BCS Level 3 IT Solutions Technician Digital IT Apprenticeship End-point Assessment Knowledge Unit

Core Technical IT Knowledge Syllabus

Version 1.1
May 2020

BCS Level 3 IT Solutions Technician Digital IT Apprenticeship End-point Assessment Knowledge Unit – Core Technical IT Knowledge

Contents

Change History

Any changes made to the syllabus shall be clearly documented with a change history log. This shall include the latest version number, date of the amendment and changes made. The purpose is to identify quickly what changes have been made.

Version Number	Changes Made
V1.0 February 2020	Document created.
V1.1 May 2020	Removal of “Training Criteria” and “Classroom size” sections as not applicable.

Introduction

This is the second unit of the four knowledge units required for the Level 3 IT Solutions Technician Apprenticeship and forms part of the end-point assessment. It covers the range of concepts, approaches and techniques that are applicable to core technical IT, for which apprentices are required to demonstrate their knowledge and understanding.

Objectives

Apprentices should be able to demonstrate knowledge and understanding of core technical IT principles and techniques. Key areas are:

1. Understands the concepts of networking including the ISO (International Organisation for Standardisation) and TCP/IP (Transmission Control Protocol/Internet Protocol) network stacks, Ethernet LANs (Local Area Networks), IP addressing, Port numbers, DNS (Domain Name System), DHCP (Dynamic Host Configuration Protocol), and the principals of routing between LANs and WANs (Wide Area Networks).
2. Understands the different types of network devices, routers and network switches, their relationship to the stack model and the use of firewalls.
3. Understands the main components within an IT Solution including how hardware and software components work together.
4. Understands the main components of a computer system and their purpose, including servers, end-user computers, and mobile devices (both physical and virtual), user interfaces, CPUs, storage and connectivity.
5. Understands the purpose of an Operating System.
6. Understands the concepts of Cloud, Cloud Services and storage.
7. Understands the main trends in emerging technologies – including the Internet of Things (IoT), artificial intelligence, and automation - and the potential implications for digital activities.
8. Understands the necessary numerical skills including Binary and Hexadecimal.
9. Understands the role of configuration management and version control systems and when they should be used.
10. Understands the concepts of virtualisation.
11. Understands the use of different platforms (including web, mobile, or desktop applications).
12. Understands the concepts of relational databases, non-relational structured and unstructured databases.
13. Understands the benefits of and requirements for vendor support including commercial cloud offerings.

Evidence of lessons learnt in these key areas should be collected and reflected upon when the apprentice is compiling the portfolio as the apprentice could identify how the task might be done better / differently with knowledge subsequently gained.

Target Audience

The syllabus is relevant to anyone enrolled on the Level 3 IT Solutions Technician apprenticeship programme.

Eligibility for the Examination

Apprentices must be enrolled on the level 3 IT Solutions Technician Digital IT apprenticeship and have entered end-point assessment gateway. Level 2 English and Maths will need to be achieved, if not already, prior to taking the end-point assessment.

Format and Duration of the Examination

The format for the examination is a 1-hour multiple-choice examination consisting of 40 questions. The examination is closed book (no materials can be taken into the examination room). The pass mark is 26/40 (65%).

Additional Time for Apprentices Requiring Reasonable Adjustments Due to a Disability

Apprentices may request additional time if they require reasonable adjustments. Please refer to the reasonable adjustments policy for detailed information on how and when to apply.

Additional Time for Apprentices Whose Language is Not the Language of the Examination

If the examination is taken in a language that is not the apprentice's native / official language, then they are entitled to 25% extra time.

If the examination is taken in a language that is not the apprentice's native / official language, then they are entitled to use their own **paper** language dictionary (whose purpose is translation between the examination language and another national language) during the examination. Electronic versions of dictionaries will **not** be allowed into the examination room.

Calculators

Candidates taking online examinations will have access to an on-screen calculator. No other calculators or mobile technology will be allowed.

Syllabus

For each top-level area of the syllabus a percentage and K level is identified. The percentage is the exam coverage of that area, and the K level identifies the maximum level of knowledge that may be examined for that area.

1 Networking concepts (45%, K2)

In this topic, the apprentice will understand the concepts of networking including the ISO and TCP/IP network stacks, Ethernet LANs, IP addressing, port numbers, DNS, DHCP, and the principals of routing between LANs and WANs. The successful apprentice should be able to:

1.1 Explain the purpose of a network.

- shared resource;
- security;
- centralised management.

