SCOTTISH QUALIFICATIONS AUTHORITY

Higher National Unit Specification

General information for centres

Unit title: Hardware Concepts

Unit code: DG0K 33

Unit purpose: This Unit is designed to introduce candidates to the issues involved in installing and maintaining PC Hardware. It is intended for candidates undertaking an HNC/D in Computing, Computer Networking or a related area who require an understanding of computer hardware.

On completion of the Unit candidates should be able to:

1. Install, configure and upgrade PC hardware.
2. Diagnose and troubleshoot hardware problems.
3. Carry out preventive maintenance.
4. Describe the features of motherboards, processors and memory.
5. Describe the features of printers.
6. Describe basic networking concepts.

Credit value: 1 HN credit at SCQF level 6: (8 SCQF credit points at SCQF level 6)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Recommended prior knowledge and skills: Access to this Unit will be at the discretion of the Centre. There are no specific requirements but candidates would benefit from knowledge of computer hardware. This may be demonstrated by the possession of relevant SQA National Qualifications in Computing or Information Systems.

Core skills: There may be opportunities to gather evidence towards core skills in this Unit, although there is no automatic certification of core skills or core skills components.

Context for delivery: This Unit is included in the framework of a number of HNC and HND group awards. It is recommended that it should be taught and assessed within the context of the particular group award to which it contributes.

Assessment: Evidence for the knowledge and/or skills for the entire Unit must be produced using a set of 30 restricted-response questions to assess candidates' knowledge and understanding. This may be administered as a single end-of unit test, or as several subtests, each covering one or more outcomes.

General information for centres (cont)

Candidates must answer at least 70% of the questions correctly in order to obtain a pass. If subtests are used, they must also score at least 70% in each subtest.

Testing must take place in a closed-book environment where candidates have no access to books, handouts, notes or other learning material. Testing can be done in either a machine-based or paper-based format and must be invigilated by a tutor or mentor. There must be no communication between candidates and communication with the invigilator must be restricted to matters relating to the administration of the test.

If a candidate requires to be reassessed, a different selection of questions must be used. At least half the questions in the reassessment must be different from those used in the original test.

If an outcome has a practical component, this must be assessed by having the candidate use a logbook to record the practical tasks successfully completed. The logbook can be in paper or electronic form and must be authenticated by the tutor or mentor.

For some outcomes only a sample of the practical tasks needs to be completed and recorded for assessment purposes, e.g. three out of five. This is clearly indicated in the logbook instructions for the outcomes involved. Where this occurs, tutors must inform candidates of the tasks to be completed.

An Assessment Exemplar and Guidelines on the Delivery of the Unit have been produced to indicate the national standard of achievement required at SCQF level 6.

Higher National Unit Specification: statement of standards

Unit title: Hardware Concepts

Unit code: DG0K 33

The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Install, configure and upgrade PC hardware.

Knowledge and skills

- System modules.
- Resource requirements.
- Storage devices.
- Peripheral devices.
- Optimising performance.
- Upgrading.

Evidence Requirements

Restricted response test

The knowledge and skills component of Outcome 1 must be examined by six questions, derived from the six items listed below. Each question must be derived from a different item.

1. System modules

   Identify and install system modules: names, purpose, and characteristics; procedures for adding and removing field-replaceable modules for desktop and portable systems.

2. Resource requirements

   Identify typical resource requirements and procedures for setting/altering these when installing and configuring devices: IRQs, DMAs, and I/O addresses

Higher National Unit Specification: statement of standards (cont)

Unit title: Hardware Concepts

3. Storage devices

   Install and configure storage devices: IDE, SCSI, installation and configuration procedures and sequences, cables.

4. Peripheral devices

   Install and configure peripheral devices: installation procedures and sequences: peripheral ports, cabling and connectors.

5. Optimising performance

   Optimise PC operations, identify effects of specific procedures under given scenarios.

6. Upgrading

   Identify upgrading issues, when and how to upgrade system components.

The test may be administered on its own as a subtest or be combined with other outcome subtests in the Unit.

Alternatively, the 6 questions for this outcome may contribute towards a single end-of-unit test of 30 questions.

Logbook

The logbook for Outcome 1 must record successful completion by the candidate of **at least three** of the six tasks listed below, **including the first task**. The tasks to be completed must be selected by the tutor.

1. System modules.

   A record of the manufacturer, model number and characteristics of at least five system modules installed by the candidate. (Modules include: motherboard, firmware, power supply, processor/CPU, memory, storage devices, display devices, adapter cards, ports, cases and riser cards.)

Higher National Unit Specification: statement of standards (cont)

Unit title: Hardware Concepts

2. Resource requirements

   A record of the IRQs, DMAs, and I/O addresses for at least four devices installed by the candidate. Devices include sound cards, modems, floppy drive controllers, hard drive controllers, multimedia devices, NICs and I/O ports (serial, parallel, USB, IEEE 1394 / Firewire, infrared).

3. Peripheral devices.

   A record of the peripheral ports, cabling and connectors for at least three peripheral devices installed by the candidate. Peripheral devices include modems (dial-up, cable, DSL, ISDN), external storage, digital cameras, PDAs, wireless access points, infrared devices, printers, UPS (uninterruptible power supply) and monitors.

4. Storage devices

   A record of the manufacturer, model, interface type, capacity, configuration and cabling for at least two storage devices installed by the candidate. Storage devices include: hard disks (IDE, SCSI), floppy disks and optical devices (CD, DVD).

5. Optimising performance

   A record of at least two optimisation procedures carried out by the candidate. Optimisation procedures include addition of cooling systems, disk subsystem enhancements, NICs, specialised video cards, memory, additional processors.

6. Upgrading.

   A record of at least two upgrades carried out by the candidate. Upgrades include motherboards, memory, hard drives, CPU, BIOS, adapter cards, laptop power sources, PCMCIA cards.

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 70 minutes should be allocated for a 30-question end-of-unit test.

Higher National Unit Specification: statement of standards (cont)

Unit title: Hardware Concepts

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Outcome 2

Diagnose and troubleshoot hardware problems.

Knowledge and skills

- Common problems.
- Troubleshooting procedures and tools.

Evidence Requirements

Restricted response test

The knowledge and skills component of Outcome 2 must be examined by three questions, at least one being derived from each of the two items listed below. The third question may be derived from either item.

1. Common problems

   Recognize common problems associated with each module and their symptoms. Identify steps to isolate and troubleshoot problems, interpret symptoms and infer the most likely cause.

2. Troubleshooting procedures and tools

   Identify basic troubleshooting procedures and tools. Elicit problem symptoms from customers, justify asking particular questions in a given scenario.

The test may be administered on its own as a subtest or be combined with other outcome subtests in the Unit.

Alternatively, the 3 questions for this outcome may contribute towards a single end-of-unit test of 30 questions.

Logbook

The logbook for Outcome 2 must record successful completion by the candidate of **each** of the two tasks listed below.

Higher National Unit Specification: statement of standards (cont)

Unit title: Hardware Concepts

1. Problems associated with each module and their symptoms

   A record of the procedures used by the candidate to isolate and troubleshoot two specified problems in different system modules, interpret observed symptoms and infer the most likely cause.

2. Basic troubleshooting procedures and tools

   A record of the questions used by the candidate to elicit problem symptoms from customers, including the justification for asking particular questions in a given scenario.

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 70 minutes should be allocated for a 30-question end-of-unit test.

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Outcome 3

Carry out preventive maintenance.

Knowledge and skills

- Preventive maintenance measures, products and procedures.
- Safety measures and procedures.
- Environmental protection measures and procedures.

Evidence Requirements

Restricted response test

The knowledge and skills component of Outcome 3 must be examined by three questions, derived from the three items listed below. Each question must be derived from a different item.

Higher National Unit Specification: statement of standards (cont)

Unit title: Hardware Concepts

1. Preventive maintenance measures, products and procedures

    Identify the various types of preventive maintenance measures, products and procedures and when and how to use them.

2. Safety measures and procedures

    Identify various safety measures and procedures, and when/how to use them.

3. Environmental protection measures and procedures

    Identify environmental protection measures and procedures, and when/how to use them.

The test may be administered on its own as a subtest or be combined with other outcome subtests in the Unit.

Alternatively, the 3 questions for this outcome may contribute towards a single end-of-unit test of 30 questions.

Logbook

The logbook for Outcome 3 must record successful completion by the candidate of **at least two** of the three tasks listed below. The tasks to be completed must be selected by the tutor.

1. Preventive maintenance measures, products and procedures

    A record of at least two preventive maintenance measures or procedures carried out by the candidate.

2. Safety measures and procedures

    A record of at least two safety measures or procedures carried out by the candidate.

3. Environmental protection measures and procedures

    A record of at least two environmental protection measures or procedures carried out by the candidate.

Higher National Unit Specification: statement of standards (cont)

Unit title: Hardware Concepts

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 70 minutes should be allocated for a 30-question end-of-unit test.

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Outcome 4

Describe the features of motherboards, processors and memory.

Knowledge and skills

- Characteristics of CPU chips
- Types of RAM (Random Access Memory)
- Motherboard components and architectures
- Purpose and contents of CMOS memory

Evidence Requirements

Restricted response test

The knowledge and skills component of Outcome 4 must be examined by eight questions, two being derived from each of the four items listed below. Each question must be derived from a single item.

1. Characteristics of CPU chips

    Distinguish between the popular CPU chips in terms of their basic characteristics.

2. Types of RAM (Random Access Memory)

    Identify the types of RAM (Random Access Memory)

        Form factors, operational characteristics, banking and speed requirements

Higher National Unit Specification: statement of standards (cont)

Unit title: Hardware Concepts

3. Motherboard components and architectures

Identify types of motherboards, their components and their architecture

Communication ports, memory, processor sockets, cache memory, bus architecture

4. Purpose and contents of CMOS memory

Identify the purpose of CMOS (Complementary Metal-Oxide Semiconductor) memory, what it contains, and how and when to change its parameters.

The test may be administered on its own as a subtest or be combined with other outcome subtests in the Unit.

Alternatively, the 8 questions for this outcome may contribute towards a single end-of-unit test of 30 questions.

Logbook

There are no practical tasks relating to Outcome 4.

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 70 minutes should be allocated for a 30-question end-of-unit test.

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Outcome 5

Describe the features of printers.

Knowledge and skills

- Printer technologies
- Printer problems

Higher National Unit Specification: statement of standards (cont)

Unit title: Hardware Concepts

Evidence Requirements

Restricted response test

The knowledge and skills component of Outcome 5 must be examined by four questions, two being derived from each of the two items listed below. Each question must be derived from a single item.

1. Printer technologies

    Identify printer technologies, interfaces, and options/upgrades.

2. Printer problems

    Recognize common printer problems and techniques used to resolve them.

The test may be administered on its own as a subtest or be combined with other outcome subtests in the Unit.

Alternatively, the 4 questions for this outcome may contribute towards a single end-of-unit test of 30 questions.

Logbook

There are no practical tasks relating to Outcome 5.

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 70 minutes should be allocated for a 30-question end-of-unit test.

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Higher National Unit Specification: statement of standards (cont)

Unit title: Hardware Concepts

Outcome 6

Describe basic networking concepts.

Knowledge and skills

- Network cabling
- Networking concepts
- Technologies for establishing Internet connectivity

Evidence Requirements

Restricted response test

The knowledge and skills component of Outcome 6 must be examined by six questions, two being derived from each of the three items listed below. Each question must be derived from a single item.

1. Network cabling

   Identify the common types of network cables, their characteristics and connectors: Coaxial, Plenum/PVC, UTP, STP, fibre

2. Networking concepts

   Identify basic networking concepts including how a network works: NICs, addressing, bandwidth, status indicators, protocols, cabling, networking models, infrared, wireless

3. Technologies for establishing Internet connectivity

   Identify common technologies available for establishing Internet connectivity and their characteristics.

The test may be administered on its own as a subtest or be combined with other outcome subtests in the Unit.

Alternatively, the 6 questions for this outcome may contribute towards a single end-of-unit test of 30 questions.

Higher National Unit Specification: statement of standards (cont)

Unit title: Hardware Concepts

Logbook

There are no practical tasks relating to Outcome 6.

Assessment guidelines

It is suggested that all the above concepts be presented and explained within the context of current real-world practice and applications.

The suggested time allocation for a restricted response test is 2 minutes for each question plus 5 minutes starting-up time and 5 minutes finishing-off time, thus a total of 70 minutes should be allocated for a 30-question end-of-unit test.

Although individual outcome tests are permissible, it is suggested that if subtests are to be used, outcomes should be combined to produce tests of no fewer than 10 questions. A 10-question test would therefore have a time allocation of 30 minutes.

Administrative Information

Unit code: DG0K 33

Unit title: Hardware Concepts

Superclass category: CA

Date of publication: May 2004

Version 01

Source: SQA

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. The cost for each Unit specification is £2.50. (A handling charge of £1.95 will apply to all orders for priced items.)

Higher National Unit Specification: support notes

Unit title: Hardware Concepts

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

The suggested time allocation for each outcome (including assessment) is as follows:

Outcome 1: 10 hours
Outcome 2: 8 hours
Outcome 3: 4 hours
Outcome 4: 5 hours
Outcome 5: 5 hours
Outcome 6: 8 hours

Guidance on the content and context for this Unit

As it is likely that the bulk of the material in this Unit will be delivered through lecturer exposition, it is important that every opportunity is taken to introduce real-world examples, opportunities for whole-class and group discussion and practical demonstrations wherever possible. Concepts and terminology should be presented in context throughout the Unit. Video presentations should be used where appropriate for providing an alternative explanation of a difficult topic, or as a focus for class discussion or groupwork.

Given the theoretical nature of this Unit, it is intended that a significant amount of time will be made available as a central part of the course for revision, tutorials and formative assessment exercises. Candidates should be strongly encouraged to undertake further reading, and opportunities for individual or group research should be provided.

The most important overall emphasis should be on the relevance and currency of content in such a rapidly-evolving field.

This Unit may assist candidates in preparing for CompTIA examination 220-231: A+ Core Hardware. Vendor certifications can change rapidly and candidates should be encouraged the check the current details at **www.comptia.org** to ensure that all objectives have been covered. This examination can also contribute towards the Microsoft Certified Systems Administrator (MCSA) award.

The content of this unit may be delivered using relevant vendor-supplied materials, such as Cisco IT Essentials 1. As these materials are under continuous development, centres should check carefully to ensure that they meet all the requirements for the unit.

Higher National Unit Specification: support notes (cont)

Unit title: Hardware Concepts

Outcome 1

Outcome 1 is about installing, configuring and upgrading PC hardware.

1 System modules

Candidates should be able to identify the names, purpose and characteristics of system modules and recognize these modules by sight or definition. Modules include: motherboard, firmware, power supply, processor/CPU, memory, storage devices, display devices, adapter cards, ports, cases and riser cards.

They should be able to identify basic procedures for adding and removing field-replaceable modules for desktop and portable systems and, given a replacement scenario, choose the appropriate sequences.

Desktop components include: motherboard, storage devices (FDD, HDD, CD/CDRW, DVD/DVDRW, tape drive, removable storage), power supply (AC adapter, AT/ATX), cooling systems (fans, heat sinks, liquid cooling), processor / CPU, memory, display devices, input devices (keyboard, mouse/pointer devices, touch screen, adapters (Network Interface Card (NIC), sound card, video card, modem, SCSI, IEEE 1394/Firewire, USB).

Portable components include: storage devices (FDD, HDD, CD/CDRW, DVD/DVDRW, removable storage), power sources (AC adapter, DC adapter, battery), memory, input devices (keyboard, mouse/pointer devices, touch screen, PCMCIA / mini PCI adapters, Network Interface Card (NIC), modem, SCSI, IEEE 1394 / Firewire, USB storage (memory and hard drive), docking station / port replicators, LCD panel, wireless (adapter / controller, antennae).

2 Resource requirements

Candidates should be able to identify typical resource requirements (IRQs, DMAs, and I/O addresses) and know the procedures for altering these settings when installing and configuring devices. They should be able to choose the appropriate installation or configuration steps in a given scenario. Content may include the following: legacy devices (e.g., ISA sound card), specialised devices (e.g., CAD/CAM), internal modems, floppy drive controllers, hard drive controllers, multimedia devices, NICs, I/O ports (serial, parallel, USB ports, IEEE 1394 / Firewire, infrared).

Higher National Unit Specification: support notes (cont)

Unit title: Hardware Concepts

3 Storage devices

Candidates should be able to identify proper procedures for installing and configuring common storage devices (IDE, SCSI), choose the appropriate installation or configuration sequences in given scenarios and recognise the associated cables. Content may include the following: IDE: interface types (EIDE, ATA/ATAPI, Serial ATA, PI), RAID (0, 1 and 5), Master/Slave/cable select, devices per channel, Primary/Secondary, cable orientation/requirements; SCSI: interface types (narrow, fast, wide, ultra-wide, LVD, HVD, internal versus external), SCSI IDs (jumper block/DIP switch settings (binary equivalents), resolving ID conflicts), RAID (0, 1 and 5), cabling (length, type, termination requirements (active, passive, auto)).

4 Peripheral devices

Candidates should be able to identify proper procedures for installing and configuring common peripheral devices and choose the appropriate installation or configuration sequences in given scenarios. Content may include the following: modems and transceivers (dial-up, cable, DSL, ISDN), external storage, digital cameras, PDAs, wireless access points, infrared devices, printers, UPS (uninterruptible power supply) and suppressors, monitors.

They should also be able to identify the names, purposes, and performance characteristics of standardised/common peripheral ports and the associated cabling and connectors and recognize ports, cabling and connectors by sight. Content may include the following: port types (serial, parallel, USB, IEEE 1394/Firewire, infrared), cable types (serial (straight through vs. null modem), parallel, USB), connector types (serial: DB-9, DB-25, RJ-11, RJ-45; parallel: DB-25, Centronics (mini, 36)), PS2/MINI-DIN, USB, IEEE 1394).

5 Optimising performance

Candidates should be able to identify procedures to optimize PC operations in specific situations and predict the effects of specific procedures under given scenarios. Topics may include: cooling systems (liquid, air, heat sink, thermal compound), disk subsystem enhancements (hard drives, controller cards (e.g., RAID, ATA-100, etc.), cables), NICs, specialised video cards, memory, additional processors.

Higher National Unit Specification: support notes (cont)

Unit title: Hardware Concepts

6 Upgrading

Candidates should be able to determine the issues that must be considered when upgrading a PC and, in a given scenario, determine when and how to upgrade system components. Issues may include: drivers for legacy devices, bus types and characteristics, cache in relationship to motherboards, memory capacity and characteristics, processor speed and compatibility, hard drive capacity and characteristics, system/firmware limitations, power supply output capacity. Components may include the following: motherboards, memory, hard drives, CPU, BIOS, adapter cards, laptop power sources (lithium ion, NiMH, fuel cell), PCMCIA Type I, II, III cards.

Outcome 2 is about diagnosing and troubleshooting hardware problems.

1 Common problems

Candidates should be able to recognize common problems associated with each module and their symptoms and identify steps to isolate and troubleshoot the problems. Given a problem situation, they should be able to interpret the symptoms and infer the most likely cause.

Content may include the following: I/O ports and cables (serial, parallel, USB, IEEE 1394 / Firewire, infrared, SCSI), motherboards (CMOS/ BIOS settings, POST audible/visual error codes), peripherals, computer case (power supply, slot covers, front cover alignment, storage devices and cables, FDD, HDD, CD/CDRW, DVD/DVDRW, tape drive, removable storage), cooling systems (fans, heat sinks, liquid cooling, temperature sensors), processor /CPU, memory, display device, input devices (keyboard, mouse/pointer devices, touch screen, adapters (Network Interface Card (NIC), sound card, video card, modem, SCSI, IEEE 1394/Firewire, USB), portable systems (PCMCIA, batteries, docking stations/port replicators, portable unique storage).

2 Troubleshooting procedures and tools

Candidates should be able to identify basic troubleshooting procedures and tools, and know how to elicit problem symptoms from customers. They should be able to justify asking particular questions in a given scenario. Content may include the following: troubleshooting / isolation / problem determination procedures, determining whether a hardware or software problem, gathering information from user (customer environment, symptoms / error codes, situation when the problem occurred).

Higher National Unit Specification: support notes (cont)

Unit title: Hardware Concepts

Outcome 3

Outcome 3 is about carrying out preventive maintenance.

1 Preventive maintenance measures, products and procedures

Candidates should be able to identify types of preventive maintenance measures, products and procedures and know when and how to use them. Content may include: liquid cleaning compounds, types of materials to clean contacts and connections, non-static vacuums (chassis, power supplies, fans), cleaning monitors, cleaning removable media devices, ventilation, dust and moisture control on the PC hardware interior, hard disk maintenance (defragging, scan disk, CHKDSK), verifying UPS (Uninterruptible Power Supply) and suppressors.

2 Safety measures and procedures

Candidates should also be able to identify various safety measures and procedures and know when/how to use them. Content may include the following: ESD (Electrostatic Discharge) precautions and procedures, what ESD can do, how it may be apparent, or hidden, common ESD protection devices, situations that could present a danger or hazard, potential hazards and proper safety procedures relating to high-voltage equipment, power supply, CRTs.

3 Environmental protection measures and procedures

Candidates should be able to identify environmental protection measures and procedures and know when/how to use them. Content may include the following: special disposal procedures that comply with environmental guidelines, batteries, CRTs, chemical solvents and cans, MSDS (Material Safety Data Sheet).

Outcome 4

Outcome 4 is about motherboards, processors and memory.

1 Characteristics of CPU chips

Candidates should be able to distinguish between the popular CPU chips in terms of their basic characteristics. Content may include the following: popular CPU chips (Pentium class compatible), voltage, speeds (actual vs. advertised), cache (level I, II, III), sockets/slots, VRM(s)

Higher National Unit Specification: support notes (cont)

Unit title: Hardware Concepts

2 Types of RAM (Random Access Memory)

Candidates should be able to identify the types of RAM (Random Access Memory), form factors and operational characteristics and determine banking and speed requirements under given scenarios. Content may include: types: EDRAM (Extended Data Output RAM), DRAM (Dynamic Random Access Memory), SRAM (Static RAM), VRAM (Video RAM), SDRAM (Synchronous Dynamic RAM), DDR (Double Data Rate), RAMBUS; form factors (including pin count): SIMM (Single In-line Memory Module), DIMM (Dual In-line Memory Module), SoDIMM (small outline DIMM), MicroDIMM, RIMM; operational characteristics: memory chips (8-bit, 16-bit, and 32-bit), parity chips versus non-parity chips, ECC vs. non-ECC, single-sided vs. double sided.

3 Motherboard components and architectures

Candidates should also be able to identify the most popular types of motherboards, their components and their architecture (bus structures). Content may include the following: types of motherboards: AT, ATX; Components: communication ports (serial, USB, parallel, IEEE 1394/Firewire, infrared), memory (SIMM, DIMM, RIMM, SoDIMM, MicroDIMM), processor sockets (Slot 1, Slot 2, Slot A, Socket A, Socket 7, Socket 8, Socket 423, Socket 478, Socket 370), external cache memory (Level 2); bus architecture: ISA, PCI (32-bit, 64-bit), AGP (2X, 4X, 8X (Pro)), USB (Universal Serial Bus), AMR (audio modem riser) slots, CNR (communication network riser) slots; basic compatibility guidelines: IDE (ATA, ATAPI, ULTRA-DMA, EIDE), SCSI (Narrow, Wide, Fast, Ultra, HVD, LVD (Low Voltage Differential); chipsets.

4 Purpose and contents of CMOS memory

Candidates should also be able to identify the purpose of CMOS (Complementary Metal-Oxide Semiconductor) memory, what it contains, and how and when to change its parameters. Given a scenario involving CMOS, they should be able to choose the appropriate course of action. Content includes: CMOS Settings: default settings, CPU settings, printer parallel port (uni-directional, bi-directional, disable/enable, ECP, EPP), COM/serial port (memory address, interrupt request, disable), floppy drive (enable/disable drive or boot, speed, density), hard drive (size and drive type), memory (speed, parity, non-parity) boot sequence, date/time, passwords, plug & play BIOS, disabling on-board devices, disabling virus protection, power management, infrared.

Higher National Unit Specification: support notes (cont)

Unit title: Hardware Concepts

Outcome 5

This Outcome is about printers.

1 Printer technologies

Candidates should be able to identify printer technologies, interfaces, and options / upgrades. Technologies include: laser, ink dispersion, dot matrix, solid ink, thermal, dye sublimation. Interfaces include: parallel, network, SCSI, USB, infrared, serial, IEEE 1394 / Firewire, Wireless. Options / upgrades include: memory, hard drives, NICs, trays and feeders, finishers (e.g., stapling, etc.), scanners / fax / copier.

2 Printer problems

Candidates should also be able to recognise common printer problems and know the techniques used to resolve them. Content may include: printer drivers, firmware updates, paper feed and output, calibrations, printing test pages, errors (printed or displayed), memory, configuration, network connections, connections, paper jam, print quality, safety precautions, preventive maintenance, consumables, environment.

Outcome 6

This Outcome is about basic networking concepts.

1 Network cabling

Candidates should be able to identify the common types of network cables, their characteristics and connectors. Cable types include: coaxial (RG6, RG8, RG58, RG59), Plenum/PVC, UTP (CAT3, CAT5/e, CAT6), STP, fibre, (single-mode, multi-mode). Connector types include: BNC, RJ-45, AUI, ST/SC, IDC/UDC.

2 Networking concepts

Candidates should be able to identify basic networking concepts including how a network works. Concepts include: installing and configuring network cards, addressing, bandwidth, status indicators, protocols (TCP/IP, IPX/SPX (NWLINK), AppleTalk, NETBEUI/NETBIOS), full-duplex, half-duplex, cabling (twisted pair, coaxial, fibre optic, RS-232), networking models (peer-to-peer, client/server), infrared, wireless.

Higher National Unit Specification: support notes (cont)

Unit title: Hardware Concepts

3 Technologies for establishing Internet connectivity

Candidates should also be able to identify common technologies available for establishing Internet connectivity and their characteristics. Technologies include: LAN, DSL, cable, ISDN, dial-up, satellite, wireless. Characteristics include: definition, speed, connections.

