GCE AS/A LEVEL

WJEC GCE AS/A LEVEL in

INFORMATION AND COMMUNICATION TECHNOLOGY

DESIGNATED BY QUALIFICATIONS WALES

SPECIFICATION

Teaching from 2017

For award from 2018 (AS)
For award from 2019 (A level)

Version 4 October 2019

This Qualification Wales regulated qualification is not available to centres in England.

SUMMARY OF AMENDMENTS

Version	Description	Page number
2	Removal of *Performance Descriptions* to align with reformed GCE qualifications and consequent re-numbering of sections from page 43.	43 onwards
3	'Awarding, reporting and re-sitting' section has been amended to clarify resit rules and the carry forward of NEA (internal assessment) marks.	42
4	Clarification of arrangements for the use of spreadsheet evidence in the Unit 1 assessment has been provided.	21

WJEC GCE AS and A LEVEL in INFORMATION AND COMMUNICATION TECHNOLOGY

For teaching from 2017
For AS award from 2018
For A level award from 2019

WJEC GCE AS AND A LEVEL ICT (WALES)

Subject/Option Entry Codes	English-medium	Welsh-medium
Advanced Subsidiary (AS) "Cash in" entry *A Level (A)"Cash in" entry*	2530QS 1530QS	2530CS 1530CS
IT1: Information Systems	2530U1	2530N1
IT2: Presenting Information Task	2530U2	2530N2
IT3: Use and Impact of ICT	1530U3	1530N3
IT4: Relational Database Project	1530U4	1530N4

Availability of Assessment Units			
Unit		**June 2018**	**June 2019 & each subsequent year**
IT1		✓	✓
IT2		✓	✓
IT3			✓
IT4			✓

Qualification Designation Numbers

Advanced Subsidiary: C00/1189/4
Advanced: C00/1177/9

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	24 %	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	16%	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	36%	2 hours 30 minutes	Written Paper	90 marks (180 UMS)

A written paper, 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	24 %	Internal Assessment	100 marks (120 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.

GCE AS and A LEVEL INFORMATION AND 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 40% weighting with the second half of the qualification (A2) having 60% 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.

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 access

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

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	24 [60]	22.4 [56]	1.6 [4]
IT2	16 [40]	0 [0]	16 [40]
IT3	36	26.4	9.6
IT4	24	0	24
Total	**100**	**48.8**	**51.2**

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.

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 the coarsening of data and subjective value judgements.*

4.1.2 The value and importance of good quality information

The costs in terms of money, time and human resources to get good quality information.	*Candidates should understand:* *the costs associated with data collection (direct and indirect), data entry, processing and maintenance.*

4.1.3 Quality of information

How using reliable 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.*

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;*
	understand that multiple validation may be applied to data but that some validation methods are more appropriate and robust than others.
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, for any given application, 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, for what they are used , and their strengths and limitations;*
- *understand how remote storage works, for what it is used and its strengths and limitations;*
- *be able to discuss types of data capture and processing errors and the problems caused by these errors;*
- *be aware of any relevant coding, validation, verification methods and identify and describe data handling processes associated with these activities using standard conventions;*
- *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 following application areas.*

Business

CAD/CAM

- *features of CAD/CAM packages;*
- *hardware requirements (type and speed of processor, cache, memory, graphics card etc.;*
- *advantages and disadvantages of using CAD/CAM software;*
- *3D printing, industrial plotters, lathes;*
- *examples such as product design, workplace, fashion, home and garden design would be suitable applications.*

Computer based shopping systems

- *payment methods;*
- *on-line shopping;*
- *other forms of e-commerce;*
- *EPOS and EFTPOS;*
- *bar codes;*
- *QR codes;*
- *Near-field communication (NFC) payment;*
- *other methods of data entry;*
- *automatic stock control;*
- *pricing;*
- *just in time stock control systems, advantages / disadvantages;*
- *HCIs;*
- *loyalty cards.*

