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AQA

LEVEL 3 TECHNICAL LEVEL
IT: Cyber Security
IT: Networking
IT: User Support

H/507/6426 – Unit 2 Communication Technologies

Mark scheme

June 2018

Version/Stage: 1.0 Final

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Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

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Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

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Question	Guidance	Mark
01	C	1
02	B	1
03	D	1
04	A	1
05	C	1

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Question	Guidance	Mark
06	**There are advantages to having the workstations in a small office supported as a network rather than having stand-alone PCs.** **List two potential disadvantages such a network could introduce.** **1 mark** (max **2 marks**) for each disadvantage, eg: • (all networked) workstations affecting by hacking / disruption • potential total loss of data / service if server unavailable • total loss of office (IT) function if server unavailable • consequent loss of reputation / commercial damage. **DNA: increased cost of managing / maintaining** **DNA: initial setup costs**	**2**
		Total 2 Marks

07.1	**The TCP/IP model is named because of the two protocols in the suite.** **State the full names of these two protocols.** **1 mark** (max **2 marks**) for: • Transmission Control Protocol • Internet Protocol.	**2**
07.2	**Some layers of the TCP/IP model correspond to more than one layer of the 7-layer OSI conceptual model.** **The application layer of the OSI model is one of the layers that correspond with the application layer of the TCP/IP model.** **List the other two layers of the OSI model that correspond with the application layer of the TCP/IP model.** **1 mark** (max **2 marks**) for: • presentation (layer) • session (layer).	**2**
07.3	**Name the only other layer of the TCP/IP model that corresponds to more than one layer of the OSI model.** **1 mark** for: • network interface (layer). **ACCEPT 'Network' only**	**1**
		Total 5 marks

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<table>
<tr><th>Question</th><th>Guidance</th><th>Mark</th></tr>
<tr><td>08</td><td>In Table 1, list the layers of the OSI model that match the descriptions.

1 mark for each layer listed correctly (max 4 marks):
<table><tr><th>OSI LAYER</th><th>DESCRIPTION</th></tr><tr><td>Transport</td><td>defines reliable/unreliable delivery</td></tr><tr><td>Network</td><td>addresses logically</td></tr><tr><td>Datalink</td><td>changes packets of data into frames</td></tr><tr><td>Physical</td><td>moves bits between devices,</td></tr></table></td><td>4</td></tr>
<tr><td colspan="3">Total 4 marks</td></tr>
<tr><td>09</td><td>An Internet-enabled office consists of the following:

• router
• modem
• internet
• laptop.

In the space provided, draw a network diagram.

1 mark (max 2 marks) for each of the following:
• laptop does NOT link directly to internet
• internet DOES link directly to router
• modem and/or router between laptop and internet.</td><td>2</td></tr>
<tr><td colspan="3">Total 2 marks</td></tr>
</table>

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Question	Guidance	Mark
10.1	**State another term for wired media and for wireless media.** **1 mark** (max **2 marks**) for: • wired: guided / bound / physical • wireless: unguided / unbound.	**2**
10.2	**In twisted pair cable, what benefit does the twisting produce?** **1 mark** for: • reduces interference. **ACCEPT noise reduction / reduces noise**	**1**
10.3	**Twisted pair cable is available in two formats.** **What is the advantage of shielded twisted pair cable compared with unshielded twisted pair cable?** **1 mark** for: • less affected by electromagnetic interference (ACCEPT EMI). **ACCEPT noise reduction / reduces noise** **DNA: "no" interference**	**1**
		Total 4 marks

11	**Data converted into a form suitable for transmission is called a signal.** **There are two types of signal, analogue and digital.** **Using suitable examples, define each signal.** **1 mark** (max **2 marks**) for an acceptable definition, eg: • analogue definition includes **continuous** wave, an infinite number of values **ACCEPT waveform / sound wave / frequency wave / "wave" only** • digital definition may make reference to **discrete** points, ACCEPT specific points, limited, defined, also accept reference to 1 and 0. **ACCEPT binary (signal) / on-off / (electrical) impulse / pulses** **1 mark** (max **2 marks**) for an acceptable example, eg: • analogue, eg human voice, **vinyl record** • digital, eg computer memory.	**4**
		Total 4 marks

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<table>
<tr><th>Question</th><th>Guidance</th><th>Mark</th></tr>
<tr><td>12</td><td>Data transmitted across a network is split into separate units.

A Protocol Data Unit (PDU) is a specific block of data transferred over a network.

Complete Table 2 with the PDU at each layer of the OSI model.

