



Shenfield High School **COMPUTER SCIENCE** OCR GCSE

J277/01: Computer systems

1.1 Systems architecture

1.2 Memory and storage

1.3 Computer networks, connections and protocols

1.4 Network security

1.5 Systems software

1.6 Ethical, legal, cultural and environmental impacts of digital technology

Specification

<https://www.ocr.org.uk/Images/558027-specification-gcse-computer-science-j277.pdf>

BBC resource

<https://www.bbc.co.uk/bitesize/examspecs/zmtchbk>

1.1 Systems architecture

**Basic
K&U**

**General
K&U**

**Thorough
K&U**

**Exam
ready**

1.1.1
Architecture
of the CPU

The purpose of the CPU:

- The fetch-execute cycle

Common CPU components and their function:

- ALU (Arithmetic Logic Unit)
- CU (Control Unit)
- Cache
- Registers

Von Neumann architecture:

- MAR (Memory Address Register)
- MDR (Memory Data Register)
- Program Counter
- Accumulator

1.1.2
CPU
performance

How common characteristics of CPUs affect their performance:

- Clock speed
- Cache size
- Number of cores

1.1.3
Embedded
systems

The purpose and characteristics of embedded systems

Examples of embedded systems



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1.2 Memory and storage		Basic K&U	General K&U	Thorough K&U	Exam ready
1.2.1 Primary storage (memory)	The need for primary storage				
	The difference between RAM and ROM				
	The purpose of ROM in a computer system				
	The purpose of RAM in a computer system				
	Virtual memory				
	Cache				
1.2.2 Secondary storage	The need for secondary storage				
	Common types of storage:				
	• Optical				
	• Magnetic				
	• Solid state				
	Suitable storage devices and storage media for a given application				
	The advantages and disadvantages of different storage devices and storage media relating to:				
	• Capacity				
	• Speed				
• Portability					
• Durability					
• Reliability					
• Cost					

1.2 Memory and storage (continued)		Basic K&U	General K&U	Thorough K&U	Exam ready
1.2.3 Units	The units of data storage:				
	• Bit				
	• Nibble (4 bits)				
	• Byte (8 bits)				
	• Kilobyte (1,000 bytes or 1 KB)				
	• Megabyte (1,000 KB)				
	• Gigabyte (1,000 MB)				
	• Terabyte (1,000 GB)				
	• Petabyte (1,000 TB)				
	How data needs to be converted into a binary format to be processed by a computer				
	Data capacity and calculation of data capacity requirements				
	<ul style="list-style-type: none"> ■ sound file size = sample rate x duration (s) x bit depth ■ image file size = colour depth x image height (px) x image width (px) ■ text file size = bits per character x number of characters 				
1.2.4 Data storage Numbers	How to convert positive denary whole numbers to binary numbers (up to and including 8 bits) and vice versa				
	How to add two binary integers together (up to and including 8 bits) and explain overflow errors which may occur				
	How to convert positive denary whole numbers into 2-digit hexadecimal numbers and vice versa				
	Denary number range 0 – 255				
	Hexadecimal range 00 – FF				
	Binary number range 00000000 – 11111111				
	Understanding of the terms 'most significant bit', and 'least significant bit'				
	How to convert binary integers to their hexadecimal equivalents and vice versa				
	Ability to deal with binary numbers containing between 1 and 8 bits e.g. 11010 is the same as 00011010				
	Understand the effect of a binary shift (both left or right) on a number				
Carry out a binary shift (both left and right)					

1.2 Memory and storage		Basic K&U	General K&U	Thorough K&U	Exam ready
1.2.4 Data storage (continued) Characters	The use of binary codes to represent characters				
	The term 'character set'				
	The relationship between the number of bits per character in a character set, and the number of characters which can be represented, e.g.:				
	<ul style="list-style-type: none"> • ASCII • Unicode 				
Data storage Images	How an image is represented as a series of pixels, represented in binary				
	Metadata				
	The effect of colour depth and resolution on:				
	<ul style="list-style-type: none"> • The quality of the image • The size of an image file 				
Data storage Sound	How sound can be sampled and stored in digital form				
	The effect of sample rate, duration and bit depth on:				
	<ul style="list-style-type: none"> • The playback quality • The size of a sound file 				
1.2.5 Compression	The need for compression				
	Common scenarios where compression may be needed				
	Advantages and disadvantages of each type of compression				
	Effects on the file for each type of compression				
	Types of compression:				
	<ul style="list-style-type: none"> • Lossy • Lossless 				



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1.3 Computer networks, connections and protocols

**Basic
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1.3.1
Networks and
topologies

Types of network:

- LAN (Local Area Network)
- WAN (Wide Area Network)

Understanding of different factors that can affect the performance of a network, e.g.:

- Number of devices connected
- Bandwidth

The different roles of computers in a client-server and a peer-to-peer network

The hardware needed to connect stand-alone computers into a Local Area Network:

- Wireless access points
- Routers
- Switches
- NIC (Network Interface Controller/Card)
- Transmission media

The Internet as a worldwide collection of computer networks:

- DNS (Domain Name Server)
- Hosting
- The Cloud
- Web servers and clients

Star and Mesh network topologies

1.3 Computer networks, connections and protocols		Basic K&U	General K&U	Thorough K&U	Exam ready
1.3.2 Wired and wireless networks, protocols and layers	Modes of connection:				
	• Wired				
	• Ethernet				
	• Wireless				
	• Wi-Fi				
	• Bluetooth				
	Encryption				
	IP addressing and MAC addressing				
	Standards				
	Common protocols including:				
	• TCP/IP (Transmission Control Protocol/Internet Protocol)				
	• HTTP (Hyper Text Transfer Protocol)				
	• HTTPS (Hyper Text Transfer Protocol Secure)				
	• FTP (File Transfer Protocol)				
	• POP (Post Office Protocol)				
• IMAP (Internet Message Access Protocol)					
• SMTP (Simple Mail Transfer Protocol)					
The concept of layers					



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1.4 Network security

Basic K&U	General K&U	Thorough K&U	Exam ready
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1.4.1
Threats to
computer
systems and
networks

- Forms of attack:
- Malware
 - Social engineering, e.g. phishing, people as the 'weak point'
 - Brute-force attacks
 - Denial of service attacks
 - Data interception and theft
 - The concept of SQL injection

1.4.2
Identifying
and
preventing
vulnerabilities

- Common prevention methods:
- Penetration testing
 - Anti-malware software
 - Firewalls
 - User access levels
 - Passwords
 - Encryption
 - Physical security



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1.5 Systems software		Basic K&U	General K&U	Thorough K&U	Exam ready
1.5.1 Operating systems	The purpose and functionality of operating systems:				
	• User interface				
	• Memory management and multitasking				
	• Peripheral management and drivers				
	• User management				
1.5.2 Utility software	• File management				
	The purpose and functionality of utility software				
	Utility system software:				
	• Encryption software				
	• Defragmentation				
	• Data compression				



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1.6 Ethical, legal, cultural and environmental impacts of digital technology		Basic K&U	General K&U	Thorough K&U	Exam ready
1.6.1 Ethical, legal, cultural and environmental impact	Impacts of digital technology on wider society including:				
	<ul style="list-style-type: none"> Ethical issues 				
	<ul style="list-style-type: none"> Legal issues 				
	<ul style="list-style-type: none"> Cultural issues 				
	<ul style="list-style-type: none"> Environmental issues 				
	<ul style="list-style-type: none"> Privacy issues 				
	Legislation relevant to Computer Science:				
	<ul style="list-style-type: none"> The Data Protection Act 2018 				
	<ul style="list-style-type: none"> Computer Misuse Act 1990 				
	<ul style="list-style-type: none"> Copyright Designs and Patents Act 1988 				
<ul style="list-style-type: none"> Software licences (i.e. open source and proprietary) 					