Education

- ***Use of computers for Teaching and Learning** e-learning, CAL and CBT - Computer Assisted Learning and Computer Based Training;*
- *distance learning, online learning, video-conferencing;*
- *VLEs ;*
- *authoring software ;*
- *virtual and augmented reality.*

School / college administration

- *computer based methods of registration e.g. OMR, wireless, smart cards, biometrics, RFID tags, administration hardware and software systems;*
- *student record keeping;*
- *monitoring and tracking systems;*
- *parental access to pupil performance and behaviour data.*

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); PET (Positron emission tomography);*
- *advantages and disadvantages of scanning devices;*
- *backup and recovery procedures;*
- *remote diagnosis;*
- *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 and intranets ;*
- *distributed medical databases;*
- *backup and recovery procedures;*
- *cloud computing for healthcare;*
- *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

- *gaming; individual and multi-player games;*
- *remote gaming;*
- *digital photography;*
- *music including downloading from the Internet and related issues;*
- *music creation; MIDI, sequencers, notators, sound wave editors;*
- *music and video download services, advantages and disadvantages;*

Messaging services

- *Social networking services;*
- *Instant messaging services;*
- *Video ;*
- *mobile phones.*

Online banking

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

Online

- *cinema and theatre booking;*
- *interactive services, dating, voting;*
- *pay to view services;*
- *government services; passports, driving licences;*
- *real time information services; satellite navigation.*

Robotics

Medical robotics

- *medical robots; surgical, rehabilitation, disinfection, biorobots;*
- *advantages and disadvantages of the use of robotics in medical science.*

Robotic systems and artificial intelligence

- *autonomous vehicles;*
- *drones;*
- *virtual reality.*

Internet of things	• *interconnectivity of people and smart devices and their uses in the home, workplace and cities;* • *control of environmental conditions such as crops, transportation;* • *control of building access and security;* • *monitoring of use of utilities; smart metering;* • *monitoring and management of smart devices; fridges, heating, cooling;* • *healthcare; smart watches to monitor and measure fitness, internal body medical delivery devices, smart pills;* • *advantages and disadvantages of using interconnected smart devices.*

4.1.7 Presenting Information

Formats, media and audience	*Candidates should understand:* *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 and purpose;* *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:*
• Word processing / DTP	*templates, style sheets, reviewing tools, mail merge, macros, indexing;* *differentiate between the functions found in home DTP software and large-scale professional DTP software.*
• Presentations	*templates, creating a show, animated transitions, importing files, (including video and sound files), exporting files, data compression techniques;*
• Databases	*import/export, validation, 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 Networks, Personal Area Networks, Metropolitan Area Networks and Wide Area Network;*
Cyber Security	*be able to explain the purpose of encryption and the need for decryption;*
	be able to identify the need for WPA/ WEP protocols;
	demonstrate an understanding of the need for firewalls and describe how they function;
	be able to describe malware in terms of risk and protection from malware;
The Internet and Intranets	*define the Internet in terms of a world-wide communications network;*
	demonstrate an understanding of how traffic is routed on the Internet;
	define and give examples of restricted Intranets;
	demonstrate an understanding of the Internet and its uses, including: benefits and developments, communications, sharing data and ideas, accessing information;
	describe changes in working practices (collaborative working), teleworking and collaborative access to documents and email collaboration benefits, disadvantages (services such as voice mailboxes, address books; group sending; file attachments); and problems with the use of email;
	FTP (definition and purpose), newsgroups, chatrooms, on-line shopping, on-line databases accessing information;
	search engines (selection and appropriate use);
	cloud storage and 'dropbox' facilities.

