.....

.....

.....

.....

..... [4]

3 Andy likes to play computer games.

(a) Andy uses several input devices to play the games. These include a keyboard and a microphone.

Describe the principal operation of a microphone.

.....

.....

.....

.....

.....

..... [3]

(b) Andy plays some of the computer games over the internet. He has several devices that connect wirelessly to the router in his house.

(i) Identify the topology of Andy's home network. Justify your choice.

Topology .....

Justification .....

.....
[2]

(ii) The router has a wireless access point (WAP) to allow the devices to connect wirelessly.

Identify **three** functions of the router in Andy's network.

1 .....

.....

2 .....

.....

3 .....

.....
[3]

9 **(a)** Identify **two** differences between a public IP address and a private IP address.

1 .....

.....

2 .....

.....

[2]

(b) Complete the table by identifying the **most appropriate** term for each description. Each term must be different.

Description	Term
Receives data packets from a network and forwards them onto a similar network	
Manages access to a centralised resource	
Joins networks that use different sets of rules to transmit data	
Monitors and controls incoming and outgoing network traffic based on set criteria	

[4]

8

(c) When Bart is at work, he connects his work laptop to his employer's Local Area Network (LAN). The LAN has both a router and a gateway.

Give **two** similarities and **one** difference between a router and a gateway.

Similarity 1 .....

.....

Similarity 2 .....

.....

Difference .....

.....

.....

[3]

7 A company allows customers to stream music from its servers over the Internet.
The company's internet connection is currently provided through copper cables.

(a) Identify **two** pieces of hardware, other than the cables, that enable the servers to connect to the Internet. Describe the purpose of each device.

Device 1 .....

Purpose .....

.....

.....

Device 2 .....

Purpose .....

.....

.....

[4]

(b) The company wants to upgrade their internet connection to fibre-optic cables.

Give **one** benefit and **one** drawback to the company of upgrading to fibre-optic cables.

Benefit .....

.....

.....

Drawback .....

.....

.....

[2]

1 Ana owns a small company with four employees. The office has a network containing several computers that run on a client-server model. There is one server that connects to the Internet using a router.

(a) Networks transmit data using various types of connection shown in the following table.

Complete the table.

Type of connection	Description
Fibre-optic	....
....	A communication device in Earth's orbit that receives and transmits data
Radio waves	....
....	Carries data as electrical signals and can consist of a twisted pair

[4]

(b) Explain how the client-server model enables the employees to access the same files from different computers.

.....

.....

.....

.....

.....

..... [2]

(c) Each computer in the network has a private IP address.

Give **two** reasons why the computers do **not** have public IP addresses.

1 .....

.....

2 .....

.....

[2]

5 Oscar is watching a concert on his laptop computer.

(a) The concert is streamed to his computer at the same time as it is taking place.

(i) Identify whether Oscar is using real-time or on-demand bit streaming. Justify your choice.

Streaming method .....

Justification .....

.....

.....

.....

.....

[3]

(ii) The video of the concert repeatedly stops and restarts while Oscar is watching it on his laptop computer. His friend is watching the same video of the concert at the same time, in a different location, but he does not experience the same problem as Oscar.

Give **three** possible reasons why Oscar's video constantly stops and starts again.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

7 A web server has a public IPv4 address.

(a) Draw lines to link each characteristic to its appropriate IP address.

Characteristic	IP address
Can use hexadecimal notation	
Each group of digits is a number between 0 and 65535	IPv4
Consists of four groups of digits	
Uses double colons (::)	IPv6
The total length of the address is 32 bits	

[2]

(b) IP addresses can be static or dynamic.

Explain the reasons for the web server using a static instead of a dynamic IP address.

.....

.....

.....

.....

.....

..... [3]

4 A laptop on a home network connects to the Internet through a router.

(a) The laptop has an IP address.

(i) Give the reasons why the laptop has an IP address.

.....

.....

.....

..... [2]

(ii) The laptop's IP address is private.

