NAME DATE STARTED TARGET END DATE

GCE AS LEVEL — COMPUTER SCIENCE UNIT 1 QUESTION PACK

2500U10-1 · 2015 spec Unit 1 Topic 4 · AS unit, first sat 2017, 100 marks, 2h paper

REVISE.wales

COMPUTER SCIENCE — UNIT 1 · Networking & the Internet

Topic 1.7 — Network protocols, packets, transmission methods and standards

TCP/IP packet structure, common protocols (DHCP, SMTP, HTTP, UDP), multiplexing, simplex/half-duplex/full-duplex transmission, handshaking and the importance of networking standards.

2015 specification · current

Estimated time for entire question pack: ~1 h 14 min

Derived from the Unit 1 pace of ~1.2 min/mark, padded for written-prose answers (49 marks over 7 questions).

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **comprehensive topic question pack**, not a single mock paper. It contains every question from the WJEC AS Unit 1 papers (Summer 2017 – Summer 2024, COVID gap) that maps onto Topic 1.7 of the 2015 specification.

Questions are ordered by source paper date.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working. A calculator is allowed where useful.

For Examiner's use only

Q	Source	Max	Mark
1	S17 Q3	10	
2	S18 Q2	3	
3	S19 Q1	4	
4	S22 Q3	8	

Q	Source	Max	Mark
5	S23 Q5	10	
6	S23 Q6	6	
7	S24 Q2	8	
Total		**49**	

Networking & the Internet — what the spec asks

WJEC GCE AS Computer Science (from 2015) · Unit 1: Fundamentals of Computer Science · Topic 1.7.

TCP/IP packet structure

- Header: source IP, destination IP, sequence number, checksum, TTL.
- Payload: chunk of application data (up to ~1500 bytes typically).
- Trailer: error-check bits.
- Packets routed independently; reassembled at destination using sequence numbers.

Common protocols

- HTTP / HTTPS: web pages (HTTPS adds TLS encryption).
- SMTP: send email; POP3 / IMAP: retrieve email.
- FTP: file transfer; SSH: secure remote login.
- DHCP: assign IP addresses automatically; DNS: domain → IP lookup.

UDP vs TCP

- TCP: connection-oriented, reliable, retransmits lost packets, ordered.
- UDP: connectionless, unreliable, no retransmission, lower overhead.
- UDP used for streaming media, VoIP, online gaming (latency > reliability).
- TCP used for web, email, file transfer (data integrity matters).

Transmission methods

- Simplex: data one way only (e.g. radio broadcast).
- Half-duplex: both directions but not simultaneously (e.g. walkie-talkie).
- Full-duplex: both directions simultaneously (e.g. phone call, modern Ethernet).
- Serial vs parallel; synchronous vs asynchronous transmission.

Networking standards & handshaking

- Standards (IEEE 802.x, TCP/IP suite) ensure interoperability between vendors.
- Without standards, devices from different manufacturers couldn't communicate.
- Handshaking: initial exchange to agree on speed, parity, encoding, encryption.
- Three-way TCP handshake: SYN → SYN-ACK → ACK.

Multiplexing

- Combines multiple signals over a single channel to improve bandwidth use.
- TDM (Time Division Multiplexing): each signal gets a time slot.
- FDM (Frequency Division Multiplexing): each signal on a different frequency.
- Statistical multiplexing dynamically allocates capacity by demand.

Crib sheet »

Networking & the Internet in one page

Quick-reference notes — revisit before each question.

TCP/IP packet

Header (src/dst IP, seq#, checksum, TTL) + payload + trailer.
Routed independently, reassembled by sequence number.

Common port-protocol map

80 HTTP, 443 HTTPS, 25 SMTP, 110 POP3, 143 IMAP, 21 FTP, 22 SSH, 53 DNS, 67/68 DHCP.

TCP vs UDP

TCP: reliable, ordered, slower — web, email, files.
UDP: fast, unreliable — streaming, VoIP, games.

Three-way handshake

SYN → SYN-ACK → ACK.
Establishes TCP connection; agrees initial sequence numbers.

Duplex modes

Simplex: one-way (broadcast).
Half-duplex: alternating (walkie-talkie).
Full-duplex: both ways simultaneously (phone, modern Ethernet).

Why standards matter

Vendor interoperability.
Predictable behaviour.
Layered design lets innovation happen at one layer without breaking others.

Examiner only

3. *(a)* State what is meant by a protocol. [1]

(b) Name the most appropriate protocols for each of the following:

(i) Obtaining an IP address from a server. [1]

(ii) Sending an email from one server to another. [1]

(iii) The basic communication protocol used on the Internet. [1]

(c) State the role of handshaking. [1]

(d) Data is sometimes detected simultaneously on a bus network. State the name given to this problem and describe how the network deals with it. [2]

(e) Describe how traffic is routed on a packet switched network. [3]

Examiner only

Answer **all** *questions.*

1. Complete the following truth table. [4]

A	B	C	A OR C	B AND C	(A OR C) XOR (B AND C)	NOT ((A OR C) XOR (B AND C))
0	0	0				
0	1	0				
1	0	0				
1	1	0				
0	0	1				
0	1	1				
1	0	1				
1	1	1				

2. State the use of the following network protocols:

(a) DHCP [1]

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(b) SMTP [1]

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(c) HTTP [1]

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Examiner only

Answer **all** *questions.*

1. *(a)* Define the term *Internet*. [1]

(b) Describe the use of the following networking protocols:

(i) Universal Datagram Protocol (UDP). [1]

(ii) Dynamic Host Configuration Protocol (DHCP). [1]

(iii) Simple Mail Transfer Protocol (SMTP). [1]

Examiner only

3. (a) Explain the role of multiplexing on a network. [2]

(b) Describe the contents of a typical TCP/IP data packet. [6]

Examiner only

5. (a) State what is meant by the term handshaking. [1]

(b) Explain the importance of having networking standards. [3]

Examiner only

(c) Name **two** standard networking protocols and describe their function and importance. [6]

Protocol 1

Protocol 2

Examiner only

6. Describe simplex, half duplex and full duplex data transmission methods and give an example use for each. [6]

Simplex

Half duplex

Full duplex

Examiner only

2. (a) Describe the typical contents of a TCP/IP packet. [5]

(b) Explain network collisions, how they are detected, and dealt with. [3]

END OF QUESTION PACK

7 questions · 49 marks · ~1 h 14 min
Source: WJEC AS Computer Science Unit 1 (2500U10-1), Summer 2017–2024, COVID gap
Curated for WJEC Computer Science 2015 spec AS Unit 1 — Topic 4 (1.7)