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 terminal and Windows command line;* • *GUIs - graphical user interfaces including Windows, Icons, Menus, Pointers;* • *voice interfaces:* *- speech recognition systems* *- natural language interfaces* *- speech synthesis;* • *graphical devices such as graphics tablets* • *game playing devices such as joysticks, steering wheels, game pads; motion recognition cameras* • *touch sensitive screens such as public information systems; POS systems at retail outlets;* • *touch and force sensitive devices* • *biometric devices such as iris recognition, hand prints.*

4.1.10 Social Issues

Health and safety issues associated with ICT	*Candidates should show:* *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;* *an awareness of the consequences of the inappropriate use of ICT, which includes aspects of cyberbullying such as posting:* • *abusive messages on social media;* • *offensive comments online;*
Legislation covering the use of computers	*an understanding of current legislation covering the use of computers, data and electronic communication.* *explain the types and 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 relationships between them, structured in such a way that allows it to be accessed by a number of different applications programs.*
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;* • *methods for simplifying data entry including spinners, list boxes or combo boxes;* • *goal seek;* • *pivot tables;* • *conditional formatting;* • *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.

Spreadsheet evidence should be restricted to printouts or screenshots in both ordinary and formula view with no annotation other than the headings. The centre is responsible for ensuring that the candidate has not annotated the printouts.

It is up to the candidate to ensure that all features and formulas are readable and visible to the examiner.

The printouts should be attached to the declaration sheet provided by WJEC. These should then be given to the examinations officer who will give them back to the candidates at the beginning of the examination.

The spreadsheet printouts and declaration sheet, signed by both the teacher and the candidate, must be attached to the candidate's script and sent with it to the Examiner notified by WJEC.

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;*
- *absolute cell referencing*
- *lookup or vlookup or hlookup tables;*
- *simplify data entry:*
  - *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	*Candidates must attempt all tasks*	*Basic features*	*Advanced Features*
Task 1 **2 marks**	*Leaflet or magazine*	*Candidates should use **all** of these features – **10 marks***	**At least six** of the following are *required to access the higher mark ranges – **6 marks***
Task 1 **DTP** Design, plan and produce a document of at least two A4 sides and containing at least 200 words	▪ Leaflet	▪ Use of bold, centre & underline (all 3) ▪ Right or fully justify ▪ Autoshapes/WordArt ▪ Frames or frame borders ▪ Customised bullet points ▪ Shading effects ▪ Headers and footers ▪ Use one original image created by the candidate ▪ Use of a second imported image from a different source ▪ Customised tables	▪ Different paragraph formats ▪ Different line spacing ▪ Superscript and subscript ▪ Set and use own tabs ▪ Set and use own indents ▪ Watermarks ▪ Pagination ▪ Create own style sheets ▪ Automatic contents page ▪ Create and insert graphs, smart art
Task 2 **4 marks**	Mailmerge documents including macros	**6 marks**	**6 marks**
Automated documents produce documents containing automated routines	▪ Mailmerge	▪ Import data from an external source ▪ Design and use of professional format and layout for data ▪ Ensure automated routines work	▪ **Three** individual macros or modules created using internal programming capabilities of the software package ▪ Advanced reviewing tools such as comments, tracking changes, markups etc ▪ Demonstrate the use of search and replace ▪ Use of visual basic or embedded code

Task 3 **3 marks**	Slide based presentation Or Web pages	**6 marks**	**9 marks**
Presentation Design & produce a website or presentation of at least six slides / pages for an audience	***Either a*** ▪ Slide based presentation ***Or*** ▪ Web pages	▪ Original background styles or master slide/template ▪ Animation effects applied to text and graphics ▪ Transition effects ▪ Hypertexts ▪ Hotspots ▪ Bookmarks	▪ Use of original sound ▪ Use of original video ▪ Use of original animation / Flash graphics ▪ Embedded games or interactive media (must be original code)

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) where relevant, the image and / or ethos they are trying to convey
(iv) detailed designs of documents, presentations, or web page, including the following 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	**2**	**10**	**6**	**18**
Task 2	**4**	**6**	**6**	**16**
Task 3	**3**	**6**	**9**	**18**
Evaluation				**14**
Compression and storage techniques				**4**
Total				**80**

A detailed scheme of assessment is shown in Section 7.3

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* *Ring* *Star* *Mesh* *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 recovery planning (backup and restoration); auditing (keeping logs).*