Give the reasons why the laptop does **not** have a public IP address.

.....

.....

.....

..... [2]

(iii) The router has an IPv4 address.

Give **three** differences between the format of an IPv4 address and an IPv6 address.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(b) A Public Switched Telephone Network (PSTN) is one example of a communication system that can be used to support the Internet.

Identify **and** describe **two other** communication systems that can be used to support the Internet.

System 1 .....

Description .....

.....

System 2 .....

Description .....

.....

[4]

1 Devices connected to the Internet have IP (Internet Protocol) addresses.

(a) Three IPv4 addresses are given.

Circle either Valid or Invalid to indicate whether each address is valid or invalid. Explain your decision.

Address 1: 3A.21.2H.1 Valid / Invalid

Explanation .....

.....

Address 2: 299.53.2.2 Valid / Invalid

Explanation .....

.....

Address 3: 192.2.1.0 Valid / Invalid

Explanation .....

.....

[3]

(b) A website can be accessed using either the Uniform Resource Locator (URL) or the IP address.

Describe how a URL is converted into its matching IP address.

.....

.....

.....

.....

.....

..... [3]

(c) People use the Internet to stream media.

Complete the following statements by filling in the names of the missing methods of bit streaming.

..... bit streaming is used when watching a live stream of events that are currently taking place. The event is captured live with a video camera connected to a computer, and it cannot be paused or rewound.

..... bit streaming is used when watching an event that has taken place in the past. Existing media are encoded to bit streaming format and uploaded to a server. It can be paused and rewound.

[2]

1 Computers on the Internet have IP addresses.

(a) IP addresses can be in either IPv4 or IPv6 format.

(i) Give an example of a valid IPv4 address.

.....

..... [1]

(ii) State why there is a need for IPv6 addressing.

.....

..... [1]

(iii) A computer's IPv6 address is:

C100:2235::1000:25AA:AA50

Explain why this IPv6 address would be an invalid IPv4 address.

.....

.....

.....

..... [2]

(b) A company has computers in two separate buildings that communicate using the Internet over a Public Switched Telephone Network (PSTN).

(i) Describe the transmission of data using a PSTN.

.....

.....

.....

..... [2]

(ii) The company wants to install a dedicated line between the two buildings.

Identify **one** benefit and **one** drawback of installing a dedicated line between the two buildings.

Benefit .....

.....

Drawback .....

.....

[2]

(c) A network can use routers and gateways.

Explain the role of routers **and** gateways in a network.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(d) The company has an email server.

Identify **three** other types of server.

1 .....

2 .....

3 .....

[3]

4 Customers of a bank can access their account information by logging in on the bank's website.

(a) The bank has a client-server model of networked computers.

(i) Describe, using the bank as an example, the key features of a client-server model.

.....

.....

.....

.....

.....

..... [3]

(ii) Give **two** other examples of applications that can use the client-server model.

1 .....

.....

2 .....

.....

[2]

(b) The bank's customers log in to the website using a web application.

Explain why the web application uses server-side scripting.

.....

.....

.....

.....

.....

..... [3]

(c) The bank is upgrading its local area network (LAN) copper cables to fibre-optic cables.

(i) State **two** benefits to the bank of upgrading to fibre-optic cable from copper cable.

1 .....

.....

2 .....

.....

[2]

(ii) State **two** drawbacks of upgrading to fibre-optic cables.

1 .....

.....

2 .....

.....

[2]

1 Four communication media and five features are shown.

Draw one or more lines from each communication media to the appropriate feature(s).

Communication media	**Feature**
Fibre-optic cable	Can be twisted pair or co-axial
Radio waves	Transmits light pulses
Copper cable	Large range of wavelengths
Satellite	Least likely to have interference
	Wireless transmission

[6]

5 A college has a client-server network.

(a) The college has a file server and other servers.

State the purpose of **two** other servers in the college network.

Server 1 .....

Server 2 .....

[2]

(b) The students use the network to access the Internet.

