

Level 2 Technical Award in Engineering 1145-502

Part of 1145-20

November 2017 Version 1.0

Guide to the examination

Who is this document for?

This document has been produced for centres who offer **City & Guilds Level 2 Technical Award in Engineering**. It gives all of the essential details of the qualification's external assessment (exam) arrangements and has been produced to support the preparation of candidates to take the exam.

The document comprises four sections:

1. **Details of the exam.** This section gives details of the structure, length and timing of the exam.
2. **Content assessed by the exam.** This section gives a summary of the content that will be covered in each exam and information of how marks are allocated to the content.
3. **Guidance.** This section gives guidance on the language of the exam, the types of questions included and examples of these, and links to further resources to support teaching and exam preparation.
4. **Further information.** This section lists other sources of information about this qualification and City & Guilds Technical Qualifications.

1. Details of the exam

External assessment

City & Guilds Technical qualifications have been developed to meet national policy changes designed to raise the rigour and robustness of vocational qualifications. These changes are being made to ensure our qualifications can meet the needs of employers and Higher Education. One of these changes is for the qualifications to have an increased emphasis on external assessment. This is why you will see an external exam in each of our Technical qualifications.

An external assessment is an assessment that is set and/or marked by the awarding organisation (ie externally). All City and Guilds Technical qualifications include an externally set and marked exam. This must be taken at the same time by all candidates who are registered on a particular qualification. We produce an exam timetable each year. This specifies the date and time of the exam so you can plan your delivery, revision and room bookings/PC allocation in plenty of time.

The purpose of this exam is to provide assurance that all candidates achieving the qualification have gained sufficient knowledge and understanding from their programme of study and that they can independently recall and draw their knowledge and understanding together in an integrated way. Whilst this may not be new to you, it is essential that your learners are well prepared and that they have time to revise, reflect and prepare for these exams. We have produced a Teaching, Learning, and Assessment guide that you should refer to alongside the present document ([Teaching, Learning and Assessment Guide](#)). If a learner does not pass the exam at their first attempt, there is only one opportunity to resit the exam, so preparation is essential.

Exam requirements of this qualification

- **Level 2 Engineering** – Theory exam (2 hours)

The exam is graded and a candidate must achieve at least a Pass grade in order to be awarded the qualification. (In addition to the exam, a synoptic assignment must also be completed and passed). You can find full details of the synoptic assignment in the *Qualification Handbook* and the *Synoptic Assessment Guide* – please see the link to the qualification page at the end of this document.

When does the exam take place?

The exam is offered on two fixed dates in March or June. The exact dates will be published at the start of the academic year in the *Assessments and Exam Timetable*
<http://www.cityandguilds.com/delivering-our-qualifications/exams-and-admin>.

At the start of the programme of study, in order to effectively plan teaching and exam preparation, centres should know when the exam will be taking place and allocate teaching time accordingly. Section 2 of this document gives a summary of the content that needs to be covered in order to prepare learners for the exam and full details of this are given in the *Qualification Handbook*.

Form of exam

The exam for this qualification is paper based (1145-502).

Can candidates resit the exam?

Candidates may resit the exam once only. If a candidate fails the exam both on the first attempt and when resitting it, that candidate has failed the qualification and cannot achieve it in that academic year.

How the exam is structured

The exam has a total of 80 marks and is made up of:

- approximately 5 – 7 short answer questions
- 1 extended response question.

Short answer questions are used to confirm **breadth of knowledge and understanding**.

The extended response question is to allow candidates to demonstrate **higher level and integrated understanding** through written discussion, analysis and evaluation. This question also ensures the exam can differentiate between those learners who are ‘just able’ and those who are higher achieving.

More details about, and examples of, question types are given in Section 3 of this document.

Assessment Objectives

The exams are based on the following set of assessment objectives (AOs). These are designed to allow the candidate’s responses to be assessed across the following three categories of performance:

- **Recollection** of knowledge.
- **Understanding** of concepts, theories and processes.
- **Integrated application** of knowledge and understanding.

