Institute for Apprenticeships & Technical Education

End-point assessment plan for Materials Science Technologist (degree) apprenticeship standard

Apprenticeship standard number	Level of this end point assessment (EPA)	Integrated
ST0675	6	Non-integrated degree apprenticeship

Contents

Introduction and overview

This document sets out the requirements for end-point assessment (EPA) for the Materials Science Technologist apprenticeship standard. It is for end-point assessment organisations (EPAOs) who need to know how EPA for this apprenticeship must operate. It will also be of interest to Materials Science Technologist apprentices, their employers and training providers.

Full time apprentices will typically spend 48 months on-programme (before the gateway) working towards the occupational standard, with a minimum of 20% off-the-job training. All apprentices will spend a minimum of 12 months on-programme.

The EPA period should only start, and the EPA be arranged, once the employer is satisfied that the apprentice is consistently working at or above the level set out in the occupational standard, all of the pre-requisite gateway requirements for EPA have been met and that they can be evidenced to an EPAO.

All pre-requisites for EPA assessment methods must also be complete and available for the assessor as necessary.

As a gateway requirement and prior to taking the EPA, apprentices must complete all approved qualifications mandated in the Materials Science Technologist standard.

These are:

Level 6 degree in Materials

For level 3 apprenticeships and above, apprentices without English and mathematics at level 2 must achieve level 2 prior to taking their EPA.

(For those with an education, health and care plan or a legacy statement, the apprenticeship's English and maths minimum requirement is Entry Level 3. A British Sign Language (BSL) qualification is an alternative to the English qualification for those whose primary language is BSL).

The EPA must be completed within an EPA period typically lasting 9 months, beginning when the apprentice has passed the EPA gateway.

The EPA consists of 3 discrete assessment methods.

The individual assessment methods will have the following grades:

Assessment method 1: Work Based Project comprising of Project Report, Presentation and Questioning

· Fail
· Pass
· Distinction

Assessment method 2: Professional Discussion

· Fail
· Pass
· Distinction

Assessment method 3: Knowledge Test

· Fail
· Pass

Performance in the EPA will determine the overall apprenticeship standard and grade of:

· Fail
· Pass
· Distinction

EPA summary table

On-programme (typically 48 months)	Training to develop the occupation standard's knowledge, skills and behaviours.
End-point Assessment Gateway	• Employer is satisfied the apprentice is consistently working at, or above, the level of the occupational standard. • English/mathematics Level 2 Apprentices must complete the following approved qualifications mandated in the standard: • Level 6 degree in Materials Apprentices must agree a project outline with their employer and EPAO.
End Point Assessment (which would typically take 9 months)	Assessment Method 1: Work Based Project comprising of Project Report, Presentation and Questioning With the following grades: · Fail · Pass · Distinction Assessment Method 2: Professional Discussion With the following grades: · Fail · Pass · Distinction Assessment Method 3: Knowledge Test With the following grades: · Fail · Pass
Professional recognition	Aligns with recognition by: • The Institute of Materials, Minerals, and Mining (IOM3) – Associate Member with Incorporated Engineer registration (IEng AIMMM)

Length of end-point assessment period:

The EPA must be completed within an EPA period typically lasting 9 months, beginning when the apprentice has passed the EPA gateway.

Order of assessment methods

The assessment methods can be delivered in any order. The result of one assessment method does not need to be known before taking the other.

Gateway

The EPA period should only start once the employer is satisfied that the apprentice is consistently working at or above the level set out in the occupational standard, that is to say they are deemed to have achieved occupational competence. In making this decision, the employer may take advice from the apprentice's training provider(s), but the decision must ultimately be made solely by the employer.

In addition to the employer's confirmation that the apprentice is working at or above the level in the occupational standard, the apprentice must have completed the following gateway requirements prior to beginning EPA:

- English and mathematics at level 2.

For those with an education, health and care plan or a legacy statement the apprenticeships English and mathematics minimum requirement is Entry Level 3 and British Sign Language qualification are an alternative to English qualifications for whom this is their primary language.

Apprentices must complete the following approved qualifications as mandated in the standard:

- Level 6 degree in Materials

For Work Based Project comprising of Project Report, Presentation and Questioning:

- Apprentices must agree a project outline and scope with their employer and EPAO.

