Version 2
This version confirms that there will be no further January assessments.

WJEC CBAC

GCE

Examinations from 2009

First AS Award: Summer 2009

First A Level Award: Summer 2010

Information & Communication Technology

Contents

WJEC AS GCE in
Information and Communication Technology
WJEC A Level GCE in
Information & Communication Technology

First AS Award - Summer 2009
First A level Award - Summer 2010

GCE Information & Communication Technology

Subject/Option Entry Codes	
Advanced Subsidiary (AS) "Cash in" entry *A Level (A)"Cash in" entry*	*2241* *3241*
IT1 : Information Systems	1241
IT2 : Presenting Information Task	1242
IT3 : Use and Impact of ICT	1243
IT4 : Relational Database Project	1244

When making entries, the following option codes should be entered after the four digit unit or cash-in code to indicate English medium or Welsh medium entries:

English medium 01
Welsh medium W1

Availability of Assessment Units			
Unit	**January 2009**	**June 2009**	**June 2010 & each subsequent year**
IT1	✓	✓	✓
IT2		✓	✓
IT3			✓
IT4			✓

Qualification Accreditation Numbers

Advanced Subsidiary: 500/3026/7
Advanced: 500/2607/0

SUMMARY OF ASSESSMENT

This specification is divided into a total of 4 units, 2 AS units and 2 A2 units. Weightings noted below are expressed in terms of the full A level qualification.

AS (2 units)

IT1	30 %	2 hours 15 minutes	Written Paper	80 marks (120 UMS)

A written paper of two sections, A and B, presented in a question and answer booklet. There are no optional questions. Quality of Written Communication is assessed in two questions.

Candidates will be required to prepare a spreadsheet on a specific topic, defined by WJEC, in advance of the written paper. Hard copies of the spreadsheet are taken into the examination and used to answer questions in Section B. This spreadsheet is submitted with the completed examination paper.

IT2	20%	Internal Assessment	80 marks (80 UMS)

Candidates undertake DTP and multimedia tasks, presenting the outcome for internal assessment and moderation by WJEC.

A LEVEL (the above plus a further 2 units)

IT3	30%	2 hours 30 minutes	Written Paper	90 marks (120 UMS)

A written paper of two sections, A and B, presented as a question paper requiring a separate answer booklet. Candidates answer all questions in Section A and one from two in Section B. Quality of Written Communication is assessed in two questions.

IT4	20 %	Internal Assessment	100 marks (80 UMS)

Candidates analyse, design, implement, test and evaluate a solution to a problem of their choice requiring the use of a relational database.

This is a substantial piece of work, undertaken over an extended period of time. It is internally assessed and moderated by WJEC.

INFORMATION & COMMUNICATION TECHNOLOGY

1 INTRODUCTION

1. 1 Criteria for AS and A Level GCE

This specification has been designed to meet the general criteria for GCE Advanced Subsidiary (AS) and A Level (A) and the subject criteria for AS/A *Information and Communication Technology* as issued by the regulators [2006]. The qualifications will comply with the grading, awarding and certification requirements of the Code of Practice for 'general' qualifications (including GCE).

The AS qualification will be reported on a five-grade scale of A, B, C, D, E. The A level qualification will be reported on a six-grade scale of A*, A, B, C, D, E. The award of A* at A level will provide recognition of the additional demands presented by the A2 units in term of 'stretch and challenge' and 'synoptic' requirements. Candidates who fail to reach the minimum standard for grade E are recorded as U (unclassified), and do not receive a certificate. The level of demand of the AS examination is that expected of candidates half way through a full A level course.

The AS assessment units will have equal weighting with the second half of the qualification (A2) when these are aggregated to produce the A level award. AS consists of two assessment units, referred to in this specification as IT1 and IT2. A2 also consists of two units and these are referred to as IT3 and IT4.

Assessment units may be retaken prior to certification for the AS or A level qualifications, in which case the better result will be used for the qualification award. Individual assessment unit results, prior to certification for a qualification, have a shelf-life limited only by the shelf-life of the specification.

The specification and assessment materials are available in English and Welsh.

1.2 Prior learning

There is no specific requirement for prior learning, although many candidates will have already gained a knowledge and understanding of Information and Communication Technology through their study of a GCSE or GCSE (Short Course) specification in ICT or a GCSE (Double Award) in Applied ICT.

This specification may be followed by any candidate, irrespective of their gender, ethnic, religious or cultural background. It is not age specific and can contribute to lifelong learning, irrespective of occupational pathway.

1.3 Progression

The four part structure of this specification (2 units for AS, and an additional 2 for the full Advanced) allows for both staged and end-of-course assessment and thus allows candidates to defer decisions about progression from AS to the full A level qualification.

This specification provides a suitable foundation for the study of *ICT* or a related area through a range of higher education courses vocational courses (e.g. Information Technology, Information Systems, Business Computing) or direct entry into employment. In addition, the specification provides a coherent, satisfying and worthwhile course of study for candidates who do not progress to further study in this subject.

1.4 Rationale

ICT is a subject that by its nature requires candidates to consider individual, moral, ethical, social, cultural and contemporary issues. The specification provides a framework for exploration of such issues and includes specific content through which individual courses may address these issues.

1.5 The Wider Curriculum

This specification provides opportunities for candidates to develop an understanding of spiritual, moral, ethical, social and cultural issues as they relate to the designer or user of ICT systems, for example in the AS, Sections 4.1.6 *Uses of ICT*, 4.1.9 *Human Computer Interface*, and particularly 4.1.10 *Social Issues,* which considers health and safety issues, acceptable use of ICT and legislation. In the A2 content, Section 4.3.1 *(Networks)* includes consideration of security strategies and auditing, 4.3.2 *(Moral, Social and Ethical Issues associated with the Internet)* includes censorship, privacy and effects upon communities, while 4.3.4 (*Working with ICT)* has content related to Codes of Conduct, viruses and software piracy.

The presenting information task (IT2) and relational database project (IT4) may serve to extend understanding of these issues in order that a balanced appreciation of the conflicts and dilemmas involved in the design and implementation of ICT systems may be encouraged.

This specification also supports sustainable development, health and safety considerations and European development, consistent with international agreements. Examples include 4.1.10 *Social Issues,* which includes the user's responsibilities with respect to the use of the Internet, RSI and legislation such as the Computer Misuse Act and the Data Protection Act. Section 4.3.4 *Working with ICT* includes Codes of Conduct and Section 4.3.5 considers *ICT Security Policies*).

The approach used in constructing the specification lends itself to the establishment of links with other areas of study, particularly those involving problem solving and the practical use of ICT.

1.6 Prohibited combinations and overlap

Every specification is assigned a national classification code indicating the subject area to which it belongs. Centres should be aware that candidates who enter for more than one GCE qualification with the same classification code will only have one grade (the highest) counted for the purpose of the School and College Performance Tables. The classification code for this specification is 2650.

1.7 Equality and Fair Assessment

AS/A levels often require assessment of a broad range of competences. This is because they are general qualifications and, as such, prepare candidates for a wide range of occupations and higher level courses.

The revised AS/A level qualification and subject criteria were reviewed to identify whether any of the competences required by the subject presented a potential barrier to any disabled candidates. If this was the case, the situation was reviewed again to ensure that such competences were included only where essential to the subject. The findings of this process were discussed with disability groups and with disabled people.

Reasonable adjustments are made for disabled candidates in order to enable them to access the assessments. For this reason, very few candidates will have a complete barrier to any part of the assessment. Information on reasonable adjustments is found in the Joint Council for Qualifications document *Regulations and Guidance Relating to Candidates who are eligible for Adjustments in Examinations.* This document is available on the JCQ website (www.jcq.org.uk).

Candidates who are still unable to access a significant part of the assessment, even after exploring all possibilities through reasonable adjustments, may still be able to receive an award. They would be given a grade on the parts of the assessment they have taken and there would be an indication on their certificate that not all of the competences have been addressed. This will be kept under review and may be amended in future.

1.8 Facilities Required

In order to provide suitable preparation for the examination, centres should have sufficient ICT support to provide candidates with access to a computer on a regular basis throughout the AS and A2 course.

Centres should provide access to a range of generic software packages, which must include a spreadsheet program with macro facilities, relational database management software with a programming capacity, and word processing/DTP/ presentation software.

ICT systems must provide facilities for generating hard copies for submission to WJEC.

Private candidates will be expected to have access to the same ICT facilities as those detailed above. Because of potential difficulties of securing appropriate supervision and facilities for the presenting information task (IT2) and the relational database project (IT4), prospective private candidates are strongly advised to contact WJEC **before** starting the course.

2 AIMS

This specification encourages candidates to become discerning users of ICT, developing a broad range of ICT skills and knowledge and understanding of ICT. This should form a basis for progression into further learning, including progression from AS to A2, and/or employment.

Specifically, it encourages candidates to develop:

- the capacity for thinking creatively, innovatively, analytically, logically and critically;
- the skills to work collaboratively;
- the ability to apply skills, knowledge and understanding of ICT in a range of contexts to solve problems;
- an understanding of the consequences of using ICT on individuals, organisations and society and of social, legal, ethical and other considerations on the use of ICT;
- an awareness of emerging technologies and an appreciation of the potential impact these may have on individuals, organisations and society.

3 ASSESSMENT OBJECTIVES

The AS and A level specifications have the same assessment objectives. In the A level specification, the assessment objectives relating to application, analysis and evaluation are given a higher weighting.

Knowledge, understanding and skills in ICT are closely linked. This specification requires that students demonstrate the following assessment objectives in the context of the content and skills prescribed in Section 4.

AO1 Knowledge and understanding

Candidates should be able to demonstrate knowledge and understanding of:

- the characteristics of data and information, and the need for their organisation and manipulation to facilitate effective use;
- the use of ICT for a range of purposes;
- the influence of social, cultural, legal, technical, ethical, economic and environmental considerations on the use of ICT;
- the consequences of using ICT for individuals, organisations and society;
- the components, characteristics and functions of ICT systems (including hardware, software and communication) which allow effective solutions to be achieved;
- the systematic development of high quality ICT related solutions to problems;
- emerging technologies and their implications for future use of ICT.

AO2 Skills

Candidates should be able to:

- Investigate and analyse problems and produce a specification;
- Design effective solutions;
- Select and use appropriate application software;
- Test and implement an effective ICT related system;
- Document specifications and solutions;
- Evaluate solutions and their own performance.

Weightings

Assessment objective weightings are shown below as a % of the full A level, with AS weightings in brackets.

Unit	%	AO1%	AO2%
IT1	30 [60]	28 [56]	2 [4]
IT2	20 [40]	0 [0]	20 [40]
IT3	30	22	8
IT4	20	0	20
Total	**100**	**50**	**50**

4 SPECIFICATION CONTENT

Information and Communication Technology is about the *application* of skills, knowledge and understanding. It is recommended therefore that the specification content is delivered in a practical way to enable candidates to recognise the purpose of knowledge and to be able to draw on it in practical situations.

The specification content is presented under the unit titles of:

4.1	**Unit IT1**	**Information Systems**	*(AS)*
4.2	**Unit IT2**	**Presenting Information**	*(AS)*
4.3	**Unit IT3**	**Use and Impact of ICT**	*(A2)*
4.4	**Unit IT4**	**Relational Databases**	*(A2)*

The first two sub-sections form the AS subject content. The two units are examined by a written paper (IT1) and internally assessed task (IT2). However, the holistic nature of Information and Communication Technology means that AS candidates are likely to address aspects listed under the content of the remaining (A2) units during the internally assessed task. The last two sub-sections form the A2 content. These two units are examined by a written paper (IT3) and an internally assessed project (IT4).

The content sections describe the knowledge and understanding which may be examined in the written papers IT1 and IT3. However, centres are encouraged to build upon their own expertise by developing specialist knowledge and understanding over and above the minimum requirement presented in these sections.

Where appropriate, opportunities for the delivery of Key Skills and the collection of naturally occurring evidence from within the specification content are signposted. These occur mainly in the practical units (IT2 and IT4). However, many topics identified within the specification content of units IT1 and IT3 may, depending on the teaching strategy employed, be used to initiate group discussions or as the basis for a presentation or an extended essay and therefore provide evidence for the Key Skill of Communication at Level Three.

By definition, the practical work in units IT2 and IT4 will provide evidence which can contribute towards the Key Skill of ICT 3.1, 3.2 and 3.3.

AS

4.1 Unit IT1 INFORMATION SYSTEMS

This section is about acquiring knowledge and understanding of information systems, which is assessed by means of a two and a quarter hours' written examination. However, candidates will also draw upon this knowledge during their practical work in Unit IT2. It also acts as a foundation for Unit IT4, *Use and Impact of ICT,* for those candidates going on to A Level.

The CONTENT column lists the essential knowledge and understanding associated with this unit: the AMPLIFICATION column expands upon this with notes for teachers delivering the specification. SECTION A and SECTION B relate to the two sections in the IT1 examination paper.

CONTENT	AMPLIFICATION
SECTION A	*This Section will account for 75% of the marks for IT1.*

4.1.1 Data, information and knowledge

The relationship between data, information and knowledge.	*Candidates should understand that:* • *data consists of raw facts and figures e.g. readings from sensors, survey facts;* • *information is data which has been processed by the computer;* • *knowledge is derived from information by applying rules to it;*
The reasons for encoding data and the problems associated with encoding.	*Candidates should understand why data is encoded and the potential problems associated with this, especially value judgements.*

4.1.2 The value and importance of information

The importance of up to date, accurate and complete information.	*Candidates should understand:* *that up to date, accurate and complete information adds value to organisations by aiding decision making, monitoring progress (company and individual) and the targeting of resources so giving a competitive advantage;*
The costs in terms of money, time and human resources to get good quality information.	*the costs associated with data collection (direct and indirect), data entry, processing and maintenance.*

4.1.3 Quality of information

How information can improve the quality of decision making.	*Candidates should understand that accurate, correctly targeted, understandable, complete, relevant, up to date information has user confidence.*
How to find information.	*On-line (Internet, Intranet, CD Roms) and non-ICT sources.*

4.1.4 Validation and verification

	Candidates should:
How data errors occur.	*understand how data errors can occur during input, transcription, processing and transmission;*
The purpose of validation and use of the common types.	*be able to define and understand the purpose of validation, including the following types: presence, format, range, data type, fixed value, check digit;*
The purpose of verification.	*be able to define and understand the purpose of verification, including the following types: double entry, proof reading, sending back printouts.*

4.1.5 Capabilities and limitations of ICT

Advantages of ICT over manual methods of processing data.	*Candidates should be able to give an application and explain each of the following: repetitive processing, speed of processing, data storage capacity, speed of searching, accuracy and speed of data communications, the ability to produce different output formats.*
Factors affecting the efficiency of data processing systems.	*Candidates should understand the effects of:* *hardware, software, suitability of the operating system, communication and input (GIGO);* *the nature of computer software, change in circumstances during development, speed of implementation, compatibility, insufficient testing, poor communications with user, abilities of the user, poor post-implementation procedures, maintenance procedures, cost, hardware, support.*

4.1.6 Uses of ICT

The examples of the uses of ICT presented below provide the contexts through which the rest of this section should be studied.

Candidates should (where relevant);

- *understand how input, storage and output devices work, what they are used for, and their strengths and limitations*
- *be able to discuss the problems caused by errors*
- *be aware of any relevant coding, validation, verification methods and identify and describe data handling processes associated with these activities*
- *be able to design appropriate field and data structures*
- *be able to describe the purpose and functions of the data held within the file*
- *be able to evaluate suitable HCI's*
- *be able to discuss changes in working practices, ethical issues and associated health hazards*
- *be able to describe the dangers from computer crimes and the measures needed to protect the data*
- *be able to discuss the advantages and disadvantages of using computer systems for **each** of the application areas.*

Business

CAD/CAM

- *features of CAD/CAM packages*
- *hardware requirements (speed of processor, memory, graphics card etc.*
- *advantages and disadvantages of using CAD/CAM software*
- *examples such as product design, home and garden design and fashion design would be suitable applications.*

Computer based shopping systems

- *payment methods*
- *on-line shopping*
- *e-commerce*
- *EFT*
- *EPOS*
- *bar codes*
- *other methods of data entry*
- *automatic stock control*
- *pricing*
- *just in time control systems, advantages / disadvantages*
- *HCI's*
- *loyalty cards.*

Education

Use of computers for Teaching and Learning

- *CAL - Computer Assisted Learning*
- *CBT - Computer Based Training*
- *distance learning*
- *video-conferencing*
- *online learning / e-learning*
- *chat rooms for discussion with tutors / experts*
- *features of software packages*
- *revision programs*
- *authoring software*
- *interactive whiteboards.*

School / college administration

- *computer based methods of registration e.g. OMR, wireless, smart cards, retina scans*
- *student record keeping.*

Health

Scanning, life support, computer controlled equipment

- *sensors (analogue and digital), data measured and its use*
- *scanning devices; MRI (magnetic resonance image); CAT (computerised axial tomography)*
- *advantages and disadvantages of scanning devices*
- *backup and recovery procedures*
- *new and future developments and limitations.*

Medical databases

- *electronic patient record keeping (EPR)*
- *blood bar coding and tracking systems ISBT 128*
- *use of the Internet, intranets and extranets*
- *distributed medical databases*
- *backup and recovery procedures*
- *new and future developments and limitations.*

Expert systems

- *Artificial Intelligence*
- *neural networks and how parallel processors work*
- *software languages (PROLOG, ASPRIN)*
- *expert system shells (knowledge base, inference engine, user interface)*
- *how expert systems work*
- *medical uses of expert systems e.g. MYCIN, NEOMYCIN etc.*
- *advantages and disadvantages of expert systems.*

Home

Entertainment

- *games*
- *photography*
- *music including downloading from the Internet and related issues*
- *MIDI, sequencers, notators, sound wave editors*
- *pay-to-view services*
- *home online / interactive shopping*
- *cinema and theatre booking*
- *email*
- *interactive services e.g. betting, voting, dating*
- *teletext services*
- *mobile phones.*

Home on-line banking

- *EFTPOS*
- *on-line banking (advantages and disadvantages)*
- *security*
- *card services - debit/ credit*
- *card crimes and methods of prevention.*

4.1.7 Presenting Information

	Candidates should understand:
Formats, media and audience	*that information may be presented in a range of different formats and via different media and the need to use the most appropriate format for the intended audience;*
	the nature and complexity of information, time to study, needs of the recipient, life span.
The use, key functions, advantages & disadvantages of:	*Candidates should have a broad understanding of the listed applications, including the following functions:*
	templates, style sheets, importing, mail merge, macros.
• Word processing / DTP	*Differentiate between the functions found in home DTP software and large-scale professional DTP software;*
• Presentation	*templates, creating a show, animated transitions, importing files, (including video and sound files), exporting files, data compression techniques;*
• Databases	*import/export, query, report;*
• Web authoring	*hyperlinks, formatting, use of animation, frames, HTML (note - understanding of the programming is not required).*

4.1.8 Networks

	Candidates should:
Networks and standalone computers	*be able to describe the characteristics and relative advantages of network and stand-alone computers;*
LANs and WANs	*be able to describe the difference between a Local Area Network and a Wide Area Network;*
The Internet, Intranet and Extranet	*define the Internet;*
	define and give examples of Intranet, Extranet;
	show an understanding of the Internet and its uses, including: benefits and developments, communications, sharing data and ideas, accessing information;
	benefits, disadvantages and dangers of email (services such as voice mailboxes, address books; group sending; file attachments);
	FTP (definition and purpose), newsgroups, chatrooms, on-line shopping, on-line databases accessing information;
	search engines (selection and appropriate use).

4.1.9 Human Computer Interface (HCI)

HCI requirements	*Candidates should understand the need to have a good dialogue between humans and machines, taking into account factors such as the task, user experience, user preference and resources.*
Types of HCI	*Candidates should understand the appropriate applications, input devices, advantages and disadvantages associated with the use of;* • *command lines such as MSDOS* • *GUIs - graphical user interfaces including Windows, Icons, Menus, Pointers;* • *voice interfaces:* *- speech recognition systems* *- natural language interfaces* *- speech synthesis;* • *graphical devices such as graphics pads* • *game playing devices such as joysticks, steering wheels, game pads;* • *touch sensitive screens such as public information systems; POS systems at retail outlets;* • *biometric devices such as iris recognition, hand prints.*

4.1.10 Social Issues

	Candidates should show:
Health and safety issues associated with ICT	*an awareness of RSI, stress, eyestrain, dependency, ELF radiation, back strain (posture) and their prevention;*
Acceptable use of ICT equipment and services	*an awareness of the user's responsibilities relating to the appropriate use of ICT equipment, networks and the Internet;*
Legislation covering the use of computers	*an understanding of the Computer Misuse Act, Data Protection Act (1998), Copyright Act;* *explain the consequences of malpractice and crime on information systems.*

4.1.11 Database Systems

Definition of a database	*Candidates should be able to define a database as a large collection of data items and links between them, structured in such a way that allows it to be accessed by a number of different applications programs.*
Advantages and disadvantages of a database approach over flat files	
Database security	*Hierarchy of passwords* *Storage of data separate to programs*

SECTION B *This Section will account for 25% of the marks for IT1.*

4.1.12 Modelling

Spreadsheet features and functions

When undertaking this unit candidates should; understand and use the following spreadsheet modelling concepts;

- *cell*
- *label*
- *data formats*
- *common formulas (as listed below)*
- *absolute cell referencing*
- *relative cell referencing*
- *single and multi-level sorting of data*
- *searching for data*
- *3D referencing*
- *named cell ranges*
- *data validation techniques*
- *graphing techniques*
- *macros to initiate automated routines*

Candidates should also understand and use:

- *the concept of workbooks*
- *a variety of spreadsheet facilities used for data entry including spinners, list boxes or combo boxes*
- *a variety of formulas and functions of a spreadsheet*
- *various formatting options of their spreadsheet to display a professional presentation*

Methodology and practice

This unit requires candidates to use ICT hardware and spreadsheet modelling software to solve a realistic problem and answer questions on their solution in the written examination. The spreadsheet solution must be prepared under supervised conditions as it will be taken into the written part of the examination. In researching potential solutions to the spreadsheet problem, candidates should have the opportunity to work collaboratively.

Solutions produced by the candidate will be used during the examination to answer questions in Section B of the paper. A hard copy of the spreadsheet workbook, including formula views must be submitted to the examiner, along with the candidate's script.

Instructions about the permissible content, layout and authentication of the spreadsheet workbook are provided in the Teacher's Guide.

The context for the task in 2009/2010 is '*business modelling'.*

Care must be taken to ensure an appropriately demanding task is undertaken which addresses the features listed below.

Candidates will be given credit when providing practical evidence from their task to support their answers in the written examination.

Candidates should produce a spreadsheet workbook which contains ***evidence*** *of;*

- *worksheets showing labels, data, formula*
- *multiple sheets and the use of 3D referencing between them*
- *lookup or vlookup or hlookup tables*
  - *drop down list boxes*
  - *spinners for data entry*
  - *logical True or False or Tick Boxes or Option boxes*
- *startup user interface*
- *validation techniques and error messages produced*
- *sorting techniques*
- *Search for specific criteria*
- *Control buttons should be used to initiate macros.*
- *Appropriate use of graphs such as bar or column graphs, line graphs, pie charts, scatter graphs, pictographs.*

Candidates should be familiar with the following formulas / standard functions:

A

- *SUM*
- *COUNT*
- *MAX*
- *MIN*
- *AVERAGE*
- *RAND*

B

- *SINGLE IF*
- *MULTIPLE IF*
- *DATE*
- *ROUND*

and should include evidence of at least two formulas or standard functions from list A and two from list B in their workbook.

Simulation Modelling

Candidates should understand and be able to discuss the following;

- *Definition of a simulation model*
- *Uses of simulation modelling for weather forecasting, car crash analysis and financial forecasting*
- *Advantages and disadvantages of using simulation models*
- *Issues relating to hardware used for simulation modelling, including parallel and distributed processing.*

4.2 Unit IT2 PRESENTING INFORMATION

This unit requires candidates to use ICT hardware and software applications to solve a problem involving three separate tasks: the production of (i) a document such as a leaflet or magazine (ii) a document containing automated routines, such as a mail merged letter. (iii) a presentation to an audience, such as a web page or slide type show.

An outline of the requirements of the three tasks is presented in the table below, which lists the features (basic and advanced) that should be included in each submission.

IT2 Presenting Information (Internally Assessed Task)			
Background			
Analysis of existing data processing activities			
Tasks	*Examples*	*Basic features*	*Advanced Features*
	Candidates must attempt all tasks	*Candidates should use **all** of these features*	**At least five** of the following are *required to access the higher mark ranges.*
Task 1 **DTP** Design & produce a document of at least two A4 sides and containing at least 150 words	▪ Leaflet or magazine	▪ Use of different font styles ▪ Use of different font sizes ▪ Use of bold, centre & underline ▪ Right or fully justify ▪ Autoshapes ▪ Bullet points ▪ WordArt ▪ Shading effects ▪ Headers and footers ▪ Use of at least **two** forms of electronic combination of graphical images *e.g. scanned images, graphics from the Internet, clipart from disc, digital camera images, graphs from a spreadsheet, graphics from a paint or CAD package* ▪ Tables	▪ Customised tables ▪ Different paragraph formats ▪ Different line spacing ▪ Superscript and subscript ▪ Page or frame borders ▪ Set and use own tabs ▪ Set and use own indents ▪ Watermarks ▪ Pagination ▪ Use of layering *(forward and behind)* ▪ Create own style sheets
Task 2 **Automated documents** Design & produce documents containing automated routines	▪ Mailmerge letters including macros	▪ Import data from an external source ▪ Design and use of professional format and layout for data ▪ Ensure automated routines work	▪ Individual macros or modules created using internal programming capabilities of the software package ▪ Individually designed templates *(other than the normal template or standard templates provided by wizards in the software package)*
Task 3 **Presentation** Design & produce a presentation of at least six slides / pages for an audience	***Either a*** ▪ Slide based presentation ***Or*** ▪ Web pages	▪ Background styles ▪ Animation effects ▪ Transition effects ▪ Hypertext ▪ Hotspots ▪ Bookmarks	▪ Use of sound ▪ Use of original video ▪ Use of original animation / Flash graphics

The design stage is crucial to the success of the final product. At this stage candidates should communicate clearly:

(i) the purpose of each of the documents and each of the pages / slides in their presentation
(ii) the intended audience / user(s)
(iii) the image and / or ethos they are trying to convey
(iv) detailed designs of documents, presentations, or web page, including (as appropriate):
- explanation of features used including page size, orientation, margin sizes, font styles, font sizes, paragraph styles
- explanation of any calculated data / automated routines
- the origin of graphics or other imported data
- explanation of any pre-processing of images or text
- navigation routes through the presentation system or web pages
- explanation of animated effects
- explanation of bookmarks, hypertext or hotspots
- explanation of macros and / or templates used
- settings for tabs or indents
- explanation of sound, video files, animation and any Flash graphics
- explanation of how the data might be compressed and stored

Outline Scheme of Assessment

Component	*Design of documents*	*Use of basic features*	*Use of advanced features*	*Total*
Background				**4**
Analysis of data processing activities				**6**
Task 1	**6**	**11**	**5**	**22**
Task 2	**6**	**6**	**6**	**18**
Task 3	**6**	**6**	**8**	**20**
Evaluation				**6**
Compression and storage techniques				**4**
Total				**80**

A detailed scheme of assessment is shown in Section 8.3

A Level

4.3 Unit IT3 USE AND IMPACT OF ICT

This section is about the use and impact of Information and Communication Technology. It is important to note that the amplification is not exhaustive: candidates should consider other contemporary hardware and software. Teachers should be aware of the need to update examples as technology develops over time.

The CONTENT column lists the essential knowledge and understanding associated with this unit: the AMPLIFICATION column expands upon this with notes for teachers delivering the specification.

CONTENT	AMPLIFICATION
4.3.1 Networks	
Choosing a network for a company	*Candidates should understand the factors which influence choice:* • *cost of network* • *size of organisation* • *how the system will be used* • *existing systems* • *performance required* • *security issues*
Types of networks available and the use of associated hardware	*Candidates should understand the advantages and disadvantages of:* • *client server networks* • *peer to peer networks*
Network topologies	*Bus/Ethernet* *Ring* *Star* *Suitable topologies for LAN and WAN* *Advantages and disadvantages of different network topologies*
Wireless networking	*Advantages and disadvantages of wireless networks*
Software components	
Network management, administration and problem solving strategies	*User accounts and logs; security strategies; configuration management; remote management; disaster planning (backup and restoration); auditing (keeping logs).*

4.3.2 The Internet	*Candidates should recognise the Internet as a network of networks.*
The Impact of the Internet upon Business	
Candidates should understand the use of associated hardware and the advantages and disadvantages of:	
(i) FTP	*Distribution of information between business and other organisations.*
(ii) E-commerce	*The requirements of interactive shopping, for example maintaining a company website, catalogue of stock, methods of secure payment, database of customer orders.* *Advantages and disadvantages to both the customer and business.*
(iii) Online databases	*How to access online information.* *How a search engine works, how web pages are added to search engine lists.* *Define and explain how the following can be used to access information:* • *URL's* • *Web crawlers* • *Boolean searches* • *Hyperlinks*
(iv) Distributed computing using the Internet	*Shared processing across the Internet and its advantages and disadvantages e.g. WHO's 'Popular Power' influenza research; music distribution; SETI research into radio signals.*
Connecting to the Internet	*Candidates should be able to:*
Cable access to the Internet	*describe the use of and the advantages and disadvantages of Dialup and Broadband;*
Mobile access to Internet	*describe the use of and the advantages and disadvantages of mobile access to the Internet.*
Moral, Social and Ethical Issues associated with the Internet	*Candidates should show an awareness and understanding of:* • *censorship* • *accuracy of information* • *privacy* • *effects upon communities* • *ownership and control*

4.3.3 Human Computer Interface (HCI)

The factors to be taken into account when designing a good user interface	*Candidates should understand the importance of:* • *consistency of signposting and pop up information* • *on screen help* • *layout appropriate to task* • *differentiation between user expertise* • *clear navigational structure* • *use by disabled people*

4.3.4 Working with ICT

Telecommuting

Teleworking	*'Working from home using computer networks'.* *Use and associated hardware.* *Advantages and disadvantages for the organisation and individual.*
Video-conferencing	*Use and associated hardware.* *Advantages and disadvantages for the organisation and individual.*

Codes of Conduct

Definition	*An agreement made by an employee to obey the rules of the organisation and work within specified guidelines as regards use of ICT and the Internet.*
Potential problems	*Introduction of viruses. Misuse of ICT such as using an organisation's printers for personal work. Using the Internet and running up telephone bills for own purposes, using company time for personal email.* *Distribution of material that is racially or sexually offensive.* *Misuse of data for illicit purposes.* *Inappropriate use of mobiles phones – in restaurants, schools, public transport.* *Blackmail, computer fraud or selling to other organisations.* *Violating terms of copyright or software agreements.*

Contents of a code of conduct	*Responsibilities* *Respecting rights of others* *Abiding by current legislation* *Protecting hardware and software from malicious damage* *Complying with licensing agreements* *Authorisation* *Permissions on data access* *Security defining rules about password disclosure, personal use of emails and the Internet and data transfer rules* *Penalties for misuse* • *informal warnings* • *written warnings* • *dismissal* • *prosecution*
Difference between Legal and Moral issues with respect to codes of conduct	***Disinformation*** *Not fully informing potential customers or clients of all available facts concerning products or services e.g. imminent introduction of new models.* ***Privacy*** *Informing data subjects of their legal rights and processes for complying with those rights.* *Monitoring company emails.* ***Employment patterns*** *Effects upon the workforce.* *Personal empowerment.* ***Equity*** *Information poor and information rich societies and the consequences of such.* ***Intellectual property rights*** *Ownership rights to data.*

4.3.5 ICT Security Policies

Candidates should understand: the potential threats and consequences for data misuse and understand the need for backup procedures	*Threats* • *Terrorism* • *Natural disasters* • *Sabotage* • *Fire* • *Theft*	*Consequences* • *Loss of business and income* • *Loss of reputation* • *Legal action*
The factors to take into account when designing security policies	*Physical security* *Prevention of misuse* *Audit trails for detection* *Continuous investigation of irregularities* *System Access - establishing procedures for accessing data such as log on procedures, firewalls* *Personnel administration* *Operational procedures including disaster recovery planning and dealing with threats from viruses* *Staff code of conduct and responsibilities* *Disciplinary procedures.*	
Operational procedures for preventing misuse	*Screening potential employees* *Routines for distributing updated virus information and virus scanning procedures* *Define procedures for downloading from the Internet, use of floppy discs, personal backup procedures* *Establish security rights for updating web pages* *Establish a disaster recovery programme* *Set up auditing procedures (Audit trails) to detect misuse.*	
Prevention of accidental misuse	*Backup and recovery procedures* *Standard backups to floppy disc* *RAID systems – mirror discs (Redundant Array of Inexpensive Disc)* *Grandfather, Father, Son systems* *Backing up program files.*	
Prevention of deliberate crimes or misuse	*Methods for controlling access to computer rooms* *Methods of securing integrity of transmitted data e.g. encryption methods including private and public keys. Call back procedures for remote access* *Establish firewalls* *Proxy servers* *Methods to define security status and access rights for users* *Methods for physical protection of hardware and software* *Security of document filing systems.*	

Factors determining how much a company spends to develop control, minimising risk	
Risk Analysis	*Identify potential risks* *Likelihood of risk occurring* *Short and long term consequences of threat* *How well equipped is the company to deal with threat*
4.3.6 Database systems	
Databases	*Explain the terms data consistency, data redundancy, data integrity and data independence.* *Explain the terms relational database organisation and data normalisation.* *Restructure data into normalised form.* *Describe the use of primary keys, foreign keys and links.* *Describe the advantages of different users having different views of data.* *Database security. Recognise that the individual user of a database may be prevented from accessing particular elements of the information.* *Data warehousing and data mining.* *The purpose of a database management system (DBMS), query languages and data dictionaries.*
Distributed databases	Candidates should be able to define a distributed database and discuss their advantages and disadvantages with reference to suitable examples.
4.3.7 Management of Change	
Consequences of change	*Candidates should be aware of the effects upon;* • *the skills required and not required* • *organisational structure* • *work patterns* • *internal procedures* • *the workforce (fears introduced by of change)*

4.3.8 Management Information Systems

	Candidates should: *recognise Management Information Systems as organised collections of people procedures and resources designed to support the decisions of managers;*
Features of an effective Management Information System	*appreciate that Management Information Systems should:* • *include data that is relevant and accurate* • *give information when required* • *be accessible to wide range of users* • *present data in the most appropriate format* • *be flexible*
Understand the flow of information between external and internal components of an MIS	*be able to draw and interpret data flow diagrams.*
Features of good MIS	*To include;* • *accuracy of the data* • *flexibility of data analysis* • *providing data in an appropriate form* • *accessible to a wide range of users and support a wide range of skills and knowledge* • *improve interpersonal communications amongst management and employees* • *allow individual project planning* • *avoid information overload*
Factors which can lead to poor MIS	*To include;* • *complexity of the system* • *inadequate initial analysis* • *lack of management involvement in initial design* • *inappropriate hardware and software* • *lack of management knowledge about computer systems and their capabilities* • *poor communications between professionals* • *lack of professional standards*

4.3.9 System Development Life Cycle (SDLC)

Candidates should understand the main components of the SDLC and how they may be applied to the development of a computerised solution as listed below.

System Investigation

Analysis of existing system and feasibility report

(a) Existing Hardware and Software

(b) Definition of the scope of the present system

- *Organisational chart*
- *Define sources of data*
- *Methods of data capture*

(c) Major data processing functions and processes

- *High level (contextual view) data flow*

(d) Identification of problems with the present system

(e) Identify user requirements for the new system

(f) Analysis of costs and benefits of the new system

System Analysis

Identify and understand tools and techniques used to analyse a system.

Identify external and internal components to a system and the flow of data between them including Data Flow Diagrams (DFDs), including High level (contextual view) DFDs and low level (detailed view) DFDs, decision tables and systems diagrams.

Candidates must be able to use all of the elements of a Data flow diagram correctly including:

- *flow direction line*
- *process*
- *entity*
- *data store*

Data dictionaries.

Entity Relationship diagrams.

Candidates should understand that a 'Data Model' includes an

Entity *Places, object or people represented by data in a spreadsheet or database*

Attribute *Information of facts about an entity*

Entity relationship modelling - candidates should be able to draw and interpret ERM diagrams: one to one, one to many, many to many.

System Design

Design of hardware, software, data and file structures, information systems, network and data transmission issues, personnel issues and security processes and procedures.

System Implementation	*Acquisition and installation of hardware and software re-training.* *Appropriateness of different changeover strategies including 'direct' and 'parallel running'.*
System Maintenance	*Technical and User Documentation.* *Maintenance issues including identification of errors, security issues, changes in the business environment, dissatisfaction with hardware and software, updating the system* *Perfective, Adaptive,Corrective maintenance*
System Evaluation	*Criteria for evaluating a system.* *Understand the tools and their appropriateness for gathering information for the evaluation report including quantitative test, Error Logging Interviews, Questionnaires* *Methods of avoiding post implementation cost.*

4.4 Unit IT4 RELATIONAL DATABASES

This unit requires candidates to produce a relational database project. The database project does not have to be based in an actual commercial context, but candidates should be encouraged to develop a realistic system.

The context for the project is left to the teacher and candidate, though care must be taken to ensure an appropriately demanding project is undertaken which addresses the published assessment criteria. If more than one candidate works in the same context the teacher must ensure that they work on independent outcomes to facilitate accurate assessment and subsequent moderation.

Relational database software provides various software tools to produce solutions to data handling problems. Candidates may use any ***suitable*** software to complete this project.

When undertaking this unit candidates should be able to:

- discover how a structured database could be used in an organisation
- understand data types and formats
- discover how data is captured and prepared for use in a relational database
- understand validation techniques to minimise errors
- learn and apply the principles of normalisation of data with respect to relational database design
- design, implement and test a relational database to meet a specification
- produce user documentation
- develop good practice in their use of ICT
- be able to evaluate their design

This unit may contribute towards the evidence for the Key Skill of Problem Solving 3.1, 3.2 and 3.3 as candidates have to *explore a complex problem, plan and implement at least one option for solving a problem* and *apply agreed methods to check if the problem has been solved.* The work may also contribute towards Improving Own Learning and Performance and, if candidates are developing a database for a *client* then aspects of Working with Others 3.1, 3.2 and 3.3 may also be covered.

When completing the database project, candidates should consider the following:

(i) the production of a clear set of user requirements for the database;

(ii) development of design specifications for a relational database which require at least three related tables;
there must be no repeating groups of data in a table;
all attributes in a table must be atomic;
all primary keys must remain unique - every foreign key must have a matching primary key in its related table;

(iii) implementation of the design for a relational database to the stated specification;

(iv) a test plan to fully test the relational database system, including annotated printed copies of all test results;

(v) the production of user documentation;

(vi) project management: managing their work effectively, including a project time plan;

(vii) an evaluation report.

Guidance on each of the above components follows:

	COMPONENT	AMPLIFICATION
(i)	**User Requirements**	*When developing a set of user requirements candidates should:* ▪ *give a general background description of their chosen organisation* ▪ *describe the image and ethos of the organisation* ▪ *specify the aims and objectives for the system* ▪ *outline the user interface requirements* ▪ *outline the security requirements* ▪ *specify the hardware and software requirements for the new system.*
(ii)	**Design Specification**	*When producing the design specification candidates should:* • *design fields required including calculated, date and time fields.* • *produce a data dictionary for all tables defining the entities* • *ensure primary and foreign keys have been defined clearly* • *Produce an entity relationship diagram* • *define relationships between tables* *They should design:* • *calculations to be included in reports and forms or queries* • *a user-friendly interface containing a menu structure* • *a security system to gain access to the database* • *forms which allow entry of data into a single table* • *forms to enable data entry into multiple tables* • *data validation checks on field entries and to enable the selection and entry of data from built-in lists (lookup lists)* • *report forms* • *queries (single and multiple field) for specified reasons / purposes* • *queries using relational links and logic between tables for specified reasons / purposes* • *queries using parameters for specified reasons / purposes* • *append, delete or update queries for specified reasons/purposes* • *any automated routines e.g. macros, modules, etc.* • *algorithms for individual routines which enhance solutions using the programming capabilities of the software package e.g. a password routine* • *a report from tables and/or from queries and other outputs to the system* *In the design of reports, candidates should:* • *have reports from tables or from queries* • *have suitable headers and footers* • *have sorted data grouping* • *include calculations, totals or other statistical fields clearly display fields and data.*

(iii) Implementation

The candidate's solution should be implemented as closely to the stated design as possible. Any changes to the original design must be annotated.

(iv) Testing

When testing the database candidates must produce a test plan which tests expected outcomes against actual outcomes. There should be clear evidence of all outcomes in the form of screenshots or printouts wherever appropriate.

Candidates must ensure that the test plan tests:

- *the user interface and all routes through the system*
- *all data entry forms with valid, invalid and extremes of data*
- *all validation procedures*
- *all reports*
- *all queries*
- *security systems*
- *all individual and automated routines*
- *that all calculations are correct*

(v) User Documentation

This is to help users of the system understand and use it effectively. It should therefore contain:

- *details of where to find the database (directories)*
- *how to start up the database*
- *details of how to enter passwords or other security procedures*
- *details of how to navigate the user interface*
- *details of how to add, delete, edit, print and save data in records via examples given in screenshots of data entry forms*
- *examples of validation text to support validation procedures*
- *instructions about responding to error messages*
- *instructions about using different types of queries and producing reports*
- *instructions about disaster recovery*

Guidance in the User Documentation should be supported by screenshots of the system wherever possible.

(vi) Evaluation

Candidates must critically evaluate their solution against;

- *the user requirements*
- *Problems encountered and strategies used to resolve them.*

(vii) Project Planning

Candidates must manage their work effectively and include a project time plan.

They will be expected to:

- *use suitable names for the database, tables, forms, queries etc.*
- *save work regularly*
- *keep dated backup copies of files on another disk, in another location*
- *work to a time plan*
- *protect confidentiality and observe copyright laws.*

Outline Scheme of Assessment

Components	*Max Mark*
User requirements	12
Design	24
Implementation	25
Testing	16
User Documentation	15
Evaluation	8
Total	**100**

A detailed scheme of assessment is shown in Section 8.4

5 SCHEME OF ASSESSMENT

AS and A level qualifications are available to candidates following this specification.

AS

The AS is the first half of an A level course. It will contribute 50% of the total A level marks. Candidates must complete the following **two units** in order to gain an AS qualification.

		Weighting Within AS	Weighting Within Advanced
IT1	**Information Systems**	60%	30%
IT2	**Presenting Information Task**	40%	20%

IT1: Written Paper (2 hours 15 minutes)

This is a written paper with two sections, A and B, presented in a question and answer booklet. There are no optional questions. The Questions are designed to assess breadth and depth of knowledge of the IT1 specification content shown on pages 11 to 19. The paper is marked out of 80.

Quality of Written Communication is assessed in questions on this paper.

Candidates will be required to prepare a spreadsheet on a specific topic, defined by WJEC, in advance of the written paper. Hard copies of the spreadsheet are taken into the examination and used to answer questions in Section B. This spreadsheet is submitted with the completed examination paper.

IT2: Presenting Information Task

Candidates are required to undertake DTP and multimedia activities in this task.

The unit stands alone as a flexible, worthwhile experience, providing candidates who do not progress beyond AS the opportunity to demonstrate high quality presentational skills in a practical way. For those going on to A Level, the unit offers preparation ahead of the main project in unit IT4.

Quality of written communication is assessed in this unit.

This internally assessed unit is marked by the centre and moderated by the WJEC.

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Advanced

The A level specification consists of two parts: Part 1 (AS) and Part 2 (A2).

Part 1 (AS) may be taken separately and added to A2 at a further examination sitting to achieve an A level qualification, or alternatively, both the AS and A2 may be taken at the same sitting.

Candidates must complete the AS units outlined above plus a further two units to complete A Level Information & Communication Technology. The A2 units will contribute 50% of the total A level marks.

		Weighting within A2	Weighting within Advanced
IT3*	**Use and Impact of ICT**	60%	30%
IT4*	**Relational Database Project**	40%	20%

*Includes synoptic assessment

IT3: Written Paper (2 hours 30 minutes)

This is a written paper with two sections, A and B, presented as a question paper requiring a separate answer booklet. The paper is designed to assess breadth and depth of knowledge of the IT3 specification content shown on pages 22 to 30 and will include some questions of a synoptic nature. The paper is marked out of 100.

Quality of written communication is assessed in some questions on this paper.

IT4: Relational Database Project

Candidates are required to use ICT hardware and relational database software to solve a realistic problem of their choosing. In doing so they are required to produce a clear set of user requirements, develop a design specification, implement and test the database, produce user documentation and show evidence of managing their work effectively. This project should represent about 50 hours of supervised time

At A Level, candidates are expected to demonstrate a greater depth to their ICT skills, an increased emphasis on the commercial aspects of ICT systems and an increased sensitivity to the wider effects of their work.

This is a substantial piece of work, undertaken over an extended period of time.

Quality of written communication is assessed in this unit.

This internally assessed unit is marked by the centre and moderated by the WJEC.

Synoptic Assessment

Synoptic assessment, testing candidates' understanding of the connections between the different elements of the subject and their holistic understanding of the subject, is a requirement of all A Level specifications. In the context of this specification, synoptic assessment is addressed by the links between:

- the content examined in IT1 which is examined in greater depth in IT3
- aspects of the assessment criteria included in IT2 which are extended in IT4.

Quality of Written Communication

Candidates will be required to demonstrate their competence in written communication in all assessment units, both AS and A2, where they are required to produce extended written material. Mark schemes for all units include the following specific criteria for the assessment of written communication.

- legibility of text; accuracy of spelling, punctuation and grammar; clarity of meaning;
- selection of a form and style of writing appropriate to purpose and to complexity of subject matter;
- organisation of information clearly and coherently; use of specialist vocabulary where appropriate.

Both assessment objectives subsume the use of written communication. Use of appropriate language, punctuation and grammar is expected as the means by which ideas can be expressed (e.g. in IT2 and IT4) and logical argument shown in answers to questions (e.g. IT1 and IT3). Marks will not be awarded unless the meaning is clearly conveyed. Mark schemes therefore will, where appropriate, be constructed to allow for the presentation of coherent accounts, cogent argument, appropriate format, use of computing terminology and clarity.

Availability of Units

All assessment units are available in the summer examination series.

The table below summarises the availability of all units, along with the first assessment opportunity for each.

Availability of Assessment Units

Unit	January 2009	June 2009	June 2010 & each subsequent year
IT1	✓	✓	✓
IT2		✓	✓
IT3			✓
IT4			✓

Awarding, Reporting and Re-sitting

The overall grades for the GCE AS qualification will be recorded as a grade on a scale from A to E. The overall grades for the GCE A level qualification will be recorded on a grade scale from A* to E. Results not attaining the minimum standard for the award of a grade will be reported as U (Unclassified). Individual unit results and the overall subject award will be expressed as a uniform mark on a scale common to all GCE qualifications (see table below). The grade equivalence will be reported as a lower case letter ((a) to (e)) on results slips, but not on certificates:

	Max. UMS	A*	A	B	C	D	E
Units IT1 and IT3 (weighting 60%)	120		96	84	72	60	48
Units IT2 and IT4 (weighting 40 %)	80		64	56	48	40	32
AS Qualification	200		160	140	120	100	80
A Qualification	400		320	280	240	200	160

At A level, Grade A* will be awarded to candidates who have achieved a Grade A in the overall A level qualification and 90% of the total uniform marks for the A2 units.

Candidates may re-sit units prior to certification for the qualification, with the best of the results achieved contributing to the qualification. Individual unit results, prior to certification of the qualification have a shelf-life limited only by the shelf-life of the specification.

6 KEY SKILLS

Key Skills are integral to the study of AS/A level Information & Communication Technology and may be assessed through the course content and the related scheme of assessment as defined in the specification. The following key skills can be developed through this specification at level 3:

- Communication
- Application of Number
- Problem Solving
- Information and Communication Technology
- Working with Others
- Improving Own Learning and Performance

Mapping of opportunities for the development of these skills against Key Skills evidence requirement is provided in 'Exemplification of Key Skills for Information & Communication Technology, available on the WJEC website.

7 PERFORMANCE DESCRIPTIONS

Introduction

Performance descriptions have been created for all GCE subjects. They describe the learning outcomes and levels of attainment likely to be demonstrated by a representative candidate performing at the A/B and E/U boundaries for AS and A2.

In practice most candidates will show uneven profiles across the attainments listed, with strengths in some areas compensating in the award process for weaknesses or omissions elsewhere. Performance descriptions illustrate expectations at the A/B and E/U boundaries of the AS and A2 as a whole; they have not been written at unit level.

Grade A/B and E/U boundaries should be set using professional judgement. The judgement should reflect the quality of candidates' work, informed by the available technical and statistical evidence. Performance descriptions are designed to assist examiners in exercising their professional judgement. They should be interpreted and applied in the context of individual specifications and their associated units. However, performance descriptions are not designed to define the content of specifications and units.

The requirement for all AS and A level specifications to assess candidates' quality of written communication will be met through one or more of the assessment objectives.

The performance descriptions have been produced by the regulatory authorities in collaboration with the awarding bodies.

AS performance descriptions for information and communication technology

	Assessment objective 1: knowledge and understanding	**Assessment objective 2: skills**
Assessment objectives	**Candidates should be able to demonstrate knowledge and understanding of:** • the characteristics of data and information, and the need for their organisation and manipulation to facilitate effective use • the use of ICT for a range of purposes • the influence of social, cultural, legal, technical, ethical, economic and environmental considerations on the use of ICT • the consequences of using ICT for individuals, organisations and society • the components, characteristics and functions of ICT systems (including hardware, software and communication) which allow effective solutions to be achieved • the systematic development of high-quality ICT- related solutions to problems • emerging technologies and their implications for future use of ICT.	**Candidates should be able to:** • investigate and analyse problems and produce a specification • design effective solutions • select and use appropriate application software • test and implement an effective ICT-related system • document specifications and solutions • evaluate solutions and their own performance.
A/B boundary performance descriptions	Candidates characteristically demonstrate**:** a) an understanding of the characteristics of data and information b) an appreciation of the need to organise and manipulate data to provide useful information efficiently c) a knowledge of how ICT is used for a range of purposes d) an understanding of how social, cultural, legal, technical, ethical, economic and environmental considerations affect the use of ICT e) a knowledge of the consequences of the use of ICT on society, individuals and organisations f) a knowledge of the hardware components that make up an ICT system and their main characteristics g) a knowledge of systems and applications software and how these are used to provide effective ICT solutions h) an understanding of the communications systems that support ICT use i) an understanding of the systematic approach required to develop high quality ICT solutions to problems. j) an appreciation of the rapid development of ICT technologies and the implications of emerging technologies for the future use of ICT.	Candidates characteristically demonstrate: a) the ability to analyse a substantial problem and draw up a specification b) the ability to select appropriate software with which to produce a solution. c) the ability to design effective solutions, documented appropriately d) the use of application software to implement effective solutions e) the ability to design and implement an appropriate testing strategy f) evaluation skills which analyse their own performance and that of their solution.

E/U boundary performance descriptions	Candidates should be able to demonstrate: a) a basic understanding of the characteristics of data and information b) some appreciation of the need to organise and manipulate data to provide useful information c) a knowledge of how ICT is used for a limited range of purposes d) a basic understanding of how some of the following considerations affect ICT use: social, cultural, legal, technical, ethical, economic and environmental e) a knowledge of the consequences of the use of ICT on society, individuals and organisations f) a knowledge of some of the hardware components that make up an ICT system and their main characteristics g) a basic knowledge of systems and applications software and how these are used to provide ICT solutions h) some understanding of the communications systems that support ICT use i) an understanding of the need for a systematic approach when developing ICT solutions to problems. j) some appreciation of the rapid development of ICT technologies.	Candidates characteristically demonstrate: a) the ability to analyse a straightforward problem and draw up a basic specification b) some ability to consider alternative software possibilities c) the ability to produce some documentation to communicate workable design solutions d) basic use of application software to implement a solution e) some ability to plan and implement a test strategy f) basic evaluation skills with some indication of the strengths and limitations of themselves and their solution.

A2 performance descriptions for information and communication technology

	Assessment objective 1: knowledge and understanding	**Assessment objective 2: skills**
Assessment objectives	**Candidates should be able to demonstrate knowledge and understanding of:** • The characteristics of data and information, and the need for their organisation and manipulation to facilitate effective use • The use of ICT for a range of purposes • The influence of social, cultural, legal, technical, ethical, economic and environmental considerations on the use of ICT • The consequences of using ICT for individuals, organisations and society • The components, characteristics and functions of ICT systems (including hardware, software and communication) which allow effective solutions to be achieved • The systematic development of high-quality ICT-related solutions to problems • Emerging technologies and their implications for future use of ICT.	**Candidates should be able to:** • Investigate and analyse problems and produce a specification • Design effective solutions • Select and use appropriate application software • Test and implement an effective ICT-related system • document specifications and solutions • evaluate solutions and their own performance.
A/B boundary performance descriptions	Candidates characteristically demonstrate: a) a clear understanding of the characteristics of data and information b) a full understanding of the need to organise and manipulate data to provide useful information efficiently c) a knowledge of how ICT is used for a wide range of purposes d) an in-depth understanding of how social, cultural, legal, technical, ethical, economic and environmental considerations affect the use of ICT e) a full understanding of the consequences of the use of ICT on society, individuals and organisations f) a knowledge of a wide range of the hardware components that make up an ICT system and their main characteristics g) a thorough knowledge of systems and applications software and how these are used to provide effective ICT solutions h) a clear understanding of the communications systems that support ICT use i) a full understanding of the systematic approach required to develop high quality ICT solutions to problems. j) an appreciation of the rapid development of ICT technologies and the implications of emerging technologies for the future use of ICT in a wide range of areas.	Candidates characteristically demonstrate: k) the ability to use subject-specific terminology appropriately and accurately l) the ability to analyse a complex problem and produce a detailed specification m) the ability to design an effective and efficient solution, with clear and detailed documentation n) the selection and use of appropriate software, using advanced features, to implant an effective solution o) the ability to design and implement a rigorous testing strategy using evaluation skills which analyse in depth their own performance and that of their solution.

E/U boundary performance descriptions	Candidates characteristically demonstrate: a) some understanding of the characteristics of data and information b) an understanding of the need to organise and manipulate data to provide useful information efficiently c) a knowledge of how ICT is used for a limited range of purposes d) a superficial understanding of how social, cultural, legal, technical, ethical, economic and environmental considerations affect the use of ICT e) an understanding of the consequences of the use of ICT on society, individuals and organisations f) a knowledge of most of the hardware components that make up an ICT system and their main characteristics g) a knowledge of systems and applications software and how these are used to provide ICT solutions h) a clear understanding of the communications systems that support ICT use i) limited understanding of the systematic approach required to develop ICT solutions to problems. j) some appreciation of the rapid development of ICT technologies and the implications of emerging technologies for the future use of ICT.	Candidates characteristically demonstrate: a) the ability to analyse a straightforward problem and draw up a specification with some degree of detail b) the ability to select appropriate software with which to produce a solution and justify their choice to some extent c) the ability to design workable solutions and produce some documentation d) the use of appropriate features of application software to implement working solutions e) the ability to design and implement a limited testing strategy f) evaluation skills which analyse both their own performance and that of their solution.

Synoptic assessment: Synoptic assessment draws on both assessment objectives and will test candidates' understanding of the connection between different elements of the subject. The statements within the assessment objectives contain an element of synoptic assessment.

8 INTERNAL ASSESSMENT GUIDELINES

8.1 Introduction

These instructions are provided to help teachers in the supervision and assessment of units IT2 and IT4. They consist of the following sections:

8.2 Assessment of internally assessed units

Each unit will be assessed in accordance with the guidelines set out below. The teacher will mark the unit and ensure that there is sufficient annotation and documentation to enable the moderator to assess the unit accurately.

8.3 Criteria for the Assessment of Unit IT2

The purpose of IT2 is twofold. On the one hand it is intended to provide a broad and flexible experience, which centres may tailor to the specific needs, interests and abilities of candidates, whilst providing a valuable preparation ahead of the main project. On the other hand the unit stands alone as a worthwhile experience, providing candidates who do not progress beyond AS the opportunity to demonstrate high quality presentation and ICT skills in a practical rather than theoretical way.

Detailed Assessment Grid IT2

Components	*Criteria*	*Mark*
Background	Description of the organization Ethos and house style	2 2
Data processing activities within the organisation	Desktop publishing (note for AM – this is analysis) Automated documents Presentation or web page	**2** **2** **2**
Task 1 – DESKTOP PUBLISHING		
Components	*Criteria*	*Mark*
Design of document	Purpose of document / intended user Detailed design of documents	**2** **4**
Use of basic features	Use of different font styles and sizes Use of bold, centre and underline Autoshapes Right or full Justification Bullet points WordArt Shading effects Headers and footers Use of at least two forms of electronic combination of graphical images *e.g. scanned images, graphics from the Internet, clipart from disc, digital camera images, graphs from a spreadsheet, graphics from a paint or CAD package* Tables	**1** **1** **1** **1** **1** **1** **1** **1** **2** **1**
Use of advanced features	Each of the following may be awarded one mark – up to a maximum of 5 marks for this section. Different paragraph formats 1 Different line spacing 1 Superscript and subscript 1 Customised tables 1 Page or frame borders 1 Set and use own tabs 1 Set and use own indents 1 Watermarks 1 Pagination 1 Use of layering *(forward and behind)* 1 Own style sheets 1	**5**

Task 2 – AUTOMATED DOCUMENTS		
Components	*Criteria*	*Mark*
Design of document	Purpose of document / intended user	**2**
	Detailed design of document	**4**
Use of basic features	Import data from an external source	**2**
	Use of suitable format and layout for data	**2**
	Ensure automated routines work	**2**
Use of advanced features	Individual macros or modules created using internal programming capabilities of the software package	**3**
	Individually designed templates *(other than the normal template)*	**3**

Task 3 – PRESENTATION		
Components	*Criteria*	*Mark*
Design of documents	Purpose of document / intended user	**1**
	Detailed design of documents	**4**
	Structure diagram showing pathways	**1**
Use of basic features	Background styles	**1**
	Animation effects	**1**
	Transition effects	**1**
	Hypertext	**1**
	Hotspots	**1**
	Bookmarks	**1**
Use of advanced features	Use of sound	**2**
	Use of original video	**4**
	Use of original animation / Flash graphics	**2**

EVALUATION	
Criteria	*Mark*
This section assesses the candidate's quality of written communication. Marks are awarded for the following criteria, but only if the candidate's response demonstrates: • legibility of text; accuracy of spelling, punctuation and grammar; clarity of meaning; • selection of a form and style of writing appropriate to purpose and to complexity of subject matter; • organisation of information clearly and coherently; use of specialist vocabulary where appropriate. A detailed and critical evaluation of all three tasks which examines the data, system and suggests future modifications *5-6 marks* A detailed evaluation of all tasks, which addresses the system and future modification *4-3 marks* Not all tasks have been evaluated or only a brief evaluation of all three tasks and limited suggestions for future modifications *2-1 marks*	**6**

COMPRESSION AND STORAGE TECHNIQUES	
Criteria	*Mark*
Identification of methods used	**2**
Justification of chosen method	**2**

8.4 Criteria for the Assessment of Unit IT4

This project should represent about 50 hours of supervised time.

Candidates are required to use ICT hardware and relational database software to solve a realistic problem of their choosing. In doing so they are required to produce a clear set of user requirements, develop a design specification, implement and test the database, produce user documentation and show evidence of managing their work effectively.

At A Level, candidates are expected to demonstrate a greater depth to their ICT skills, an increased emphasis on the commercial aspects of ICT systems and an increased sensitivity to the wider effects of their work.

The project represents an opportunity for the candidate to fulfil highly individual needs and interests.

In order to gain maximum marks candidates should attempt to cover as many of the criteria given in the table below as possible.

Detailed Scheme of Assessment

Components	*Criteria*	*Mark*
User Requirements		
Background	*Show a clear understanding of the background to the problem*	*2*
Expected outcomes / aims and objectives	*A clear statement of the aims and objectives of the system, along with the expected outcomes and house style and ethos of the organisation*	*6*
User Interface requirements	*Details of specific user interface requirements of the system*	*1*
Hardware	*Details of the minimum hardware requirements for the system to function.*	*1*
	Entity Relationship Diagram	*2*
Design		
Design of inputs	*Data dictionary*	*4*
	Normalisation	*2*
	Design of validation techniques	*2*
	Design of password protection technique	*1*
	Design of on screen data entry forms	*3*
Design of user interface	*Design of user-friendly, menu driven, front end interface*	*1*
	Design of queries (including purpose and structure)	*6*
Design of outputs	*Design of report*	*2*
Design of processes	*Automated routines using programming code*	*2*
	Design calculations in reports or forms	*1*

		Mark
Implementation	*Create tables and links*	*4*
	Data validation techniques	*2*
	Calculated field	*1*
	Create forms	*2*
	Create forms with subforms	*1*
	Create user friendly interface	*1*
	Macros	*2*
	Single table queries	*2*
	Multiple table queries	*1*
	Multiple table queries using relational links	*1*
	Parameter queries	*1*
	Append, delete or update queries	*1*
	Reports	*4*
	Individual enhancement of solutions using the programming capabilities of the software package	*2*

Components	*Criteria*	*Mark*
Testing to a Test Plan	*Test user interface and test all routes through the system*	*1*
	Test with valid data and extremes of data	*2*
	Test all validation procedures with invalid data	*2*
	Test report	*1*
	Test all queries	*6*
	Test security systems	*1*
	Test all individual and automated routines	*2*
	Test all calculations are correct	*1*
User Documentation	*Details of where to find the database (directories) and how to start up the database*	*1*
	Details of how to enter passwords or other security procedures	*1*
	Details of how to navigate the user interface	*1*
	Details of how to add, delete, edit, print and save data in records via examples given in screenshots of data entry forms	*5*
	Examples of validation text to support validation procedures	*2*
	Instructions about using different types of queries and producing a report	*4*
	Instructions about disaster recovery techniques	*1*
Evaluation	*Against user requirements*	*4*
	Problems encountered and strategies used to resolve them	*4*

Assessment Grid

	Very detailed and accurate with all criteria covered	*Detailed and accurate with most criteria covered*	*Some detail and accuracy with some criteria covered*	*Brief description or a list with few criteria covered*	*Very few criteria attempted or completed*	*None*
User Requirements	**12-10**	**9-7**	**6-4**	**3-2**	**1**	**0**
Design	**24-20**	**19-15**	**14-10**	**9-5**	**4-1**	**0**
Implementation	**25-21**	**20-15**	**14-10**	**9-5**	**4-1**	**0**
Testing	**16-13**	**12-9**	**8-5**	**4-3**	**2-1**	**0**
User Documentation	**15-12**	**11-9**	**8-5**	**4-3**	**2-1**	**0**

	Very detailed, critical and accurate	*Brief description, or a list*	*None*
Evaluation	**8-5**	**4-1**	**0**

8.5 Supervision and authentication

Malpractice

Before the course starts, the teacher is responsible for informing candidates of the WJEC's regulations concerning malpractice. Candidates must not take part in any unfair practice in the preparation of work required for assessment. They must understand that to present material copied directly from books or other sources *without acknowledgement* will be regarded as deliberate deception. Any candidate who uses, or is suspected of using or attempting to use, any unfair practice is to be reported to the WJEC immediately. If the Board is satisfied that a breach of the Regulations has occurred, the candidate may be disqualified from all subjects.

Supervision

Centres are responsible for providing sufficient supervision to be able to give an assurance that the assessments submitted are based on the work of the candidates concerned. As much work as possible must be undertaken under the direct supervision of teachers. If candidates undertake activities outside this supervision, some work associated with the activity must be undertaken under the direct supervision of teachers.

The teacher responsible for the supervision of the candidates' work will be required to certify that the marks submitted were awarded in accordance with the assessment criteria and that she/he is satisfied that the work submitted is that of the candidate concerned.

It is accepted that certain parts of a candidate's work may be taken from other sources where these are relevant and appropriate. This is perfectly acceptable as long as all such cases are clearly identified in the text and fully acknowledged. Where phrases, sentences or longer passages are quoted directly from a source, it is important that candidates use quotation marks or acknowledge ideas are taken from the work of others.

8.6 Marking of internally assessed work and standardisation

Internal standardisation

Centres following this specification must apply a consistent standard of marking across different teachers and teaching groups. Where more than one teacher is involved in assessment, centres are responsible for standardising assessments in order to ensure a single rank order of candidates for the centre as a whole.

Annotation and supporting evidence

The GCE / GCSE Code of Practice requires teachers; "... to show clearly how credit has been assigned in relation to the criteria defined in the specification." (Paragraph 5.16).

Annotation enables the moderator to check the centre's assessments against the assessment criteria and provides an opportunity to record the ephemeral evidence that is not otherwise available to the moderator.

Annotation should, therefore:

(a) highlight those key aspects of work which have led to the award of a particular mark. Direct reference to the assessment criteria is particularly helpful;
(b) provide examples of starting points where specific work has been initiated by the teacher;
(c) include full details of the nature of any assistance given to particular candidates which is beyond that given to the group as a whole;
(d) facilitate the standardisation of assessment within the centre;
(e) include any other notes which will help the moderator to appreciate the reasons for the marks given or the background to work undertaken.

Moderation

It is necessary to provide some method of moderating internal assessments of candidates' work to ensure that no injustice occurs to candidates as a result of variation in the standards applied by different centres. For this specification, the internal assessment of units IT2 and IT4 will be moderated by inspection.

Work will be submitted for moderation in May of the year of the examination. Where fewer than eleven candidates are entered, **all** outcomes will be reviewed. Where more than this number is involved a sample will be moderated in the first instance.

Adjustments to the assessments submitted by a centre will normally ensure that the rank order is unaltered, and will be made to bring centre's assessments into line with the national standard. The WJEC reserves the right to request that all submissions are seen if the exercise reveals problems which cannot be resolved by normal moderation procedures.

Problems with individual candidates

Where difficulties caused by illness or other special circumstances prevent appropriate work being submitted, the centre should use the standard WJEC procedures as soon as the difficulty becomes apparent.

Details of the special arrangements and special consideration for candidates with particular requirements are contained in the Joint Council for Qualifications document *Candidates with Special Assessment Needs: Regulations and Guidance.* Copies of this document are available from WJEC.

Retention of evidence

It is appreciated that the storage of tasks and project work can be difficult for centres entering a large number of candidates for this specification. However, provision must be made for the possibility of an enquiry about results, so candidates' marked work must be kept under secure conditions until such a time as the centre is certain no enquiry is to be made.

Teacher assistance

Internally assessed work at both AS and A level is as much a vehicle for teaching as for assessment. It is therefore expected that the teacher will need to give advice and assistance to the candidate as part of normal teaching. This should be provided freely, in such a way that candidates have alternative possibilities to explore, and their own decisions to make about accepting or using the information or advice provided by the teacher. There will, of course, be occasions when direct teacher intervention is necessary. In such cases, the details should be recorded on the assessment sheets.