1.2 Describe the purpose of all seven layers within the OSI model.

- the Physical layer;
  - electrical;
  - optical;
  - wireless;
- the Data Link layer;
  - LLC sub layer;
  - MAC sub layer;
    - MAC address;
  - data format;
    - description of an Ethernet frame;
      - header (addressing);
      - data;
      - trailer (CRC-error checking);
- the Network layer;
  - Internet Protocol;
- the Transport layer;
  - transport layer protocols (TCP and UDP);
- the Session layer;
- the Presentation layer;
- the Application layer.

1.3 Describe the purpose of all four layers within the TCP/IP Stack.

- the Network Access layer;
- the Internet layer;
- the Transport layer;
- the Application layer.

1.4 Explain the purpose of a DNS server.
- name resolution;
- storage of network records;
  - A and AAAA;
  - CNAME;
  - PTR;
  - MX;
  - SOA;
  - SRV.

1.5 Explain the purpose of a DHCP server.
- address scopes, exclusions, reservations;
- DHCP Process – DORA.

1.6 Describe and summarise the difference between a LAN and a WAN.
- the role of routers;
- network address translation (NAT).

1.7 Describe the key operating principles of the following routing protocols:
- distance vector;
  - RIP;
  - EIGRP;
- link state;
  - OSPF.

1.8 Describe the configuration and use of:
- IPv4 addresses;
  - 32 bits, 4 8-bit groups represented in decimal 0-255;
  - host segment;
  - network segment;
  - netmasks;
  - loopback;
  - APIPA;
  - Classes;
    - A;
    - B;
    - C;
    - D (reserved for multicasting);
    - E (reserved);
  - classless (CIDR) notation;
- IPv6 addresses;
  - 128 bits, 8 x 16-bit groups represented as 4 Hexadecimal values;
  - 64 bits used for host address;
  - 64 bits used for network address;
  - link-local address;
  - loopback address;
  - address representations.

1.9 Explain the purpose of configuring the IP address of both DHCP and DNS servers on a client.
- automatic IP address allocation (DHCP);
- name resolution (DNS).

1.10 Identify standard port numbers for common protocols.
- dhcp;
- dns;
- ftp;
- http;
- https;
- imap;
- pop3;
- RDP;
- smtp;
- ssh;
- telnet.

1.11 Summarise performance characteristics of Ethernet LANs.
- Fast Ethernet;
- Gigabit Ethernet;
- 10Gigabit Ethernet;
- Power over Ethernet (PoE).

2 Network Devices (5%, K2)

In this topic area, the apprentice will understand the different types of network devices, routers and network switches, their relationship to the stack model and the use of firewalls. The successful apprentice should be able to:

2.1 Recognise and describe network devices and their relationship to the OSI model.
- switches;
- routers;
- firewalls;
- network interface cards (NICs);
  - cabled;
  - wireless;
- wireless access point (WAP).

3 IT Solutions (5%, K2)

In this topic area, the apprentice will understand the main components within an IT Solution including how hardware and software components work together. The successful apprentice should be able to:

3.1 Explain the purpose of the main IT Solution components.

- operating systems – software used to manage the basic functions of a computer;
- applications – software designed to provide a specific task normally for end users;
- databases – used for storage and rapid retrieval of information;
- data store;
- servers – provide systems resources that other computers can access;
  - web proxy server;
  - file and print;
- networking - provide managed communication links between computers;
- security – maintaining the integrity of systems and data.

4 Computer System Components (5%, K2)

In this topic area, the apprentice will understand the main components of a computer system and their purpose, including servers, end-user computers, and mobile devices (both physical and virtual), user interfaces, CPUs, storage and connectivity. The successful apprentice should be able to:

4.1 Explain the features and purpose of basic computer system components.

- motherboard;
- power supply (PSU);
- cooling systems;
  - passive (e.g. fanless laptop);
  - fans;
  - liquid;
  - Peltier;
- CPU(s);
- memory;
- drives;
  - HDD;
    - mechanical;
    - SSD;
  - optical;
- display adapter / graphics processing unit (GPU);
- NIC;
  - cabled;
  - wireless.

5 Operating Systems, Platforms and Virtualisation (12.5%, K2)

In this topic area, the apprentice will understand the purpose of an operating system, the use of different platforms (including web, mobile, or desktop applications) and the concepts of virtualisation. The successful apprentice should be able to:

5.1 Explain and summarise the purpose of an operating system.
- provides a user interface for computer architecture;
- provides a platform for software execution;
- links computer architecture to external devices;
  - drivers;
  - keyboard / mouse;
  - graphics.

5.2 Identify current operating systems and summarise their key features.
- servers;
- clients;
  - static (e.g. desktop);
  - mobile.