Guidance on the delivery and assessment of this unit

This Unit is likely to form part of a group award which is primarily designed to provide candidates with technical or professional knowledge and skills related to a specific occupational area. It is highly technical in content and should not be adopted by group awards in other areas or delivered as a stand-alone Unit without careful consideration of its appropriateness. It is a Unit which candidates are likely to find accessible at an introductory level; it is suggested that it be delivered part of an HNC or first-year HND program in Computing or a related area, giving candidates experience of basic background topics involved in the hardware and software aspects of computer networks

To minimise assessment overhead, sets of multiple choice questions are used to provide evidence of candidates' knowledge for all Outcomes. It is suggested that multiple-choice questions can be used as the preferred assessment method – as well as reducing the time required for assessment and marking, these reduce the need for candidates to memorise details and encourage understanding. The numbers of questions which must be answered correctly in each assessment correspond to 70% of those set in each case.

Open learning

If this Unit is delivered by open or distance learning methods, additional planning and resources may be required for candidate support, assessment and quality assurance.

A combination of new and traditional authentication tools may have to be devised for assessment and re-assessment purposes.

For further information and advice, please see *Assessment and Quality Assurance for Open and Distance Learning* (SQA, February 2001 — publication code A1030).

Higher National Unit Specification: support notes (cont)

Unit title: Hardware Concepts

Special needs

This Unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering special alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, 2001).

General information for candidates

Unit title: Hardware Concepts

This is a 1-credit Unit at Level 6 intended for candidates undertaking a Computing or IT-related qualification who require an understanding of PC Hardware. It is designed to develop an understanding of the issues involved in designing and constructing secure computer networks. On completion of the Unit you should be able to:

- Install, configure and upgrade PC hardware.
- Diagnose and troubleshoot hardware problems.
- Carry out preventive maintenance.
- Describe the features of motherboards, processors and memory.
- Describe the features of printers.
- Describe basic networking concepts.

In the first part of the course, you will study installing, configuring and upgrading PC hardware, including identifying and installing system modules, identifying typical resource requirements and procedures for setting/altering these when installing and configuring devices, installing and configuring peripheral devices, installing and configuring storage devices, optimising PC operations and identifying upgrading issues.

The second section covers diagnosing and troubleshooting hardware problems, including recognising common problems associated with each module and their symptoms, identifying steps to isolate and troubleshoot problems, interpreting symptoms and inferring the most likely cause, identifying basic troubleshooting procedures and tools, eliciting problem symptoms from customers and justifying asking particular questions in a given scenario.

The third section covers carrying out preventive maintenance, including identifying the various types of preventive maintenance measures, products and procedures and when and how to use them, identifying various safety measures and procedures, and when/how to use them and identifying environmental protection measures and procedures, and when/how to use them.

The fourth section covers the features of motherboards, processors and memory, including distinguishing between the popular CPU chips in terms of their basic characteristics, identifying the types of RAM (Random Access Memory), identifying types of motherboards, their components and their architecture and identifying the purpose of CMOS (Complementary Metal-Oxide Semiconductor) memory, what it contains and how and when to change its parameters.

The fifth section covers the features of printers including identifying printer technologies, interfaces, and options/upgrades and recognising common printer problems and techniques used to resolve them.

General information for candidates (cont)

Unit title: Hardware Concepts

The final section covers basic networking concepts, including identifying the common types of network cables, their characteristics and connectors, describing how a network works and identifying common technologies available for establishing Internet connectivity and their characteristics.

There will be a closed-book multiple-choice assessment covering all outcomes. You will be presented with 30 questions and expected to answer 70% of these correctly. You will also be expected to keep a logbook recording the practical tasks you have carried out during the Unit.

This Unit may assist you in preparing for CompTIA examination 220-231: A+ Core Hardware. Vendor certifications can change rapidly, so you should check the current details at **www.comptia.org** to ensure that all objectives have been covered. This examination can also contribute towards the Microsoft Certified Systems Administrator (MCSA) award.