One student stated, '*The Internet and the World Wide Web are the same thing*'.

Tick (✓) **one** box to indicate whether this statement is true or false.

True	False

Justify your choice.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

2 Computer **A** needs to access a web page.

(a) State how Computer **A** could access the web page without using a Domain Name Service (DNS).

.....

.....[1]

(b) **(i)** The following table shows four IPv6 addresses.

State if each address is valid or invalid.

IP address	Valid or invalid
21E5:69AA:FFFF:1:E100:B691:1285:F56E	
::255.255.255.255	
59FB::1005:CC57:6571	
56FE::2159:5BBC::6594	

[4]

(ii) The following table shows four statements about either public or private IP addresses.

Tick (✓) **one** box in each row to indicate whether each statement refers to a public or a private IP address.

Statement	Public	Private
192.168.2.1 is an example of this type of address		
Assigned by the Internet Service Provider (ISP)		
IP address cannot be duplicated in different networks		
Network Address Translation (NAT) is necessary to access the Internet directly		

[4]

(c) One type of transmission media is copper cable.

Give **two** additional types of transmission media.

1 .....

2 .....

[2]

2 Gopal types the Uniform Resource Locator (URL) of a website into a web browser.

(a) The following sequence (1 to 5) describes the steps that take place. There are three missing statements.

1 Gopal types into the web browser.

2 .....

3 DNS looks up the URL in table

4 .....

5 .....

Three statements **A**, **B** and **C** are used to complete the sequence.

A	DNS finds corresponding IP address
B	Web browser sends URL to Domain Name Service (DNS)
C	DNS returns IP address to web browser

Write one of the letters **A** to **C** in the appropriate rows (2, 4 and 5) to complete the sequence. [2]

(b) Describe the purpose of an IP address.

.....

.....

.....

..... [2]

(c) A telecommunications operator has installed fibre-optic cables in Gopal's neighbourhood.

(i) Give **three** benefits of fibre-optic cable over copper cable.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(ii) Give **two** drawbacks of fibre-optic cable over copper cable.

1 .....

.....

2 .....

.....

[2]

4 Ava needs to view a website and she knows the Uniform Resource Locator (URL).

(a) Complete the series of steps that take place.

Write the **letter** of the appropriate statement in each space.

A	DNS finds corresponding IP
B	DNS looks up URL in table
C	Ava types the URL into a web browser

1 .....

2 Web browser sends URL to Domain Name Service (DNS)

3 .....

4 .....

5 DNS returns IP address to web browser

[2]

(b) (i) An IPv4 address has been entered as 12.258.3

Give **two** reasons why this IP address is invalid.

1 .....

.....

2 .....

.....

[2]

(ii) An IPv6 address has been entered as 15EF:5L63::2014:BB::60AA

Give **two** reasons why this IP address is invalid.

1 .....

.....

2 .....

.....

[2]

(c) The table shows four descriptions of IP addresses.

Tick (✓) **one** box in each row to identify whether each description applies to a public or private IP address.

Description	Public	Private
The address can be reached over the Internet.		
The address is more secure.		
The address can only be accessed through the same LAN.		
The address can be duplicated in different networks.		

[4]

6 Downloading a file from a website is an example of a client-server application.

(a) Describe what is meant by the term **client-server** for this application.

.....

.....

.....

.....[2]

(b) The following sequence of steps (1 to 5) describes what happens when someone uses their personal computer (PC) to request a web page. The web page consists of HTML tags and text content only. Four of the statements from **A**, **B**, **C**, **D**, **E** and **F** are used to complete the sequence.

A	Browser software interprets the script, renders the page and displays.
B	Browser software renders the page and displays.
C	Browser software compiles the script, renders the page and displays.
D	The web server retrieves the page.
E	The Domain Name Service (DNS) uses the domain name from the browser to look up the IP address of the web server.
F	The web server sends the web page content to the browser.

Write one of the letters A to F in the appropriate row to complete the sequence.

1. The user keys in the Uniform Resource Locator (URL) into the browser software.
2. .....
3. .....
4. .....
5. .....

[4]

7 Access to World Wide Web content uses IP addressing.

(a) State what IP stands for.

.....[1]

(b) The following table shows four possible IP addresses.

Indicate for each IP address whether it is valid or invalid and give a reason.

Address	Denary / Hexadecimal	Valid or Invalid	Reason
`3.2A.6AA.BBBB`	Hexadecimal		
`2.0.255.1`	Denary		
`6.0.257.6`	Denary		
`A.78.F4.J8`	Hexadecimal		

[4]

(c) Describe **two** differences between public and private IP addresses.

1 .....

.....

2 .....

.....[2]

6 **(a)** Explain the difference between the World Wide Web (WWW) and the Internet.

.....

.....

.....

.....[2]

(b) Three methods of connecting devices include fibre-optic cables, copper cables and radio waves. The table below gives descriptions relating to these connection methods.

Tick (✓) one box on each row to show the method that best fits each description.

Description	Fibre-optic cable	Copper cable	Radio waves
Wireless medium			
Twisted-pair is an example			
Uses light waves			
WiFi			
Fastest transmission medium			

[5]

(c) Bit streaming is used for both real-time and on-demand services.

Describe **one** difference between real-time and on-demand bit streaming.

.....

.....

.....

.....[2]

(d) A device needs an IP address to connect to the Internet. IPv4 is the more common type of IP address.

Describe, using an example, the format of an IPv4 address.

.....

.....

.....

.....

.....

.....[3]

(e) A computer user keys in the Uniform Resource Locator (URL) of a web page into a web browser.

Describe how the browser uses the Domain Name Service (DNS) to display the web page.

.....

.....

.....

.....

.....

.....

.....

.....[4]

5 **(a)** Telephone calls can be made by using:

- conventional telephones (using the Public Service Telephone Network (PSTN) system) over a wired network
- a computer, equipped with speakers and microphone, connected to the Internet

Put a tick (✓) in the correct column to match each description to the appropriate communication method.

Description	Conventional telephone using PSTN	Internet-based system
connection only in use whilst sound is being transmitted		✓
dedicated channel used between two points for the duration of the call	✓	
connection maintained throughout the telephone call	✓	
encoding schemes and compression technology used		✓
lines remain active even during a power outage	✓	

[5]

(b) Distinguish between the Internet and the World Wide Web (WWW).

.....

.....

.....

.....

.....

.....[3]

(c) Name the hardware device that is being described:

(i) A device that transfers data from one network to another in an intelligent way. It has the task of forwarding data packets to their destination by the most efficient route.

.....[1]

(ii) A device used between two dissimilar LANs. The device is required to convert data packets from one protocol to another.

.....[1]

(iii) A device or software that provides a specific function for computers using a network. The most common examples handle printing, file storage and the delivery of web pages.

.....[1]

3 **(a)** The table shows four statements about IP addresses.

Tick (✓) to show which of the statements are true.

Statement	True (✓)
The IP address consists of any number of digits separated by single dots (.)	
Each number in an IP address can range from 0 to 255	
IP addresses are used to ensure that messages and data reach their correct destinations	
Public IP addresses are considered to be more secure than private IP addresses	

[2]

(b) Consider the URL:

http://cie.org.uk/computerscience.html

(i) Give the meaning of the following parts of the URL.

http .....

.....

.....

cie.org.uk .....

.....

.....

computerscience.html .....

.....

.....

[3]

(ii) Sometimes the URL contains the characters **%20** and **?**.

Describe the function of these characters.

%20 .....

.....

? .....

.....

[2]

6 A company operates a chemical plant, which has a number of processes. Local computers monitor these processes and collect data.

The computers transfer these data to a central computer 50 km away. A telecommunications company (telco) provides cables.

Engineers at the telco had to decide which type of cable to use. They considered the use of either copper cable or fibre optic cable.

State **two** benefits of each type of cable. Each benefit must be clearly different.

