1	**1**	**Marks are for AO1 (understanding)** **Physical**: The (physical) layout/arrangement/architecture of the cabling/wiring/connections (between the devices/computers on the network); **A**. The (physical) layout/arrangement/architecture of the devices/computers/network **NE.** How the devices/computers are connected to each other **NE.** "Setup" for layout **NE.** List of topologies eg bus, star **Logical**: How the data/packets flow around a network // architecture of the communication mechanism in a network; **A.** Conceptual way that data moves around a network **A.** The type of protocol used (must be related to logical topology) **NE.** How a network operates/behaves	**2**
1	**2**	**Marks are for AO1 (understanding)** Every device is (directly) connected to a central node/switch/hub; Every device sends data via the central node/switch/hub; The switch sends packets of data to the intended recipient only // The hub sends every packet of data to every device; **R.** Computer **Max 2**	**2**

2	1	**Mark are for AO1 (understanding)** A peer-to-peer network does not need a central server; A peer-to-peer network will be cheaper / easier to set up / maintain; The students are unlikely to need the extra security provided by a client-server network; The students are unlikely to need the extra services provided by a client-server network; **Max 2**	2

2	2	**Marks are for AO1 (understanding)** WPA/WPA2 encrypted data (significantly) reduces the chance of unauthorised devices reading transmitted data; SSID Broadcast disabled makes it harder for people that don't know the SSID to join the network // SSID Broadcast disabled means the network (SSID) won't show up in a search; MAC address whitelisting means only approved devices can join the network;	3
2	3	**Marks are for AO1 (understanding)** **CSMA/CA and RTS/CTS** • Transmitting device checks for traffic; • If (data) signal present/another transmission is in progress, then the transmitter continues to wait; • If the channel is detected as idle, the transmitter would send a request to send (RTS); • Receiver/WAP (**A.** router **R.** server) responds (to RTS) with a Clear to Send (CTS) signal • If CTS is not received, the transmitter would wait a random amount of time/until the end of the transmission before resending the RTS; • When CTS is received, the transmitter begins transmitting data; • Receiver sends acknowledgement (ACK) (if all data is received); • If no ACK received then data is resent; **Max 6** for CSMA/CA and RTS/CTS **Majority Voting** • The transmitter would send each bit / byte / bit pattern (**R**. data) an odd number of times (greater than 2); **A.** multiple times / specified odd number greater than 2 • The receiver checks the bits / byte / bit pattern received and if they are not all the same it assumes the one it received the most copies of is the correct value; **R.** Receiver knows the data is correct **Max 2** for majority voting **Max 8** in total	8

3	1	**3 marks are for AO1 (understanding)** A node broadcasts data (to the entire network); All/Any nodes on the network receive/read the data; A node examines the received data to check if it is the intended recipient; Only one node can (successfully) transmit data at a time // Nodes use a shared transmission medium; **Max 3** **If students write a detailed description covering CSMA/CD (not required for the specification) then award marks as follows:** Computer monitors/listens to (data signal on cable/bus); If (data) signal present // if cable/bus busy continue to wait; When no (data) signal present // when cable/bus idle start to transmit; Whilst transmitting, computer monitors cable/bus to check for collision // to check if signal is identical to what it is sending; Collision occurs if two computers (start) sending at same time // if two packets/frames in transit at same time; If collision detected, jamming signal/signal warning of collision sent; To ensure other (transmitting) computers aware of problem // to stop other computers sending data; Computer that detected collision also stops sending data; Then waits a random period before attempting to retransmit/repeating transmission/this process again; Period is random to reduce likelihood of collision recurring (between computers that caused collision); If a collision occurs again then waits a longer random time before attempting to transmit again; Use of exponential back-off algorithm to determine wait time; **Max 3**	3

Qu	Pt	Marking Guidance	Marks
4	1	**Marks are for AO1 (understanding)** Use a bus transmission protocol; **A.** examples of bus protocols eg CSMA/CD. Use appropriate (physical) switching // (switch) creates temporary buses between two nodes; **A.** hub transmits data to all devices	2

Qu	Pt	Marking Guidance	Marks
5	1	**Marks are for AO1 (knowledge) and AO1 (understanding)** **AO1 (knowledge) – 1 mark:** An SSID is a (locally unique) identifier (**A**. name) for a wireless network; **AO1 (understanding) – 1 mark:** Makes it harder for (**A.** prevents) a client joining the wireless network unless they know the SSID;	2

Qu	Pt	Marking Guidance	Marks
5	2	**Marks are for AO1 (knowledge) and AO1 (understanding)** **AO1 (knowledge) – 1 mark:** (Strong) encryption used to secure wireless networks // to encrypt data that is being transmitted // to make the communications link more secure; **AO1 (understanding) – 1 mark:** (Significantly) reduces the probability that (**A.** prevents) an unauthorised device/person will be able to interpret/comprehend (**A.** read) data that is transmitted across the network; **NE**. Stops the data being read.	2

Qu	Pt	Marking Guidance	Marks
5	3	**Marks are for AO2 (analyse)** The coffee shop wants to let everyone (except specific people/devices) access the network // open access in a public space; Maintaining the list would be time consuming for staff // would be expensive/resource-intensive for the coffee shop // Every device would need to be manually added to the list of known/accepted/registered devices; Maintaining the list would require staff to have technical knowledge // costly to train staff or employ a specialist; A customer with multiple devices could be frustrated / inconvenienced having to whitelist multiple times; **A.** customer concern about what their MAC address would be used for. **MAX 2**	2

Qu	Pt	Marking Guidance	Marks
6	1	**Marks are for AO1 (Understanding)** Every device is (directly) connected to a central switch; **A.** hub Every device sends data via the central switch; **A.** hub The switch sends packets of data to the intended recipient only // The hub sends every packet of data to every device; **DPT**. Server/router instead of switch. **MAX 2**	2

Qu	Pt	Marking Guidance	Marks
6	2	**Marks are for AO1 (Knowledge)** Clients request services from a server; **A.** Direct communication with server provided client initiates. The server responds to client requests (by providing resources/services); Resources are stored on the server; **MAX 2**	2

Qu	Pt	Marking Guidance	Marks
7	1	**Marks are for AO1 (knowledge)** Bit rate is the number of bits transmitted per second; Baud rate is the number of times that a signal can change per second (on a medium);	2

Qu	Pt	Marking Guidance	Marks
7	2	**Marks are for AO1 (understanding)** Each user has equal status // each user can use and provide file sharing services // users can individually control who can access their photographs // users manage their own security; Easier / less expensive to setup/maintain (than a centralised server); Provides scalability without the need for a high-performance server/hardware; No reliance on central server // (some of the) service remains available if one peer fails; **Max 2**	2

Qu	Pt	Marking Guidance	Marks
7	3	**Mark is for AO1 (understanding)** (A locally unique) identifier (**A.** name) given to a wireless network // (SSID) allows a user/device to identify/connect to (**A.** join) network); **N.E**. To find the network without reference to identifier or connection.	1

Qu	Pt	Marking Guidance	Marks
7	4	**Marks are for AO1 (understanding)** The SSID/Service Set Identifier of the network will not be visible when trying to connect to a network; Only users who know the SSID of the network can connect // users who do not know the SSID cannot connect // makes it harder for a (malicious) user to connect unless they know the SSID; **A**. name for SSID	2