4.3.2 The Internet	*Candidates should be able to describe the Internet in terms of a world-wide communications infrastructure.*
The Impact of the Internet upon Business	
Candidates should understand the use of associated hardware and the advantages and disadvantages of:	
(i) Information Sharing	*Distribution of information between business and other organisations.*
(ii) E-commerce	*Business to business (B2B) electronic data interchange.* *Online shopping.* *Online marketplaces which process 3rd party business to consumer (B2C) or consumer to consumer (C2C) sales.* *B2B buying and selling.* *Marketing to prospective and existing customer by e-mail, social media or other means.* *Advertising through websites, e.g. social media, product placement etc.* *Data mining and its analytical uses.* *Advantages and disadvantages to both the customer and business.*
(iii) Distributed computing using the Internet	*Shared processing across the Internet and its advantages and disadvantages*
(iv) Cloud Computing Services	*Advantages and disadvantages of using Cloud Computing Services to provide applications and development platforms.*
Connecting to the Internet	*Candidates should be able to:*
Cable access to the Internet	*compare contemporary methods of accessing the Internet including ADSL, SDSL, FTTC, FTTP;*
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

Remote Working

Teleworking	*'Working from home using computer networks'.* *Use and associated hardware. e.g. video conferencing.* *Advantages and disadvantages for the organisation and individual.* *Global accessibility.* *Mobile working.*

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	*Misuse of ICT in the workplace.* *Introduction of viruses.* *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 mobile phones – in restaurants, schools, public transport, theatres etc.*

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	***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.* ***Intellectual property rights*** *Ownership rights to data.* ***Equity*** *Information poor and information rich societies and the consequences of such.* ***The digital divide*** *Factors which cause the digital divide:* • *economic and technological factors;* • *social factors – fear of technology, lack of motivation, lack of training;* • *geographic factors;* ***Employment patterns*** • *effects upon the workforce;* • *personal empowerment.* *Information poor and information rich societies and the consequences of such – the impact of the digital divide.* *Measure being taken to narrow the gap.* *The benefits and drawbacks of reducing the gap.*

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 removable media, 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 disk.* *Remote backups.* *RAID systems – (Redundant Array of Inexpensive Disks)* *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 symmetric and asymmetric methodologies.* *Firewalls.* *Proxy servers.* *Ethical hacking and penetration testing.* *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 Data and the 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* *In terms of:* • *Volume;* • *Validity;* • *Variety;* • *Variability;* • *Complexity.*
Big data	*Data warehousing and data mining.* *Detecting and preventing fraud.* *Marketing campaigns.* *Combining big data with predictive analysis.* *Explain the terms data consistency, data redundancy, data integrity and data independence.*
4.3.7 Relational Database systems	*Explain what is meant by relational database organisation and data normalisation (first, second and third normal forms).* *Restructure data into third normal form.* *Explain and apply entity relationship modelling and use it to analyse problems.*

	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.* *The purpose of a database management system (DBMS), query languages and data dictionaries.*
Searching Data	
Distributed databases	Candidates should be able to define a distributed database and discuss their advantages and disadvantages with reference to suitable examples.

4.3.8 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 change).*

4.3.9 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	*Represent and interpret systems in an appropriate diagrammatic form showing the flow of data and the information processing requirements.* *See Appendix A for the list of appropriate symbols with which learners should be familiar.*

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.*
4.3.10 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*

See Appendix A for the list of appropriate symbols with which learners should be familiar.

Data dictionaries.

Entity Relationship diagrams.

See Appendix A for the list of appropriate symbols with which learners should be familiar.

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 ER 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.

Study of alternative system development methodologies and their advantages and disadvantages.

System Implementation

Acquisition and installation of hardware and software re-training.

Appropriateness of different changeover strategies including 'pilot', 'direct', 'phased' 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.