In full, the assessment objectives covered by the exam for this qualification are:

Assessment objective	Mark allocation (approx. %)
<i>The candidate..</i>	
AO1 Recalls knowledge from across the breadth of the qualification.	40 %
AO2 Demonstrates understanding of concepts, theories and processes from a range of learning outcomes.	45 %
AO4 Applies knowledge, understanding and skills from across the breadth of the qualification in an integrated and holistic way to achieve specified purposes.	15 %

Booking and taking the exam

All assessments for City & Guilds Technical Exams must be booked through Walled Garden. There is a deadline for booking exams, synoptic assessments and any other centre marked assessments, please refer to the time line to check these dates.

The exam must be taken under the supervision of an invigilator who is responsible for ensuring that it is conducted under controlled conditions. Full details of the conditions under which the exam must be taken can be found in the Joint Council for Qualifications (JCQ) document, [Instructions for Conducting Examinations \(ICE\)](#).

Special consideration

Candidates who are unable to sit the exam owing to temporary injury, illness or other indisposition at the scheduled time may qualify for special consideration. This is a post-examination adjustment that can, in certain circumstances, be made to a candidate's final grade. The Joint Council for Qualifications' guide to the special consideration process can be found at www.jcq.org.uk.

To make a request for special consideration, please contact: policy@cityandguilds.com

Access arrangements

Access arrangements are arrangements that allow candidates with particular requirements, disabilities or temporary illness to take assessments, where appropriate, using their normal way of working. The Joint Council for Qualifications document, *Access Arrangements and Reasonable Adjustments* gives full details and can be downloaded [here](#).

For further information and to apply for access arrangements please see:

[Access arrangements - When and how applications need to be made to City & Guilds](#)
[Applying for access arrangements on the Walled Garden](#)

2. Content assessed by the exam

Level 2 Engineering

The exam assesses:

- **Unit 201: Engineering communication**
- **Unit 202: Engineering development**

The exam assesses a sample of the content of these units. This means that a single exam will **not** cover 100% of the unit content. The full range of content will be assessed over a number of examination series. Details of the coverage of a particular exam paper will **not** be released in advance of the exam itself. Centres should **not** make assumptions about what will be assessed by a particular exam based on what has been covered on previous occasions. In order to be fully prepared for the exam, learners **must** be ready to answer questions on **any** of the content outlined below.

The table below provides an overview of how the qualification's units are covered by the exam and the number of **marks** available per unit (ie **not** the number of *questions* per unit). In preparing candidates for the exam, we recommend that centres take note of the number of marks allocated to each unit and to assign teaching and preparation time accordingly.

In preparing candidates for the exam, centres should refer to the Qualification Handbook which gives full details of each unit/Learning Outcomes. The following is a summary of the qualification content which is assessed by the exam.

Unit	Learning outcome	Topics	Number of marks per unit
201 Engineering communication	LO1 Understand engineering drawing conventions	1.1 Types of engineering drawings 1.2 Drawing projection methods	34
	LO2 Understand the operation of Computer Aided Design (CAD)	2.1 Features of a CAD system 2.2 Visual representation of engineering concepts	
	LO3 Understand the use of basic components in engineering	3.1 Mechanical components 3.2 Electrical components	

	LO4 Understand basic units of measurement used in engineering	4.1 Units of measurement 4.2 Application of measurement 4.3 Measurement devices	
202 Engineering development	LO1 Understand the types and properties of materials that are used to make engineered products	1.1 Material properties 1.2 Types of Material	34
	LO2 Understand the methods used to manufacture commercial products	2.1 Shaping and forming processes 2.2 Joining and finishing processes	
	LO3 Understand the methods used to make prototype products	3.1 Virtual Modelling 3.2 Block Modelling 3.3 Rapid Prototyping 3.4 Modular kits 3.5 Creating a prototype	
	LO4 Understand the importance of design criteria in evaluation	4.1 Design criteria 4.2 Evaluation	
Total marks for sections:			68 marks
Integration across units*:			12 marks
Total marks for exam:			80 Marks

* *Integration across units.* These marks relate to Assessment Objective 4. These marks are awarded to differentiate between levels of performance by candidates taking the exam. The marks are given for how well a candidate has applied their knowledge, understanding and skills from across the units that make up the qualification in an integrated way to meet the requirements of the exam questions.

3. Guidance

Vocabulary of the exam: use of 'command' verbs

The exam questions are written using 'command' verbs. These are used to communicate to the candidate the type of answer required. Candidates should be familiarised with these as part of their exam preparation.

The following guidance has been produced on the main command verbs used in City & Guilds Technicals exams.

A more detailed version of this table, which also includes the command verbs used in the assignments is published in *City & Guilds Technical Qualifications Teaching, Learning and Assessment* guide.

Command verb	Explanation and guidance
Analyse	Study or examine a complex issue, subject, event, etc. in detail to explain and interpret, elements, causes, characteristics etc.
Calculate	Work out the answer to a problem using mathematical operations
Compare (...and contrast) (or describe the similarities/differences)	Consider and describe the similarities (and differences) between two or more features, systems, ideas, etc.
Define	Give the meaning of, technical vocabulary, terms, etc.
Describe	Give a detailed written account of a system, feature, etc. (..the effect of...on...) the impact, change that has resulted from a cause, event, etc. (..the process..) give the steps, stages, etc.
Differentiate between	Establish and relate the characteristic differences between two or more things, concepts, etc.
Discuss	Talk/write about a topic in detail, considering the different issues, ideas, opinions related to it
Distinguish between	Recognise and describe the characteristic differences between two things, or make one thing seem different from another
Evaluate	Analyse and describe the success, quality, benefits, value, etc. (of an end product, outcome, etc.)
Explain	Make (a situation, idea, process, etc.) clear or easier to understand by giving details (..how..) Give the stages or steps, etc. in a process, including relationships, connections, etc. between these and causes and effects.
Give example(s) illustrate/	Use examples or images to support, clarify or demonstrate, an explanation, argument, theory, etc.
Give a rationale	Provide a reason/reasons/basis for actions, decisions, beliefs, etc.

Identify	Recognise a feature, usually from a document, image, etc. and state what it is
Justify	Give reasons for, make a case for, account for, etc. decisions, actions, conclusions, etc., in order to demonstrate why they suitable for or correct or meet the particular circumstances, context
Label	Add names or descriptions, indicating their positions, on an image, drawing, diagram, etc.
List	Give as many answers, examples, etc. as the question indicates (candidates are not required to write in full sentences)
Name	Give the (technical) name of something
Propose	Present a plan, strategy, etc. (for consideration, discussion, acceptance, action, etc.).
Select	Choose the best, most suitable, etc., by making careful decisions
State	Give the answer, clearly and definitely
Summarise	Give a brief statement of the main points (of something)

Question types

The following explains, and gives examples of, types of questions used in City & Guilds Technical exams. In preparing candidates to take the exam, it is recommended that you familiarise them with the requirements of each question type so that they can be effective and make best use of the time available when sitting the exam.

- An effective candidate will gauge the type and length of response required from the question and the number of marks available (which is given for each question on the exam paper).
- Short answer questions may not require candidates to write in complete sentences. Extended response questions will require a more developed response.
- Candidates should read the exam paper before attempting to answer the questions and should allocate time proportionate to the number of marks available for each question or section.

Question type:	Example question	Example mark scheme:
<p>Multiple Choice questions These are objective questions with a predetermined answer. These consist of a question (or stem) and four options. The candidate should select the correct option (the key). The other 3 options (the distractors) will be plausible, but incorrect in some significant respect so that the candidate is required to consider and reject these in order to identify the correct option.</p>	<p>This question type is not used in this examination.</p>	

Question type:**Example question****Example mark scheme:****Short answer questions (restricted response)**

These are questions which require candidates to give a brief and concise written response. The number of marks available will correspond to the number of pieces of information/examples and the length of response required by the question.

Describe how an electrical component should be fixed to a printed circuit board using soldering.

- Place the component in the correct location on the PCB
- Tin the soldering iron
- Apply heat to the join / use the soldering iron
- Feed in the solder
- Any other appropriate response.

Award 1 mark for **each** relevant action up to a **maximum** 3 marks.

Question type:	Example question	Example mark scheme:
<p>Structured Response Questions These are questions that have more than one part (eg a), b), etc.). The overall question is made up of linked, short answer questions which move the candidate through the topic in a structured way. For example, the question will usually start with a 'recall'/'state'/'describe' question followed by an 'explain' to draw out understanding of the topic. They usually have a shared introductory 'stem', and the number of marks may increase through the question.</p>	<p>A designer is thinking about making a product by vacuum forming.</p> <p>a) Describe the process of vacuum forming a product from start to finish.</p> <p>b) State a suitable material for vacuum forming.</p> <p>c) Give two reasons why this material is suitable for vacuum forming.</p>	<p>a)</p> <ul style="list-style-type: none"> • Place mould in the machine • Clamp plastic over the mould • Heat the plastic • Raise the plattern / mould • Turn on the vacuum / suck the air out • Blow back some air • Lower the plattern / mould • Remove the mould • Cut off any excess material • Any other appropriate response. <p>Award 1 mark for each relevant point in the process up to a maximum of 5 marks. Award 1 mark for correct sequence in a process where a minimum of four correct points in the process are given.</p> <p>b) Thermoplastic or any named thermoplastic. Award 1 mark for a correct response.</p> <p>c) Award 1 mark each of any two of the following points:</p> <ul style="list-style-type: none"> • When heated it changes shape • When cooled it retains the new shape • It can be reshaped • Any other appropriate response.

Extended response questions

Extended response questions are those that require the candidate to write a longer written response using sentences and paragraphs. These usually require candidates to discuss, explain, etc. a topic in some detail. The question is often based on a short case study, scenario or other prompt. The level of detail should be gauged from the question and the number of marks available.

Example question

An engineering company manufactures tooling in small quantities for use by other companies. They are considering changing the way they create drawings of their products from manually produced to using CAD software.

Discuss the advantages and disadvantages of using CAD software instead of manually creating drawings of products.

Mark scheme

Indicative content:

Advantages:

- Increased accuracy
- Drawings can be changed quickly
- You can edit a previous drawing – you do not have to restart it from scratch
- Drawings can be shared electronically
- People in different parts of the world can work on the same drawing at different times of the day
- Electronic files can be sent directly to machines to make products
- Products can be tested virtually
- Different renders can be applied to see what the drawing looks like
- Libraries of standard parts can be used.

Disadvantages:

- Training may be required to use the software
- The CAD software can be quite expensive
- Any other appropriate response.

Band 1 (1 – 4 marks)

Descriptive response based on recall of knowledge, stating a few advantages or disadvantages in general terms.

Candidates at the top of this level may be characterised by showing some understanding of why one of these advantages is applicable specific to the stated context.

Example band 1 response

CAD drawings are more accurate. They can be changed more quickly as you don't have to restart a drawing when you want to change it. You can also email them to other people or CAM machines.

Band 2 (5 – 8 marks)

Mainly descriptive response showing knowledge recall, giving a range of advantages and disadvantages relative to the stated context.

Candidates at the top of this level may demonstrate understanding of some reasons for different advantages or disadvantages.

Example band 2 response

Compared to manual drawings, CAD drawings may be more accurate, helping the people who are making the tooling to see exactly what is needed. Drawings can be easier to create or change as you can edit other drawings, for example if a customer wants slightly different tools. However, the CAD software might cost a lot and the designers would need training on how to use it.

Band 3 (9 – 12 marks)

Detailed response showing both knowledge recall and understanding of a wide variety of advantages and disadvantages, all relevant to the stated context.

Candidates at the top of this level may be characterised by considering the relative impact of different advantages and disadvantages within the stated context.

Example band 3 response

CAD drawings can be quicker to create than manual drawings, as you can edit previous versions rather than restarting from scratch. This means that the company will be able to respond to orders from customers quicker, whilst at the same time spending less on creating drawings. Although there is a cost for the CAD software and to train staff to use it, this can be less than the savings if lots of drawings are needed which is likely if tooling is being produced for lots of different customers.

The CAD drawings can also be shared more easily than manual drawings, as you can use email. Whilst there may be concerns about competitors getting hold of electronic drawings, email is very quick and would help the company to make things quicker if they are making the tools on a different site or in a different country. CAD would also allow direct transfer to CAM machines to make the tools, which could save time and therefore cost to make them.

Examination technique

Candidates with a good understanding of the subject being assessed can often lose marks in exams because they lack experience or confidence in exams or awareness of how to maximise the time available to get the most out of the exam. Here is some suggested guidance for areas that could be covered in advance to help learners improve exam performance.

Before the exam

Although candidates cannot plan the answers they will give in advance, exams for Technical qualifications do follow a common structure and format. In advance of taking the exam, candidates should:

- be familiar with the structure of the exam (ie number and type of questions)
- be aware of the amount of time they have in total to complete the exam
- have a plan, based on the exam start and finish time for how long to spend on each question/section of the exam
- be aware of how many marks are available for each question, how much they should expect to write for each question and allow most time for those questions which have the most marks available.

At the start of the exam session

At the start of the exam, candidates:

- should carefully read through the instructions before answering any questions
- may find it helpful, where possible, to mark or highlight key information such as command words and number of marks available on the question paper
- identify questions which require an extended written answer and those questions where all or part of the question may be answered by giving bullets, lists etc. rather than full sentences.

Answering the questions

Candidates do not have to answer exam questions in any particular order. They may find it helpful to consider, for example:

- tackling first those questions which they find easiest. This should help them get into the 'flow' of the exam and help confidence by building up marks quickly and at the start of the exam
- tackling the extended answer question at an early stage of the exam to make sure they spend sufficient time on it and do not run out of time at the end of the exam.

Candidates should avoid wasting time by repeating the question either in full or in part in their answer.

Candidates should **always** attempt every question, even questions where they may be less confident about the answer they are giving. Candidates should be discouraged however, from spending too long on any answer they are less sure about and providing answers that are longer and give more detail than should be necessary in the hope of picking up marks. This may mean they have less time to answer questions that they are better prepared to answer.

Extended answer questions

Before writing out in full their answer to extended questions, candidates may find it helpful to identify the key requirements of the question and jot down a brief plan or outline of how they will answer it. This will help clarify their thinking and make sure that they don't get 'bogged down' or provide too much detail for one part of the question at the expense of others.

Towards the end of the exam

Candidates should always set aside time at the end of the exam to read back through and review what they have written in order to make sure this is legible, makes sense and answers the question in full.

If a candidate finds they are running out of time to finish an answer towards the end of the exam, they should attempt to complete the answer in abbreviated or note form. Provided the content is clear and relevant, examiners will consider such answers and award marks where merited.

Further guidance on preparing candidates to take the exam is given in the City & Guilds publication, [Technical Qualifications, Teaching, Learning and Assessment](#) which can be downloaded free of charge from City & Guilds website.

4. Further information

For further information to support delivery and exam preparation for this qualification, centres should see:

City & Guilds

Qualification homepage: [1145 Technicals in Engineering](#) which includes:

- Qualification handbook
- Synoptic Assignment
- Sample assessments

Technical Qualifications, Resources and Support: www.cityandguilds.com/techbac/technical-qualifications/resources-and-support

Joint Council for Qualifications

Instructions for Conducting Examinations: <http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations>