**Q1.**

Define the term **computer network**.

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**(Total 2 marks)**

**Q2.**

Explain how a firewall can be used to improve the security of a computer network.

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**(Total 2 marks)**

**Q3.**

Authentication and MAC address filtering can be used to improve network security.

Explain how **one** of these security methods works.

Ring your chosen security method:

**Authentication**        **MAC address filtering**

How it works  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(Total 2 marks)**

**Q4.**

Shade the **two** lozenges that are correct statements about network protocols.

|  |  |  |
| --- | --- | --- |
| **A** | A protocol is a set of rules. |  |
| **B** | All protocols only work with specific hardware. |  |
| **C** | All protocols transmit data securely. |  |
| **D** | Ethernet is a family of protocols. |  |
| **E** | Wi-Fi is a single protocol. |  |

**(Total 2 marks)**

**Q5.**

Explain **one** data privacy concern an organisation would need to consider when setting up a wireless network.

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**(Total 2 marks)**

**Q6.**

The table below shows three layers of the TCP/IP model and some protocols that operate at each of these layers.

|  |  |
| --- | --- |
| **Layer** | **Protocol** |
| Application layer | HTTP  HTTPS  SMTP  IMAP  FTP |
| Transport layer | TCP  UDP |
| Internet layer | IP |

Describe the role of **one** protocol from **each** layer in the table above. You **must** state which protocol you are describing.

Application layer protocol  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Transport layer protocol  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Internet layer protocol  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(Total 9 marks)**

**Q7.**

Define the term ‘computer network’.

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**(Total 2 marks)**

**Q8.**

Computer networks can be wired or wireless.

Discuss the advantages **and** disadvantages of wired and wireless networks.

In your answer you should:

•   discuss the advantages **and** disadvantages of each network type

•   compare the security of wired and wireless networks.

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**(Total 9 marks)**

**Q9.**

State which layer of the TCP/IP model each of the network protocols operates at by ticking **one** box in **each** row of the table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Network Protocol** | **Application layer** | **Transport layer** | **Internet layer** | **Link layer** |
| HTTP |  |  |  |  |
| UDP |  |  |  |  |
| IP |  |  |  |  |
| IMAP |  |  |  |  |

**(Total 4 marks)**

**Q10.**

Draw a simple diagram to show a star network topology containing four desktop computers.

**(Total 2 marks)**

**Q11.**

Draw a simple diagram to show a bus network topology containing four desktop computers.

**(Total 2 marks)**

**Q12.**

State **two** advantages of using a star topology instead of a bus topology.

1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(Total 2 marks)**

**Q13.**

State **one** disadvantage of using a star topology instead of a bus topology.

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**(Total 1 mark)**

**Q14.**

Discuss the benefits and risks of using a computer network.

**(Total 9 marks)**

**Q15.**

Define the term **network protocol**.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(Total 2 marks)**

**Q16.**

Which **two** of the following are email protocols?

Shade **two** lozenges.

|  |  |  |
| --- | --- | --- |
| **A** | FTP |  |
| **B** | HTTP |  |
| **C** | IMAP |  |
| **D** | SMTP |  |
| **E** | TCP |  |
| **F** | UDP |  |

**(Total 2 marks)**

**Q17.**

Explain why a firewall improves network security.

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**(Total 2 marks)**

**Q18.**

The four layers of the TCP/IP network model are shown below.

For each row in the table below, write the letter **A**, **B**, **C** or **D** that matches the description.

Each letter should only be used once.

**A**  Application layer

**B**  Transport layer

**C**  Internet layer

**D**  Link layer

|  |  |
| --- | --- |
| **Description** | **Letter** |
| Addresses data for transmission |  |
| Sets up the communication between the two hosts |  |
| Where the network hardware is located |  |
| Where the user software, such as web browsers or email programs, operates |  |

**(Total 2 marks)**

**Q19.**

TCP/IP is a protocol used in networking. There are 4 layers in the TCP/IP stack.

Complete the table by placing the four layers of the TCP/IP stack into order (1-4) where 1 is the top layer and 4 is the bottom layer.

|  |  |
| --- | --- |
| **Layer** | **Order (1-4)** |
| Transport |  |
| Link |  |
| Internet |  |
| Application |  |

**(Total 3 marks)**

**Q20.**

A games café is evaluating the security for their network.

(a)  State **two** reasons why using a biometric authentication measure is better than password authentication for staff accounts.

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**(2)**

(b)  Explain why it would not be appropriate for the café to use MAC address filtering on their wireless network.

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**(Total 4 marks)**

**Q21.**

Explain **two** differences between a LAN and a WAN.

**Difference 1:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Difference 2:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(Total 4 marks)**

**Q22.**

What is the purpose of the network (internet) layer within the TCP/IP stack?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(Total 2 marks)**

**Q23.**

Explain how MAC address filtering works.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(Total 2 marks)**

**Q24.**

List **three** different measures that can be used to maintain the security of a computer system.

For each measure:

•        Outline what the measure is.

•        Explain what types of threat to cyber security it is effective against.

**(Total 9 marks)**

**Q25.**

Most schools have a computer network.

Some schools allow teachers to access the school network from their home computers.

Give **one** reason why some schools allow this and **one** reason why some schools do not allow this.

**Reason for:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Reason against:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(Total 2 marks)**

Mark schemes

**Q1.**

**2 marks for AO1 (recall)**

1 mark for each of the following points:

•   two or more computers;

•   connected together (to allow communication);

**[2]**

**Q2.**

**2 marks for AO1 (understanding)**

1 mark for each of the following points (maximum of **two** marks):

•   acts as a barrier / interface between a computer (network) and external connections / devices;

•   inspects incoming and / or outgoing packets of data;

•   to see if packets may be malicious;

•   to see if packets may be allowed / disallowed by firewall settings / criteria;

•   restricts use of certain services / ports;

**[2]**

**Q3.**

**2 marks for AO1 (understanding)**

Marks can only be awarded for one of the two security methods.

1 mark for any of the following points (maximum of **two** marks):

**Authentication:**

•   takes one or more pieces of data specific to the user;

•   and compares them to known / stored credentials // and only allows access to the system if the credentials are valid;

**MAC address filtering:**

•   takes the (unique / specific) MAC address for a device;

•   and checks to see if it is in the list of allowed / blocked addresses // and only allows device to connect to the system if it has permission to do so;

**[2]**

**Q4.**

**2 marks for AO1 (recall)**

**A** A protocol is a set of rules;

**D** Ethernet is a family of protocols;

**R.** If more than two lozenges shaded.

**[2]**

**Q5.**

**2 marks for AO1 (understanding)**

1 mark for any of the following concerns and 1 mark for relevant expansion:

•   spoofing or session hijacking; where the attacker assumes the identity of an authorised user;

•   eavesdropping; all network data is broadcast and can be intercepted by third party;

•   encrypting data; making sure that data is not transmitted in plain text; by ensuring that routers have encryption turned on;

•   malware infiltration; a Wi-Fi network is more exposed to attack because it’s visible;

•   malicious hotspots; unofficial access points that look like they are part of the network;

**[2]**

**Q6.**

**9 marks for AO1 (understanding)**

|  |  |  |
| --- | --- | --- |
| **Level** | **Description** | **Marks** |
| 3 | There is a good description of the role of one named protocol in each layer.  Correct technical language is used throughout. | 7-9 |
| 2 | There is some description of the role of one named protocol in each layer.  Some correct technical language is used though there may be errors. | 4-6 |
| 1 | Statements are made about the role of one named protocol in each layer.  Little or no technical language is used or is used incorrectly. | 1-3 |
| 0 | No creditworthy material | 0 |

**Guidance to examiners**

*Good description of protocol role* might be:

HTTPS is an extension of HTTP and allows secure transfer of data between a browser and a website by encrypting data. The web browser will check the website server’s security certificate and ensure it is legitimate. This means it’s not possible to see or eavesdrop on what you’re browsing or for your data to be stolen.

*Some description of protocol role* might be:

HTTPS allows secure transfer of data between a browser and a website by encrypting the data being transferred to stop your data being stolen. It does this by checking a security certificate to see if the website is legitimate.

*Statements about protocol role* might be:

In HTTPS the S stands for secure and stops your data being stolen on a website. It encrypts your data.

**Indicative content (role of protocols listed in question)**

|  |  |
| --- | --- |
| HTTP | Provides a way for users to interact with web resources.  Transmits messages between client and server using hypertext. |
| HTTPS | As HTTP but in addition uses an encryption protocol to ensure communications are secure. |
| SMTP | Enables users to send (and receive) email messages.  Initiates sessions between user and mail server. Server then forwards messages. Uses a process called ‘store and forward’ to store messages and forward as necessary. The server decides which server to send the message to and the inbox provider then downloads the message and places it in the recipient’s inbox.  Often used in conjunction with IMAP. |
| IMAP | Stores email messages on an ISPs server but allows user to manipulate messages as though on a local device. Local devices access the ISP server to access the messages. IMAP works with desktop clients and webmail clients. Allows simultaneous logins from different devices to one account |
| FTP | Allows secure transfer of files between client and server. Files are uploaded to and downloaded from the server using FTP. |
| TCP | Connects network devices to the Internet. It defines how applications can create channels of communication across a network. It manages how a message is assembled into smaller packets before transmission and reassembles packets in the correct order at destination. |
| UDP | Communications protocol that establishes low latency and loss-tolerating connections between applications. Enables the transfer of data before an agreement is provided by the receiving party. This speeds up transfers.  Can start transferring data before agreement is received from receiving party. |
| IP | Relays data across network boundaries. It defines how to address and route each packet to make sure it reaches the right destination. |

**[9]**

**Q7.**

**2 marks for AO1 (recall)**

A **maximum of 2 marks** can be awarded.

•   a collection/group of computers;

•   connected/joined together;

**A.** references to allowing the sharing of resources if context is correct

**[2]**

**Q8.**

**9 marks for AO1 (understanding)**

|  |  |  |
| --- | --- | --- |
| **Level** | **Description** | **Marks** |
| 3 | Responses at the upper end of the level will contain a **thorough discussion** of the advantages **and** disadvantages of **both** wired and wireless networks. The security of **both** types of network are compared in detail. The response is well structured and coherent.  Responses at the lower end of the level will mostly contain **discussions**, but may also include some **thorough explanations**, of the advantages **and** disadvantages of **both** wired and wireless networks. The security of **at least one** type of network is explained in detail. The response is well structured and coherent. | 7-9 |
| 2 | Responses at the upper end of the level will contain detailed **explanations** of the advantages **and** disadvantages of **both** wired and wireless networks. The security of **at least one** type of network is **explained**. The response makes sense when read as a whole and a logical trail of thought is apparent.  Responses at the lower end of the level will mostly contain **explanations**, but may also include some **descriptions**, of the advantages **and/or** disadvantages of **both** wired and wireless networks. The security of **at least one** type of network is **described**. The response makes some sense when read as a whole. | 4-6 |
| 1 | Responses at the upper end of the level will contain **descriptions** of the advantages **and/or** disadvantages of wired **and/or** wireless networks. The security of **at least one** type of network is **described**. The response makes some sense when read as a whole.  Responses at the lower end of the level will include a few **statements** related to one or more of the required points. The response might be disjointed and without any cohesion. | 1-3 |
|  | **No creditworthy material**. | 0 |

**Indicative Content**

|  |  |  |
| --- | --- | --- |
|  | Wired Network | Wireless Network |
| Advantages | •     Connection speeds are typically faster  •     They typically have higher bandwidth  •     They typically have better security/fewer security risks | •     Typically lower setup costs  •     No wires/cables are required  •     It is easy to connect new devices  •     Users not confined to a single location // Users can connect to the network as long as they are within range  •     Can connect multiple devices without the need for extra hardware |
| Disadvantages | •     Cables can be hazardous and unsightly  •     Not all devices can connect via cable eg some tablets  •     Can be expensive to set up | •     Connection speeds can be slower  •     Connection speeds can reduce the further from the WAP you are  •     They can be subject to interference from walls, objects and other nearby electronic devices  •     They are typically less secure  •     Connections are not as stable as wired networks and can 'drop off' |
| Security | •     Typically more secure than wireless as need physical access to the network to intercept data | •     Risk of theft of bandwidth by neighbouring users within range  •     Risk of data loss/data being stolen unless encryption is used  •     Typically easier to intercept data/‘hack’ network // Wireless transmissions can be intercepted by anyone within range of the router |

**[9]**

**Q9.**

**4 marks for AO1 (understanding)**

A **maximum of 4 marks** can be awarded.

Award **1 mark** for each correct tick.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Network Protocol** | **Application layer** | **Transport layer** | **Internet layer** | **Link layer** |
| HTTP | **✓** |  |  |  |
| UDP |  | **✓** |  |  |
| IP |  |  | **✓** |  |
| IMAP | **✓** |  |  |  |

**R.** any row that contains more than one tick.

**[4]**

**Q10.**

**2 marks for AO2 (apply)**

The diagram should clearly show that:

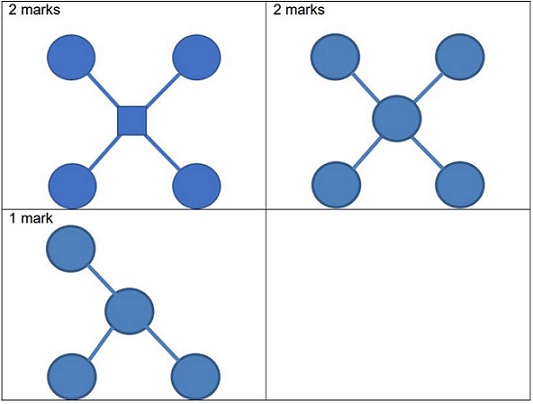
•   There are four or more computers / laptops / desktop computers in the diagram;

•   Each computer is **connected** only to a **central** hub / switch;

**I.** Other connected devices.

**I.** Representation / symbol used for computer or hub / switch.

Examples:



**[2]**

**Q11.**

**2 marks for AO2 (apply)**

The diagram should clearly show that:

•   There is a **central** bus;

•   All computers are **individually** connected to a single central bus

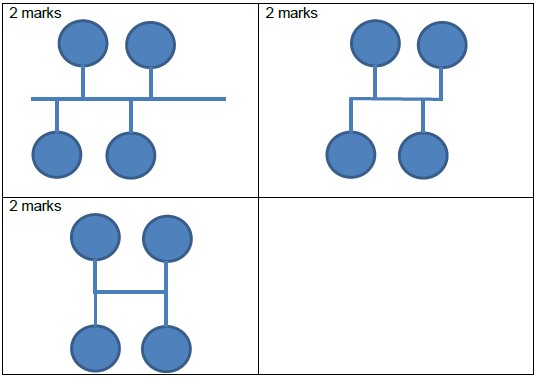
•   There are four or more computers / laptops / desktop computers

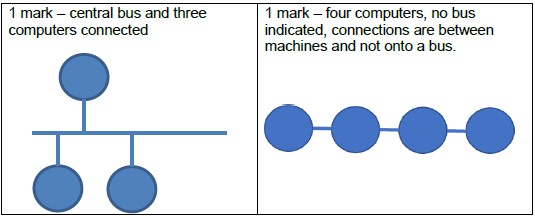
2 marks for **all three** points, 1 mark for **one or two** of the three points.

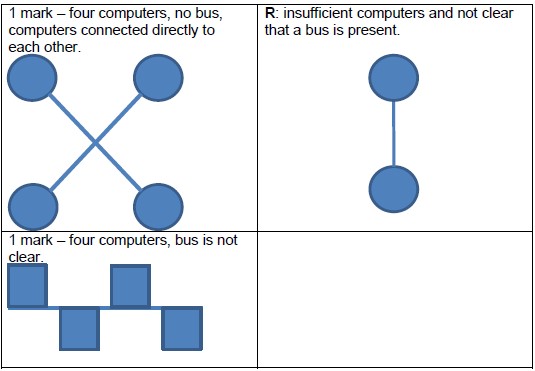
**I.** Representation / symbol used for computer

**I.** Other connected devices.

Example answers:







**[2]**

**Q12.**

**2 marks for AO1 (understanding)**

1 mark for each point to a maximum of 2 marks.

•   Less likely to experience transmission errors / data traffic problems (contention issues);

•   Faster transmission of data;

•   A faulty connection only disables one computer (unless it’s the hub / switch);

•   Fewer / no collisions (if a switch is used rather than a hub);

•   Better security (potentially as data is not broadcast to all machines if a switch is used);

**R.** Easy to connect other devices.

**[2]**

**Q13.**

**1 mark for AO1 (understanding)**

1 mark for any valid point.

•   It is more expensive to install (more cable required, more hardware needed);

•   It is harder to install (it requires more cable);

•   Switch / hub / central device may fail (breaking the entire network);

**[1]**

**Q14.**

**9 marks for AO1 (understanding)**

|  |  |  |
| --- | --- | --- |
| **Level** | **Marks** | **Description** |
| 3 | 7-9 | The student has **explained all or discussed** some risks **and** benefits of using computer networks. A clear understanding of both is shown.  Technical language is used accurately throughout the response. |
| 2 | 4-6 | The student has **described or explained** some risks **and** benefits. Some understanding is shown of both **or** a good understanding is shown of one.  Some technical language is mostly used accurately in the response. |
| 1 | 1-3 | The student has **stated or described** some risks **or** benefits. Little understanding is shown of either.  Technical language is never / rarely used and where present may lack accuracy. |
| 0 | 0 | Nothing worthy of credit. |

**Sample guidance**

**Benefits:**

•   Sharing of resources such as printers, storage space

•   Managed / central backing up of data

•   Central installation and management of software by network admin

•   Monitoring of users and network activity centrally by network admin

•   Hot desking / users can login to any machine

•   Ability to use communication tools between computers

•   Centrally managed access rights

•   Rapid data sharing

•   Allows decentralised / home working

**Risks:**

•   Security of data – requires correct settings or anyone can see restricted data

•   Spreading of malware

•   Cost of infrastructure

•   Cost of network admin required to run network

•   Dependency on network hardware

**[9]**

**Q15.**

**2 marks for AO1 (recall)**

A set of rules; that allow devices / networks to communicate / transfer data

**[2]**

**Q16.**

**2 marks for AO1 (recall)**

**C** IMAP;

**D** SMTP;

**If more than two lozenges shaded then marks are not awarded.**

**[2]**

**Q17.**

**2 marks for AO1 (understanding)**

**Max 2 marks** for one of the points below well explained **OR** two points stated from the list below.

•   It prevents unauthorised access into the network (by checking IP / MAC address / packet content);

•   It prevents unauthorised transmissions from inside the network to external locations;

•   It monitors network traffic;

•   It makes sure that only the right / authorised traffic is allowed;

•   It opens / closes ports as necessary

**R.** Prevents unauthorised users accessing network.

**R.** Prevents access to unauthorised websites.

**[2]**

**Q18.**

**2 marks for AO1 (recall)**

2 marks for **all four** correct ;;

1 mark for **any two** correct ;

|  |  |
| --- | --- |
| **Definition** | **Letter** |
| Adresses data for transmission | **C** |
| Sets up the communication between the two hosts | **B** |
| Where the network hardware is located | **D** |
| Where the user software, such as web browsers or email programs, operates | **A** |

**R.** Duplicate answers.

**[2]**

**Q19.**

**All marks AO1 (recall)**

|  |  |
| --- | --- |
| **Layer** | **Order (1 – 4)** |
| Transport | 2 |
| Link | 4 |
| Network | 3 |
| Application | 1 |

**Mark as follows:**

**1 mark:** any row correct;

**2 marks:** any two rows correct;

**3 marks:** all four rows correct;

**[3]**

**Q20.**

(a)  **All marks AO2 (apply)**

Staff could forget their password // staff can’t forget biometric measure;

Shouldering risk when staff entering their password // no risk of shouldering when using biometric data;

Lower risk of hacking;

**Max 2**

**2**

(b)  **All marks AO2 (apply)**

Network is made available to members of the public;

Won’t know the MAC addresses for (most) of the devices connecting to the network;

**2**

**[4]**

**Q21.**

**4 marks for AO1 (understanding)**

**1 mark** for each explanation point.

**Example answers**

•   A WAN is a Wide Area Network that links more than one remote geographical site / location to another;

•   A LAN is a Local Area Network that links together devices that are within one site \ location;

•   The speed of data transmission across a LAN is likely to be higher than across a WAN;

•   WANs are typically public networks (and so data encryption is likely to be used);

•   LANs (may not need data encryption) as they are typically private;

•   LANs typically carry less traffic than WANs;

•   This is because the number of users on a LAN can be controlled by the administrator whereas public WANs could have an unlimited number of users;

•   LAN Connections are generally more reliable as they are under the control and maintenance of the network administrators;

•   On a WAN it is possible that heavy traffic, peak usage times, viruses, weather or physical damage could affect the connection reliability;

•   WANs are typically under shared ownership;

•   LANs are typically owned by a single person or organisation;

•   LANs use different protocol suites (accept protocols) to WANs;

**R.** Simple expansion of acronyms.

**R.** Any reference to cost comparisons.

**R.** Reference to cable types.

**R.** WAN is a collection of LANs / LANs joined together (if only a simple statement).

**[4]**

**Q22.**

**2 marks for AO1 (understanding)**

Max 2 marks:

•   packages / unpackages data (for / after transmission);

•   adds address(es) (for transmission);

•   routes the packets (across the network);

•   provides error checking;

**R.** It provides access to the Internet

**[2]**

**Q23.**

**2 marks for AO1 (understanding)**

**1 mark** for each of the following points to a maximum of 2 marks.

•   Each device connected to the network has a (unique) reference ID / physical / physical address (called the MAC Address);

•   There is a list of allowed / denied addresses;

•   The network device / router looks at the address of the device trying to connect (and blocks / allows appropriately);

**[2]**

**Q24.**

**9 marks for AO1 (knowledge and understanding)**

Award up to **three marks for each measure**. Of these:

•        Award up to two marks for an outline (one per point)

•        Award one mark for an example of a threat that it would be effective against.

The table below lists common examples but is not exhaustive; alternative valid responses should also be credited.

|  |  |
| --- | --- |
| Virus Checker | **Outline:** Scans files to look for malicious code Needs to be updated regularly with latest virus definitions Can quarantine / delete malware/suspicious files **Effective against:** Malware (accept examples) |
| Firewall | **Outline:** Analyses/scans network traffic Can block traffic from suspicious hosts/ computers/addresses/ports **Effective against:** Hackers Transmission of malware |
| Login system / Authentication / Password / Biometric | **Outline:** User has to enter username and password Can be authenticated by other methods such as biometric (accept examples) Login details matched to a database of users **Effective against:** Hackers Unauthorised access |
| MAC address filtering | **Outline:** Each hardware device has unique hardware address A database of allowed hardware/MAC addresses is kept/whitelist To connect to a network a device must have an address on the database/whitelist **Effective against:** Unauthorised devices |
| Encryption | **Outline:** Data is stored/transmitted as ciphertext (**A.** in coded form) Only people who know the encryption method/key can decrypt/read the data **Effective against:** Data theft |
| Prevention of use external storage devices / USB ports | **Outline:** Ports on a computer are disabled Storage devices connected to them cannot be accessed // flash drives cannot be used **Effective against:** Putting malware onto a computer Theft of data |
| Access rights | **Outline:** Users are associated with certain privileges These might control files that can be accessed/run // level of internet access // ability to create/delete files // ability to change settings **Effective against:** Hackers  Theft of data Authorised users doing unauthorised things |
| CAPTCHA | **Outline:** Users have to type in some distorted text // recognise images for a set of images Humans can do this but it is a difficult task for computer programs / bots  **Effective against:** Automated hacking programs Bots |
| Automatic software updates | **Outline:** Operating system / software configured to download updates from the internet Hackers look for security vulnerabilities in software Updates can patch security vulnerabilities **Effective against:** Hackers Malware |

**[9]**

**Q25.**

**All marks AO1 (understanding)**

**Reasons for allowing:**

Teachers can access resources on the school network to allow them to plan lessons at home;

Teachers can teach lessons from home (using videoconferencing) if they are not able to get into work (eg travel difficulties);

Teachers can access electronic copies of student work so that they do not have to carry marking home;

**Reasons for not allowing:**

Data protection issues – schools may not want potentially sensitive student information to be accessed outside of school;

To try to help teachers have a work-life balance;

Increased security risks as teachers may not have fully-protected computers at home (eg if a teacher does not have anti-virus software on their home computer this may cause problems when they connect their computer to the school network);

**Max 1 mark:** if only described reasons for allowing access

**Max 1 mark:** if only described reasons for not allowing access

**[2]**