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;
(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;* ▪ *produce an entity relationship diagram.*
(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 and ensure normalisation.* *They should design:* • *calculations to be included in reports and forms or queries;* • *a user-friendly interface containing a menu structure;* • *data validation checks on field entries and to enable the selection and entry of data from built-in lists (lookup lists) validation must be designed and written by the candidates who must not rely on in-built validation routines;* • *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;* • *queries using SQL or other available code or notation;* • *any automated routines which must be designed using pseudo-code or flowcharts;* • *security system;* • *algorithms for individual routines which enhance solutions using the programming capabilities of the software package e.g. a password routine;* • *reports 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;* • *include calculations, totals or other statistical fields clearly display fields and data;* • *Show two different report structures, one single record format and another multiple record format.*

(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.

Candidates should also be aware of alternate methods of designing and implementing systems and their advantages and disadvantages.

(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, and edit 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.*

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 efficiently and effectively;*
- *protect confidentiality and observe copyright laws.*

Outline Scheme of Assessment

Components	*Max Mark*
User requirements	10
Design	24
Implementation	24
Testing	20
User Documentation	10
Evaluation	12
Total	**100**

A detailed scheme of assessment is shown in Section 7.4

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 40% 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%	24%
IT2	**Presenting Information Task**	40%	16%

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 10 to 22. 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 60% of the total A level marks.

		Weighting within A2	Weighting within Advanced
IT3*	**Use and Impact of ICT**	60%	36%
IT4*	**Relational Database Project**	40%	24%

*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 26 to 34 and will include some questions of a synoptic nature. The paper is marked out of 90.

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.

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	**June 2018**	**June 2019 & 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	B	C	D	E
Unit IT1 (weighting 24%)	120	96	84	72	60	48
Unit IT2 (weighting 16%)	80	64	56	48	40	32
Unit IT3 (weighting 36%)	180	144	126	108	90	72
Unit IT4 (weighting 24%)	120	96	84	72	60	48
AS Qualification	200	160	140	120	100	80
A Qualification	500	400	350	300	250	200

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.

A qualification may be taken more than once. However, if any unit has been attempted twice and a candidate wishes to enter the unit for the third time, then the candidate will have to re-enter all units and the appropriate cash-in(s). This is referred to as a 'fresh start'. When retaking a qualification (fresh start), a candidate may have up to two attempts at each unit. However, no results from units taken prior to the fresh start can be used in aggregating the new grade(s).

Marks for NEA (internal assessment) units may be carried forward for the life of the specification.

If a candidate has been entered for but is absent for a unit, the absence does not count as an attempt. The candidate would, however, qualify as a resit candidate.

6 WELSH BACCALAUREATE

In following this specification, learners should be given opportunities, where appropriate, to develop the skills that are being assessed through the Core of the Welsh Baccalaureate:

- Literacy
- Numeracy
- Digital Literacy
- Critical Thinking and Problem Solving
- Planning and Organisation
- Creativity and Innovation
- Personal Effectiveness

7 INTERNAL ASSESSMENT GUIDELINES

7.1 Introduction

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

7.2 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.

7.3 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 organisation	**1**
	Description of purpose of three different documents used by the organisation	**1**
	Ethos and house style displayed in all three documents	**1**
	How this ethos/house style is achieved	**1**
Data processing activities within the organisation	Desktop publishing (note for AM – this is analysis)	**2**
	Automated documents	**2**
	Presentation or web page	**2**
Task 1 – DESKTOP PUBLISHING		
Components	*Criteria*	*Mark*
Design of document	Purpose of document / intended user	**1**
	Description of house style and how it is to be achieved	**1**
Use of basic features	Use of bold, centre and underline (all three)	**1**
	Right or fully justify	**1**
	Autoshapes/WordArt	**1**
	Page or frame borders	**1**
	Customised Bullet points	**1**
	Shading effects	**1**
	Headers and footers	**1**
	Use of one original image created entirely by the candidate	**1**
	Use of a second imported image from a different source *e.g. clipart, scanned images, graphics from the Internet or a digital camera,*	**1**
	Customised tables	**1**

Use of advanced features	Each of the following may be awarded one mark – up to a maximum of 6 marks for this section. Different paragraph formats Different line spacing Superscript and subscript Set and use own tabs Set and use own indents Watermarks Pagination Automatic contents page Create own style sheets Create and insert graphs, smart art Complex use of photo editing software to create original graphic	**6**

Task 2 – EXTENDED REPORT		
Components	*Criteria*	*Mark*
Design of document	Purpose of document / intended user	**1**
	Description of house style and how it is to be achieved	**1**
	Detailed design of mail merged fields	**1**
	Detailed design of three macros	**1**
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	Three individual macros or modules created using internal programming capabilities of the software package	**3**
	Advanced reviewing tools such as comments, track changes, markups Demonstrate the use of search and replace Use of VBA or embedded code	**3**

Task 3 – PRESENTATION		
Components	*Criteria*	*Mark*
Design of	Purpose of document / intended user	**1**
	Detailed design of documents	**1**
	Structure diagram showing pathways	**1**
Use of basic features	Original Background styles	**1**
	Animation effects	**1**
	Transitions	**1**
	External hypertext	**1**
	Hotspots	**1**
	Bookmarks	**1**
Use of advanced features	Use of sound	**2**
	Use of original video	**2**
	Use of original animation / Flash graphics	**2**
	Embedded games created OR	
	Interactive media created	**3**

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: • 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. *10 -14 marks* A detailed evaluation of all tasks, which addresses the system and future modification. *6-9 marks* Not all tasks have been evaluated or only a brief evaluation of all three tasks and limited suggestions for future modifications. *1-5 marks*	**14**

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

7.4 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 including description of data processing activities*	*1*
Expected outcomes / aims and objectives	*A clear statement of the aims and objectives of the system, along with the expected outcomes, user interface requirements and house style and ethos of the organisation*	*7*
	Entity Relationship Diagram	*2*
Design		
Design of inputs	*Data dictionary* *Normalisation* *Design of validation techniques which are written and not reliant on built in routines* *Design of a data entry routine using lookup table or code (not just combo or list boxes)*	*4* *2* *4* *1*
Design of user interface	*Design of user-friendly, menu driven, front end interface and security*	*1*
Design of processes	*Design of a variety of queries (including purpose and structure)* *Automated routines using programming code designed using pseudo-code or flowcharts* *Design of additional calculations in a query or on a form*	*8* *2* *1*
Design of outputs	*Design of a report including fields, original headers/footers and calculation*	*1*

		Mark
Implementation	*Create tables and links (normalised to 3rd normal form)*	*4*
	Data validation techniques	*4*
	Create data entry forms, one with subform	*2*
	Create user friendly interface	*1*
	Create original macros	*1*
	Single table queries with search criteria	*1*
	Single table query with logical operator AND, NOT, OR, LIKE and search criterion / criteria	*1*
	Multiple table queries with search criterion/criteria	*1*
	Multiple table queries using relational links	*1*
	Parameter queries	*1*
	Append, delete or update queries	*1*
	Queries using coded SQL	*2*
	Report with original header and footer and calculation	*1*
	Individual enhancement of solutions using the programming capabilities of the software package	*2*
	Calculated field in query or form	*1*

Components	*Criteria*	*Mark*
Testing to a Test Plan	*Providing informed commentaries for all tests:*	
	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	*4*
	Test a report printout	*1*
	Test all queries	*8*
	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 a new record and delete and edit data in records via examples given in screenshots of data entry forms	*3*
	Two examples of validation text to support validation procedures	*1*
	Instructions about using different types of queries	*2*
	Instructions about disaster recovery techniques	*1*
Evaluation	*Evaluation of the solution and effectiveness of tools and techniques used.*	*4*
	Critical analysis and problem solving: • *Critical analysis* • *Comments on modifications made*	*6*
	Suggestions for future developments and improvements	*2*

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	**10-9**	**8-7**	**6-5**	**4-3**	**2 - 1**	**0**
Design	**24-20**	**19-15**	**14-10**	**9-5**	**4-1**	**0**
Implementation	**24-20**	**19-15**	**14-10**	**9-5**	**4-1**	**0**
Testing	**20-17**	**16-13**	**12-8**	**7-4**	**3-1**	**0**
User Documentation	**10-9**	**8-6**	**5-4**	**3-2**	**1**	**0**

	Very detailed, critical and accurate	*Brief description, or a list*	*None*
Evaluation	**12-7**	**6 - 1**	**0**

7.5 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.

7.6 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.

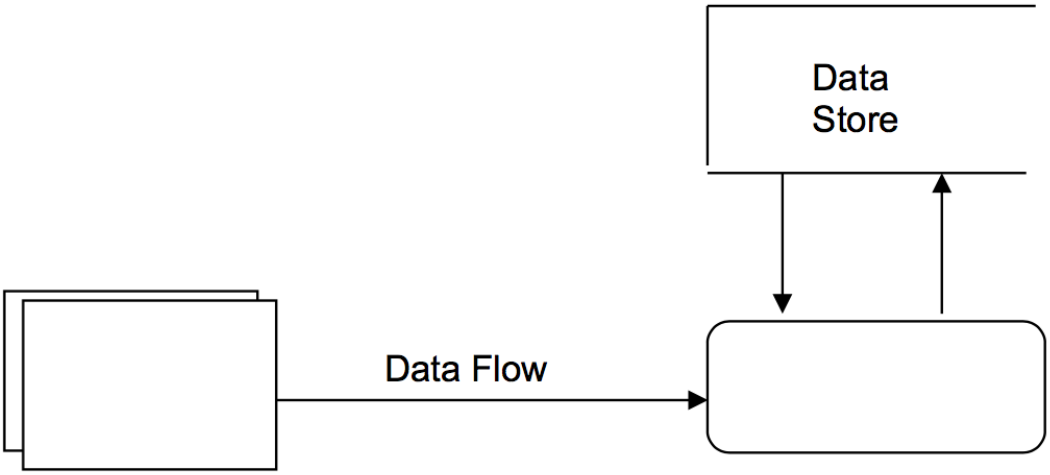
Appendix A

Conventions followed in the specification

Note 1

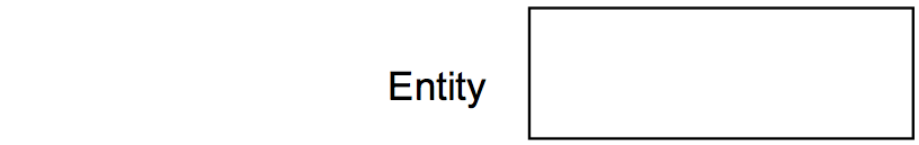
In general, the diagram conventions used will be those described in the current edition of *The BCS Glossary of ICT and Computing Terms* (published BCS Learning and Development Ltd).

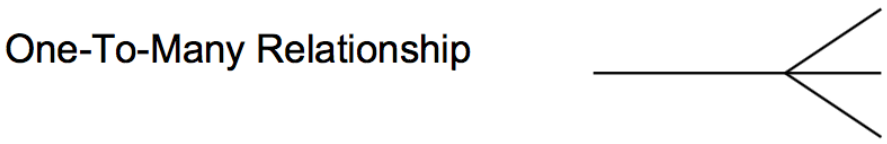
In the case of data flow diagrams, where no generally accepted symbols currently exist, candidates should be familiar with the following symbols, used in a number of current GCE textbooks:

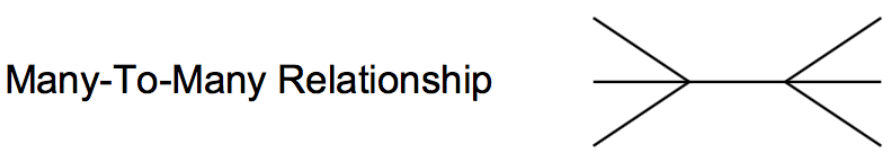


Note 2

The following symbols are used for entities and relationships.







Note 3

The following symbols are used in flowcharts: