

Level 2 Technical Certificate in Engineering (1145-21)

March 2018 Version 1.1

Guide to the examination

Version and date	Change detail	Section
1.1 March 2018	<ul style="list-style-type: none"><li data-bbox="488 268 883 296">• Exam duration information.	Exam requirements for this qualification

Who is this document for?

This document has been produced for centres who offer **City & Guilds Level 2 Technical Certificate 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/s.

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 is 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.

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

Each exam has a total of 60 marks and is made up of:

- Approximately 12 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.	35%
AO4 Applies knowledge, understanding and skills from across the breadth of the qualification in an integrated and holistic way to achieve specified purposes.	25%

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

Theory exam

The exam assesses:

- **Unit 203: Principles of engineering**
- **Unit 204: Developing engineering in workshop practice**
- **Unit 205: Working in engineering businesses**

Each 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 Learning Outcomes are covered by each 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 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 Outcome.

The following is a summary of only that qualification content which is assessed by the exam and **not** a summary of the full content of the qualification.

Unit	Learning outcome	Topics	Number of marks
203 Principles of Engineering	L01 Apply mathematical applications to engineering	1.1 General mathematical principles 1.2 Calculate areas and volumes of shapes 1.3 Use trigonometric functions 1.4 Solve different types of equations 1.5 Create different types of graph	23
	L02 Apply science to engineering	2.1 Definitions of scientific principles 2.2 Apply engineering principles in engineering situations	

	LO3 Understand engineering materials	<ul style="list-style-type: none"> 3.1 Types of engineering materials 3.2 Properties of engineering materials 3.3 Methods of testing material properties 3.4 Corrosion of engineering materials 3.5 Heat treatment of metals 3.6 Suitability of materials for engineering applications 	
204 Developing engineering workshop practice	LO1 Understand engineering health and safety requirements	<ul style="list-style-type: none"> 1.1 Legislation affecting health and safety in engineering 1.2 Safe working practices in engineering 1.3 Classification of safety signs 1.4 Risk assessment process 	10
	LO2 Prepare for engineering workshop activities	<ul style="list-style-type: none"> 2.1 Use technical information to prepare for engineering activities 2.2 Plan engineering workshop activities 	
	LO3 Use hand skills for engineering activities	<ul style="list-style-type: none"> 3.1 Mark out materials 3.2 Removal of material 3.3 Assemble components 	
	LO4 Review the quality of engineered products	<ul style="list-style-type: none"> 4.1 Characteristics of quality 4.2 Applications of measuring instruments 4.3 Carry out quality inspections 	
205 Working in engineering businesses	LO1 Understand how engineering businesses are organised	<ul style="list-style-type: none"> 1.1 Characteristics of types of engineering business 1.2 Functional areas of engineering businesses 1.3 Stakeholders of engineering businesses 1.4 Common standards for engineering businesses 	
	LO2 Use business communication	<ul style="list-style-type: none"> 2.1 Business communication skills 2.2 Use business documentation 	

LO3 Understand approaches to business improvement	3.1 Types of engineering activity and their characteristics 3.2 Approaches to business improvement	12
LO4 Understand technical drawings	4.1 Types of technical drawing 4.2 Information on engineering drawings 4.3 Mechanical symbols used on engineering drawings 4.4 Electrical symbols used on engineering drawings 4.5 Create technical sketches	
	Total marks for sections:	45 marks
	Integration across units*:	15 marks
	Total marks for exam:	60 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 Answer:
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.	One of the key stakeholders in an engineering business is the client who buys the product. Explain the expectations of this type of stakeholder.	Award 1 mark for each relevant point made to a maximum of 3 marks The client will want the product they have purchased (1) to the specification they gave (1) as they need to incorporate it into their next step/planning (1)

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

A company is designing the frame for a new bicycle. Discuss which factors are most important when selecting a material for the frame.

Mark scheme

Indicative content to include:

- Types of material
- Physical and mechanical properties required
- Ease of manufacture
- Aesthetics
- Environment
- Availability
- Scale of manufacture
- Stakeholder expectations

Band 1 (1 – 4marks)

Descriptive response based on recall of knowledge relating to a single consideration e.g. the properties of the material or the ease of manufacture. Candidates at the top of this level may be characterised by showing some understanding of how one factor affects the selection of the material.

Example band 1 response

The important factors are the properties of the frame. If it is being used off road it will need to be much stronger than if it is for a road bike. It also needs to be stronger if it's for an adult's bike than if it's for a child's bike. The stronger the material is means you don't need to use as much of it and it will last longer so composite material would be best.

Band 2 (5 – 8 marks)

Mainly descriptive response showing knowledge recall relating to a range of different factors affecting the choice of materials. Candidates at the top of this level may demonstrate understanding of a range of reasons for how or why a material is selected.

Example band 2 response

Factors to be considered include:

- The properties needed
- How the frame will be made
- What the frame looks like

The material will need suitable strength to support the user, which might be an adult or a child. It will also need to be malleable, so that it can be formed into the shape needed.

The choice of material might be limited by the availability of processes. For example if no welding is available metals cannot be used.

What the frame looks like will affect how attractive it is to customers. They might want it to be colourful so a painted metal could be used or they might want it to look high tech so then composites might be used.

Band 3 (9 – 12 marks)

Detailed response showing both knowledge recall and understanding of how a wide variety of different factors affect the selection of the material.

Candidates at the top of this level may be characterised by considering the relative impact of different types of factor on the selection of the material.

Example band 3 response

A wide variety of different factors will be taken into consideration when selecting the material for the frame. These include:

The properties needed. This will depend upon who is going to ride the bike and its use (for example, an off-road bike will need greater strength than a road racer). The strength of the material will also determine the amount of material needed, which will affect the performance of the bike due to the weight of the material.

The manufacturing process. Depending on the number of frames to be made, different combinations of material and process might work out cheaper than others. Additionally some processes might not be available in the manufacturing company.

Environmental impact. After use, materials such as metals can be recycled, but composites typically end up in landfill. This is a moral issue but can also affect customer's choices.

Aesthetics. Materials can give the bike frame a certain 'look' which will appeal to the customer.

Cost. Most practical choices of materials are a compromise between material properties manufacturing process, environmental impact, aesthetic requirements and cost. For example, a material with better properties maybe available, but cost more than the customer would pay.

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: [Technicals in Engineering \(1145-21\)](#) 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>