For Professional Discussion:

- No specific requirements

For Knowledge Test:

- No specific requirements

Assessment methods

Assessment Method 1: Work Based Project comprising of Project Report, Presentation and Questioning (This Method has 2 components.)

Method **1** Component **1**: **Summary Report**

Overview

The project is compiled after the apprentice has gone through the Gateway process.

The work-based project should be designed to ensure that the apprentice's work meets the needs of the business, is relevant to their role and allows the relevant KSBs to be demonstrated for the EPA. Therefore the project's subject, title and scope will be agreed between the employer and the EPAO. The employer will ensure it has a real business application and the EPAO will ensure it meets the requirements of the EPA (including suitable coverage of the KSBs assigned to this assessment method). The EPAO should sign-off the project title and scope, as a minimum, to confirm its suitability at the gateway.

The rationale for this assessment method component is:

- This method allows the apprentice the opportunity to utilise their competences and hard work in a real-world environment, contributing to their employer's operational objectives.
- Both the preparation of a project plan, project report and presentation reflect typical tasks undertaken in this occupation.
- This allows a wide range of KSBs to be demonstrated holistically, including technical knowledge, judgement and communication skills.

Delivery

Apprentices will conduct a project which has two distinct milestones. This includes submission of a project plan at the beginning of the project and submission of the project report following project implementation. This will then be followed by a presentation with questioning.

The apprentice will conduct their project typically over a period of 24 weeks. The project may be based on any of the following:

· A specific problem
· A recurring issue
· An idea/opportunity

The apprentice must complete a project plan and submit this to the EPAO by week 4 (after agreeing the project title and scope with the employer and EPAO). This is because planning is a vital part of this occupation. The project plan itself is not assessed but needs to be submitted to confirm that this planning activity has taken place and the deadline has been met. This work feeds into component 2 (the presentation) where the apprentice can reflect on how the project developed from the planning stage and explore/explain any variation and developments from the original plan. A project report about the project must be produced and submitted by week 24. This must make reference to the project plan and how this was delivered in order to demonstrate the knowledge, skills and behaviours assigned to this assessment method.

The project report should summarise the project and be 2,500 words +/- 10% (excluding any Annexes and Appendices).

The employer will ensure the apprentice has reasonable and sufficient time and the necessary resources, within this period, to plan and undertake the project.

The project summary should be in the form of paper based or an electronic report.

Project Plan
Once commenced, the apprentice must plan their delivery of the project and carry out initial research. They must prepare a project plan and submit this to the EPAO in week 4 of the EPA period to confirm completion of this milestone in the assessment method.

As a minimum the project plan must include:

- The purpose of this project (what problem is it going to solve?)
- Methodology
- The planned main deliverables
- Anticipated risks and issues

It must not exceed 1,000 words (+/-10%) or two sides of A4 paper using font 12.

The following information may be included in an annex to add clarity to the list above, and will not be included in the word count.

- The timeline, including deadlines
- Resources that are required to complete this project
- Cost Benefits
- Stakeholders

Project Report
This report must be completed and submitted to the EPAO by week 24.
The report should comprise of 2,500 words (+/-10%) and must make reference to the project plan and whether the plan was achieved, although actual delivery of the project is not a determining factor when grading the assessment method.

The project summary report and project plan will be reviewed by the EPAO prior to component 2, the presentation, taking place.

The EPAO may use the project plan and project report alongside the electronic or hard copy of the presentation as the basis for questions asked during the questioning component of this assessment method. The Knowledge, Skills and Behaviours can be assessed from the project report, presentation and questions as this is a holistic assessment method.

As a minimum, all project summary reports must include:

- Introduction

- Scope of the project (including key performance indicators)
- Methods (How the outcomes were achieved)
- Reference to the project plan and any deviations from the original timelines and planned methods
- How anticipated risks and issues developed and were mitigated
- Research
- Outcomes and Results
- Recommendations and conclusions
- Annex providing evidence relating to the technical project activity, which must be referenced in the report. Evidence[1] could include:

    - the final project plan
    - work records
    - video clips (maximum 15 minutes in total)
    - annotated photographs of completed work or work in progress
    - diagrams
    - job write up
    - calculations
    - data reports
    - quality/compliance records

They must also include an appendix containing:

- Mapping of the report and supporting evidence against the KSBs being assessed by this assessment method.
- A statement from the employer confirming that the report and evidence is the apprentice's own work and authenticating the project outcomes.

The annex and appendix do not form part of the overall word count.

Self-reflective accounts and witness testimonies are not valid evidence sources except in relation to S3 and B5. This is because for these areas only the apprentice must reflect and evaluate the actions they have taken to act on results and feedback with regards to the project plan.

Method **1** Component **2**: **Presentation and questioning**

Overview

Apprentices will prepare and deliver a presentation that appropriately covers the Knowledge, Skills and Behaviours assigned to this method of assessment.

[1] This list is not exhaustive and other evidence sources are permissible. However, self-reflective accounts and witness testimonies are not valid evidence sources except in relation to S3 and B5. Typically, there may be between 5-10 pieces of supporting evidence.

The presentation will be based on the project carried out in component 1 and will make reference to the project plan and the project report. The presentation and questioning will last for 90 minutes, which will include 50 minutes for delivery of the presentation, then 40 minutes of questioning. This presentation requires the apprentice to fully illustrate the Knowledge, Skills and Behaviours that are mapped to this assessment method. The presentation must include:

1. Description of the scope of the presentation – which project is being presented

2. Description of the role of the apprentice in these activities

3. Summary of actions undertaken by the apprentice, including the project plan and outcomes of these activities

4. Production processes used

5. Use of resources, including personnel

6. Variations/deviations from the initial planning stage

7. Achievements, difficulties faced and lessons learned

The presentation will be completed and submitted after the gateway and will be presented to an independent assessor, either face-to-face or via online video conferencing. If using an online platform, EPAOs must ensure appropriate measures are in place to prevent misrepresentation.

The apprentice will typically have 24 weeks to prepare, complete and submit the presentation.

The rationale for this assessment method component is:

- In this occupation it is standard practice for fully occupationally competent employees to deliver presentations, therefore, this is a valid form of assessment
- The project report contextualises the design, production environment, stakeholders and proposed outcomes of the project. The presentation and questioning complements this as it includes an analytical dimension
- This assessment method enables SMEs to offer the apprentice a project suitable for their organisation and one that adds value, rather than one that is prescribed and therefore potentially difficult for the smaller employer to facilitate.

Delivery

The presentation method will last for 90 minutes (50 minutes for delivery and 40 minutes for questioning). The assessor has the discretion to increase the time of the presentation and questioning by up to 10% to allow the apprentice to complete their last point.

The independent assessor will ask a minimum of 8 questions at the end of the presentation. The questions will be based on the content of the summary report and presentation, but the EPAO will prepare a question bank of sample questions for the assessor to draw from and adapt to individual circumstances.

To deliver the presentation, the apprentice will have access to:

· PowerPoint
· Flip chart
· Videos
· Interactive demonstrations
· Notes

· Computer
· Artefacts

The presentation will be conducted as follows:

The presentation will take place on a one-to-one basis between the assessor and the apprentice. A second assessor/invigilator may be present to take notes in order to counter any technical breakdown in recording (or the candidate not wishing to be recorded) and to increase confidence in, and validity of, the objectivity of the assessor in the event of any dispute or disagreement.

The way in which the content of the presentation is made is not prescriptive.

A copy of the project plan must have already been submitted by week 4 of the EPA and a hard copy or electronic copy of the presentation must be sent to the EPAO at least 10 days in advance of the assessment. The presentation submission must be a hard copy and/or electronic slide deck comprising of no more than 15 slides. When submitted, this must outline details of any visual aids to be used and specify any equipment required. The EPAO must ensure these are available on the day of assessment.

The presentation must be formal in tone and be well-balanced in its use of visuals, text, and other supporting elements e.g. audio, artefacts, documents, small scale demonstrations etc.

The independent assessor will make all grading decisions.