5.3 Describe benefits and limitations of the following platforms in delivering IT Solutions:
- web;
- mobile;
- desktop.

5.4 Explain and summarise virtualisation technologies.
- OS;
- server;
- storage;
- hardware.

5.5 Identify the key benefits of virtualisation.
- scalability;
- security;
- fault tolerance.

6 Cloud (5%, K2)

In this topic area, the apprentice will understand the concepts of cloud, cloud services and storage. The successful apprentice should be able to:

6.1 Explain the benefits of cloud computing and storage.
- access to latest technology;
- reduced IT costs;
- scalability;
- disaster recovery / business continuity;
- centralised management.

6.2 Explain the purpose of cloud-based services.
- Infrastructure as a Service (IaaS);
- Platform as a Service (PaaS);
- Software as a Service (SaaS).

7 Emerging Technologies (5%, K2)

In this topic area, the apprentice will understand the main trends in emerging technologies – including the Internet of Things (IoT), artificial intelligence (AI), and automation - and the potential implications for digital activities. The successful apprentice should be able to:

7.1 Explain the purpose of emerging technologies commonly found in the Internet of Things.
- 5G
- near-field communication (NFC);
- radio-frequency identification (RFID);
- Adaptive Network Topology (ANT+);
- ZigBee.

7.2 Explain potential implications of AI technologies on digital activities.
- virtual agents;
- speech recognition;
- machine learning platforms;
- multi-factor authentication (MFA).

8 Numerical Skills (5%, K3)

In this topic area, the apprentice will understand the necessary numerical skills including binary and hexadecimal. The successful apprentice should be able to:

8.1 Demonstrate the ability to be able to convert between any of the following:
- binary;
- decimal;
- hexadecimal.

8.2 Demonstrates an ability to express large numbers of data bits or bytes using the correct standard notation.
- kilobyte (KB);
- megabyte (MB);
- gigabyte (GB);
- terabyte (TB).

9 Configuration Management (2.5%, K2)

In this topic area, the apprentice will understand the role of configuration management and version control systems and when they should be used. The successful apprentice should be able to:

9.1 Define configuration management and explain the role of configuration management systems.
- Git;
- version management (and control);
  - operating system updates;
    - critical;
    - security;
    - functional;
  - application updates.

10 Database Concepts (5%, K2)

In this topic area, the apprentice will understand the concepts of relational databases, non-relational structured and unstructured databases. The successful apprentice should be able to:

10.1 Explain the key concepts of a relational database.
- structured data;
- relational model;
- Structured Query Language (SQL).

10.2 Explain the key concepts of a non-relational database.
- unstructured data;
- NoSQL;
- big data.

11 Vendor Support (5%, K2)

In this topic area, the apprentice will understand the benefits of and requirements for vendor support including commercial cloud offerings. The successful apprentice should be able to:

11.1 Summarise common contractual documents when using or providing vendor support.
- terms and conditions (T&C);
- service-level agreement (SLA);
- non-disclosure agreement (NDA);
- operational-level agreement (OLA);
- intellectual property (IP).

11.2 Explain the potential benefits of using Vendor IT support.
- legal compliance;
  - GDPR;
- access to additional or advanced:
  - knowledge;
  - expertise;
  - specialists;
- 24/7 availability;
- reduced costs.

Levels of Knowledge / SFIA Levels

This syllabus will provide apprentices with the levels of difficulty / knowledge skill highlighted within the following table, enabling them to develop the skills to operate at the levels of responsibility indicated. The levels of knowledge and SFIA levels are explained on the website www.bcs.org/levels. The levels of knowledge above will enable apprentices to develop the following levels of skill to be able to operate at the following levels of responsibility (as defined within the SFIA framework) within their workplace:

Level	Levels of Knowledge	Levels of Skill and Responsibility (SFIA)
K7		Set strategy, inspire and mobilise
K6	Evaluate	Initiate and influence
K5	Synthesise	Ensure and advise
K4	Analyse	Enable
K3	Apply	Apply
K2	Understand	Assist
K1	Remember	Follow

Question Weighting

Syllabus Area	Target Number of Questions
1. Networking Concepts	18
2. Network Devices	2
3. IT Solutions	2
4. Computer System Components	2
5. Operating Systems, Platforms and Virtualisation	5
6. Cloud	2
7. Emerging Technologies	2
8. Numerical Skills	2
9. Configuration Management	1
10. Database Concepts	2
11. Vendor Support	2
Total	**40 Questions**

Format of Examination

Type	40 Question Multiple Choice.
Duration	1 Hour. An additional 25% will be allowed for apprentices sitting the examination in a language that is not their native / mother tongue.
Pre-requisites	Training from a BCS accredited training provider is strongly recommended but is not a pre-requisite.
Supervised	Yes.
Open Book	No.
Pass Mark	26/40 (65%).
Calculators	Calculators may be used during this examination.
Delivery	Online.