4(a)	**One** mark for a benefit of circuit switching (**Max 1**) MP1 Once the connection is made, it is available until the end of the transmission (suitable for long continuous transmission) MP2 The dedicated path ensures a steady rate of data transmission, once connection has been made (because the whole bandwidth is available) MP3 The dedicated path ensures data is less likely to be lost. MP4 No intermediate delays once the circuit is established, enables real time transmission MP5 No additional time/delay to reorder needed because data arrives in the order it was sent / data sent as a continuous stream **One** mark for a benefit of packet switching (**Max 1**) MP6 No need to tie up a communication line // path available to multiple users // bandwidth can be shared by multiple users MP7 Possible to overcome failed / faulty / busy lines by re-routing packets MP8 Individual packets can be resent if lost/damaged MP9 Users only charged for the duration of connectivity MP10 High rate of data transmission possible MP11 Always uses digital networks so data is transmitted directly to the destination MP12 Good security because all packets can take different routes // A more secure method because all packets can take different routes
4(b)	**One** mark per difference (**Max 2**) MP1 Circuit switching requires a dedicated line to be connected before the data transfer takes place, in packet switching, data transfer commences directly/ straight away MP2 In circuit switching, each data unit knows the entire path address, but in packet switching, each data unit only knows the final address (routers decide intermediate paths) MP3 Circuit switching uses the whole bandwidth of the transmission path, but packet switching shares it with other users // circuit switching uses a constant high bandwidth. Packet switching has variable bandwidth MP4 In circuit switching each data unit follows the same route, but in packet switching, packets can follow any route MP5 In circuit switching data arrives in the correct order but in packet switching it has to be reordered MP6 Data remains intact / a continuous stream in circuit switching but is segmented in packet switching MP7 Lost data in circuit switching requires the **whole transmission to be resent**, but **individual packets can be resent** in packet switching MP8 Circuit switching doesn't suffer data loss but packets can be lost in packet switching.

3	**One** mark per mark point (**Max 4**) MP1 the message is divided into small chunks called packets MP2 each **packet** is given a header with important data including source and destination IP addresses MP3 each **packet** is sent independently // **packets** can be sent through different routes MP4 **packets** are sent through the optimum route // **packets** can be re-routed if a route is unavailable MP5 **packets** are reassembled at the destination into the whole message

4	**One** mark for each benefit (**Max 2**) MP1 Suitable for long continuous transmission once the connection is made, it is available until the end of the transmission MP2 No time lost in resending/rearranging packets as no loss of packets or out of order packets MP3 Steady/high rate of transmission because the whole of the bandwidth is available MP4 Data loss unlikely as all data follows the same path **One** mark for each drawback (**Max 2**) MP5 Delays due to dedicated connection required to be set up/established before transmission can begin MP6 The dedicated connection cannot be used to transmit any other data MP7 System resources may be underutilised/inefficient/not very flexible because the bandwidth can't be shared/high bandwidth is required // Bandwidth may be wasted // May send empty frames // the circuit is always there whether or not used MP8 There are no alternative routes if there is a failure or fault on the line MP9 Reduced security due to use of single path MP10 Scalability is difficult

3(a)	**One** mark per mark point (**Max 3**) MP1 A dedicated circuit / channel is required MP2 The circuit is established before the transmission begins MP3 The circuit lasts for the whole of the transmission // The circuit is closed at the end of the transmission MP4 Data travels in a continuous stream along the same route MP5 Transmission is usually bidirectional.
3(b)	**One** mark for a benefit (**Max 1**) MP1 No need for data to be reassembled // data / frames arrive in the same order in which they were sent MP2 Suitable for real time transmission // fast data transfer rate MP3 The whole of the bandwidth is available **One** mark for a drawback (**Max 1**) MP4 No other transmission can use the same circuit when it is in use // Bandwidth can be wasted as it cannot be used by other messages MP5 Not secure // Can be intercepted as all data travelling along the same route MP6 If there is a problem with the route the transmission ends // No other route is available without first doing the setup MP7 The circuit is always there whether or not it's being used MP8 Can take time to set up before transmission starts.

1(a)	**One** mark per mark point (**Max 3**) MP1 The data to be transmitted is divided into equal sized packets MP2 A packet header is attached to each packet containing key information MP3 … such as source/destination IP addresses, packet number, etc MP4 Packets are transmitted independently MP5 … and may travel though different routes/paths to the destination MP6 Routes are determined using a routing table//Packets take the optimum route depending on congestion MP7 The packets usually arrive out of order MP8 The packets are reassembled in the correct order at the destination // The packets are re-ordered using the sequence number/the header MP9 If packets are missing/corrupted a re-transmission request is sent / packets are re-sent.
1(b)	**One** mark for each benefit (**Max 2**) MP1 Packets are more likely to arrive because they can be re-routed if a problem occurs with one of the routes//Packets are more likely to arrive because if a packet is lost, it can be re-transmitted MP2 Bandwidth can be shared allowing packets from different messages to share the same path MP3 Considered secure as the packets generally travel via different routes MP4 High data transmission rate is possible **One** mark for each drawback (**Max 2**) MP5 Time delay because packets need to be re-ordered/reassembled at the destination//Time delay caused by missing packets needing to be re-sent//Time delay because it has to share the bandwidth of the circuit / channel with other packets MP6 Requires a complex algorithm to function MP7 Needs lots of RAM to handle large amounts of data.

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3(b)	**One** mark for a benefit (**Max 1**) MP1 No need for data to be reassembled // data / frames arrive in the same order in which they were sent MP2 Suitable for real time transmission // fast data transfer rate MP3 The whole of the bandwidth is available **One** mark for a drawback (**Max 1**) MP4 No other transmission can use the same circuit when it is in use // Bandwidth can be wasted as it cannot be used by other messages MP5 Not secure // Can be intercepted as all data travelling along the same route MP6 If there is a problem with the route the transmission ends // No other route is available without first doing the setup MP7 The circuit is always there whether or not it's being used MP8 Can take time to set up before transmission starts.