Benefits of copper cable

1 .....

.....

2 .....

.....

Benefits of fibre optic cable

1 .....

.....

2 .....

.....

[4]

7 **(a)** **(i)** Describe what is meant by a client-server model of networked computers.

.....

.....

.....

.....[2]

(ii) Give **two** benefits of using the client-server model.

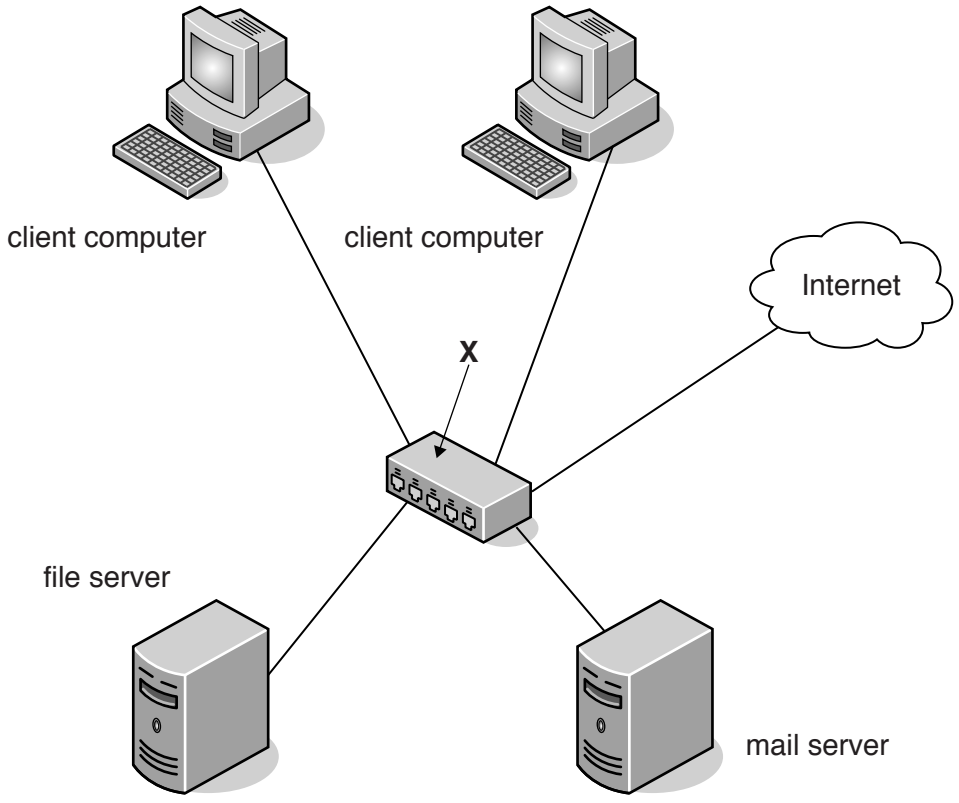
1 .....

.....

2 .....

.....
[2]

(b) The diagram shows a computer network with connection to the Internet.



Name the hardware device labelled **X**.

.....[1]

(c) A web page offers a link for users to request another web page. The requested web page contains HTML code and JavaScript code.

Put each statement in the correct sequence by writing the numbers 1 to 5 in the right-hand column.

Statement	Sequence number
The requested web page is displayed on the client computer	
The user clicks on the hyperlink and the web page is requested from the web server	
The requested web page content is transmitted to the client computer	
The client computer processes the JavaScript code using the web browser software	
The web server locates the requested web page	

[5]

1 **(a)** Explain the term bit streaming.

.....

.....

.....

.....[2]

(b) A person watches a film streamed from a website on a tablet computer.

(i) Give **two** benefits of using bit streaming for this purpose.

1 .....

.....

2 .....

.....
[2]

(ii) State **two** potential problems of using bit streaming for this purpose.

1 .....

.....

2 .....

.....
[2]

(c) Explain the terms on-demand bit streaming and real-time bit streaming.

.....

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.....[4]