1 mark (max 3 marks) for any PDU listed below,
1 mark (max 3 marks) if identified against the correct OSI layer:

<table><tr><th>PDU</th><th>OSI LAYER</th></tr><tr><td>Bit (accept 1s, 0s)</td><td>Physical</td></tr><tr><td>Frame</td><td>Datalink</td></tr><tr><td>Packet</td><td>Network</td></tr></table></td><td>6</td></tr>
<tr><td colspan="3">Total 6 marks</td></tr>
</table>

<table>
<tr><td>13</td><td>Packets of data are sent over the internet with additional information, including the destination address. Packets of data are re-assembled on arrival using the package sequence number.

Explain how a checksum identifies packet transmission errors.

1 mark (max 3 marks) for each point or expansion point, eg:
• adds together the value of all the data BEFORE transmission/uses an algorithm to calculate the value of all the data BEFORE transmission
• adds together the value of all the data on arrival/uses an algorithm to calculate the value of all the data on arrival
• the two values are compared
• if the same, likelihood is the packet has been sent correctly
• if checksum is different, packet is re-sent/has not been transmitted correctly.</td><td>3</td></tr>
<tr><td colspan="3">Total 3 marks</td></tr>
</table>

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Question	Guidance	Mark
14.1	**Where would you expect to find the IMEI number?** **1 mark** (max **1 mark**) for a location, eg: • on a silver sticker behind/beneath the battery • on the original box • by typing *#06# using the keypad • in Settings > About Device > Status • Android Device Manager. **ACCEPT "Settings" only**	**1**
14.2	**Explain the purpose of the IMEI when the phone is in everyday use.** **1 mark** (max **2 marks**) for each point or expansion point, eg: • to identify the mobile device • (used by the GSM network) to identify valid/non-blocked devices.	**2**
14.3	**The purchaser is told to keep a record of their phone's IMEI number.** **Explain how and when having the IMEI number might be essential.** **1 mark** (max **3 marks**) for each point or expansion point, eg: • to help locate the phone if lost or stolen • to prevent / discourage theft • the provider can block/lock/cancel the mobile device (if reported lost/stolen) • to stop a lost or stolen phone from accessing the network • other Networks can subsequently block/lock/cancel the mobile device • to unlock a device when moving to another provider.	**3**
		Total 6 marks

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Question	Guidance	Mark
15.1	**Name the two topologies described above.** **1 mark** (max **2 marks**) for each topology, ie (in any order): • STAR • BUS.	**2**
15.2	**Describe the layout and some of the key features associated with each of the two topologies named in Question 15.1.** **You may wish to use diagrams in your answer.** **1 mark** (max **2 marks**) for each point or expansion point, eg: STAR* topology: • each client has (its own) dedicated cable • it is more likely a switch will connect to one of the ports • in reality, there will be additional switches and routers • software can be installed centrally on the server • software thereby upgraded and maintained on the server • software can be held locally by the client • server will have OS controlling user / admin access (to peripherals). **1 mark** (max **2 marks**) for each point or expansion point, eg: BUS* topology: • uses one main backbone (data cable) to transmit data • main cable carries data between server and clients • all data passes down this one main backbone (cable) • each client branches off main bus cable • can be enhanced by using Ethernet cards / Ethernet network system • **as traffic increases, collisions increase, network slows down** *** NOTE:** if incorrect topology identified in **15.1**, credit marks as appropriate for response in **15.2** and do not penalise further. **<u>CHECK DIAGRAM/S</u> and award marks as appropriate if full marks not awarded from narrative content**	**4**
		Total 6 marks
16	**Explain what characteristics you would expect a NIC to have.** **1 mark** (max **3 marks**) for each point or expansion point, eg: • specifically designed to **connect** by **cable** or **wirelessly to a network** • the (type of) card determines the **speed** of **data transmitted.** **ALLOW mark/s as appropriate for expansion point/s and / or example/s** **DNA: ethernet port (example)**	**3**
		Total 3 marks

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<table>
<tr><th>Question</th><th>Guidance</th><th>Mark</th></tr>
<tr><td>17.1</td><td>List three advantages of using licensed data communication.

1 mark (max 3 marks) for each point, eg:
• no interference
• higher powered transceivers/higher performance/greater distances between repeaters
• (lots of) proven equipment
• wider bandwidth (products available)
• aid to guarantee/support/promote SLA
• reduced latency times
• more efficient data transfers.</td><td>3</td></tr>
<tr><td>17.2</td><td>"Interference is always going to affect unlicensed technologies."

Discuss this statement using examples of interference in the home or in the workplace.

Mark using the indicative content and the levels of response table.

Indicative content:
• with licensing, wireless operators do not interfere with each other's transmissions.
• with licensing, interference only occurs at the edge of the license-holder's assigned coverage area.
• licensing impractical for, say, interaction between a wireless keyboard and PC, hence these wireless technologies transmit in unlicensed frequency bands
• no home/domestic/work setting/anywhere not free of sources of interference as any device can operate in the unlicensed band
• interference results in the home from commonplace items, eg microwaves, Christmas lights, speakers, controllers, music players, Bluetooth, fluorescent lighting.

<table>
<tr><th>Level</th><th>Descriptor</th><th>Marks</th></tr>
<tr><td>3</td><td>Discussion developed, some detail, expanded with appropriate examples.</td><td>9-12</td></tr>
<tr><td>2</td><td>Some discussion: valid statements made in context</td><td>5-8</td></tr>
<tr><td>1</td><td>Little discussion/comparison: valid statements made in isolation.</td><td>1-4</td></tr>
<tr><td></td><td>No creditworthy response.</td><td>0</td></tr>
</table>
</td><td>12</td></tr>
<tr><td colspan="3">Total 15 marks</td></tr>
</table>

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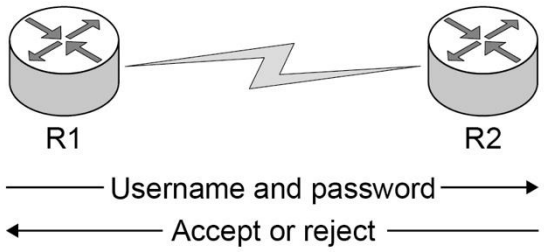
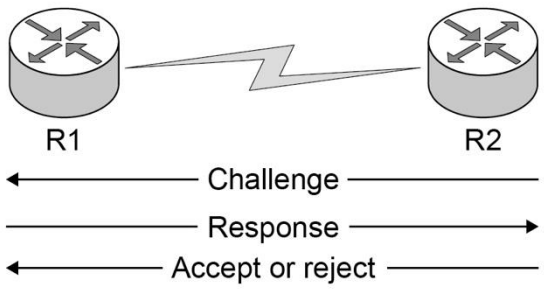
Question	Guidance	Mark
18	**"Point-to-Point Protocol (PPP) enables communication between two points. PPP supports both synchronous and asynchronous connections. It can also provide on-demand authentication using, for example, the Password Authentication Protocol (PAP) or Challenge Handshake Authentication Protocol (CHAP)."** **Explain your understanding of each feature of this statement using real-world examples.** **You may make use of diagrams to show your understanding of the on-demand authentication protocols, specifically the 2-way handshake and the 3-way handshake.** Mark using the indicative content and the levels of response table on the next page. **Indicative content:** **PAP 2-way handshake**  **CHAP 3-way handshake**  	**15**

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Question 18, cont.

Level 1	Level 2	Level 3
1 – 5 marks	**6 – 10 marks**	**11 – 15 marks**
a direct connection between two routers ACCEPT direct connection between two nodes	a point-to-point network contains only two routers packets sent from one router are received only by the other router a Point-to-Point Protocol (PPP) is a data link layer (layer 2) protocol	a serial link is a typical example of a point-to-point link the data link layer itself is split into two elements: Link Control Protocol (LCP) Network Control Protocol (NCP) LCP sets up the link and authentication NCP allows different protocols to run over the link.
Synchronous and asynchronous transmissions are two different methods of transmission **synchronisation**	synchronous transmissions are **synchronised by an external clock/**synchronous full duplex/**complex, expensive** asynchronous transmissions are synchronised by **special signals along the transmission medium**/ asynchronous half duplex/ **slower, simple, economical**	synchronous **frames** asynchronous **one bit** at a time/**parity bit** indicates start of next byte
PAP is a **two-way** process or **Handshake** **username and password check**	**no encryption**	PAP used when CHAP not supported **shared secret encrypts**
CHAP uses a **three-way** exchange or **Handshake**	**CHAP is the preferred PPP authentication method** includes a "**shared secret**" CHAP **authenticates in one direction**	CHAP can have multiple secrets CHAP **can authenticate in both directions**/using **two 3-way handshakes**
0 marks for no creditworthy response.		

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Assessment Objectives						
Question	**AO1**	**AO2**	**AO3**	**AO4**	**AO5**	**Question Total**
Section A						
1		2c (1)				1
2					5c (1)	1
3		2b (1)				1
4	1d (1)					1
5	1b (1)					1
6				4c (2)		2
7.1					5a (2)	2
7.2					5b (2)	2
7.3					5b (1)	1
8					5c (4)	4
9				4b (2)		2
10.1		2b (2)				2
10.2		2b (1)				1
10.3		2b (1)				1
11	1a (4)					4
12	1b (6)					6
13	1c (3)					3
14.1			3a (1)			1
14.2			3a (2)			2
14.3			3a (3)			3
15.1				4a (2)		2
15.2				4a (4)		4
16					5c (3)	3
Section B						
17.1			3d (3)			3
17.2			3d (12)			12
18		2a (15)				15
Total	**15**	**21**	**21**	**10**	**13**	**80**