Venue

EPAOs must ensure that the presentation and questioning elements are conducted in a suitable controlled environment in any of the following:

· Employer's premises
· Other suitable venue selected by the EPAO (e.g. a training provider)

The venue should be a quiet room, free from distraction and external influence and utilise suitable signage inside and outside of the venue. The venue will also have facilities for digital presentations e.g. a PC, projector and screen, if the apprentice is using presentation aids. Steps must be in place to ensure the apprentice is not being aided in any way e.g. an independent witness statement or use of a 360 degree camera to allow the assessor to look around the round the room during the presentation if it is to be conducted remotely through electronic means. It is the EPAO's responsibility to ensure these are in place.

Marking

The independent assessor will review and mark the project in a timely manner, as determined by the EPAO, and without extending the EPA unnecessarily. Similarly all quality control processes will also be conducted in a timely manner, as determined by the EPAO.

Required supporting material

EPAOs will produce the following material to support this assessment method:

- Outline of the assessment method's requirements
- Assessment materials and bank of questions (for component 2)
- Examples of projects
- Data capture forms for results and evidence including gaps, mapped against the KSBs

- Guidance document on how employers can assist in determining suitable project/activity
- Guidance document for both apprentices and employers as to how the assessment method will be administered, including timescales and deadlines.

Assessment Method 2: Professional Discussion (This Method has 1 components.)

Method **2** Component **1**: **Professional Discussion**

Overview

This assessment will take the form of a professional discussion, which must be appropriately structured to draw out the best of the apprentice's competence and excellence and cover the KSBs assigned to this assessment method. It will involve questions that will focus on analysis of given scenarios, coverage of prior learning or activity, problem solving.

The professional discussion can take place in any of the following:

· Employer's premises
· A suitable venue selected by the EPAO (e.g. a training provider's premises)
· On-line using video conference facilities

Additional, specific venue requirements include:

If the discussion is to take place online via video conferencing system then EPAOs must ensure appropriate measures are in place to prevent misrepresentation, for example, screen share and 360-degree camera function with assessors when the assessments are undertaken remotely.

The rationale for this assessment method is:

- It allows the apprentice to be assessed against KSBs that do not naturally occur in the project
- It allows for testing of responses where there are a number of potential answers that couldn't be tested through the multiple-choice test
- It is a cost effective for employers, as apart from a venue, it does not require additional resources
- It replicates the sort of discussion occupationally competent employees regularly undertake

Delivery

The independent assessors will conduct and assess the professional discussion.

The professional discussion must last for 60 minutes. The independent assessor has the discretion to increase the time of the professional discussion by up to 10% to allow the apprentice to complete their last answer. Further time may be granted for apprentices with appropriate needs, in-line with the EPAO's Reasonable Adjustments Policy.

The professional discussion will be conducted as set out here:

The professional discussion must be appropriately structured to draw out the best of the apprentice's competence. Apprentices must be assessed against the KSBs assigned to this assessment method – as shown in mapping of KSBs.

EPAOs must make arrangements for this assessment method with the apprentice's employer. Independent assessors must conduct and assess the professional discussion on a one-to-one basis.

The independent assessor must ask a minimum of nine open questions from a bank of questions created by the EPAO; follow up questions are allowed to further probe the responses. The set of questions can have an order decided at the discretion of the assessor but should cover three main areas:
- Prior learning and/or work based questions
- The posing of realistic hypothetical scenarios requiring a judgement, challenge, or assessment
- Problem solving questions.

There must be three questions in each of these areas.

Apprentices are expected to understand and use relevant occupational language.

Questions must cover the following topics:
1. The materials engineering environment and current challenges within manufacturing and product development
2. The impact of materials on operational delivery and manufacturing
3. Leadership and working with others in materials science
4. Developments and opportunities offered by materials innovation.

These topics must allow the apprentice opportunity to demonstrate the knowledge, skills and behaviours mapped to this assessment method.

The independent assessor must use the assessment tools and procedures that are set by the EPAO to record the professional discussion.

The independent assessor will make all grading decisions.

Venue

The professional discussion should take place in a quiet room, free from distractions and influence. Video conferencing can be used to conduct the professional discussion, but the EPAO must have processes in place to verify the identity of the apprentice and ensure the apprentice is not being aided in some way, and as outlined earlier in the plan.

Other relevant information

A question bank must be developed by EPAOs. The 'question bank' must be of sufficient size to prevent predictability and the EPAO must review it regularly (and at least once a year) to ensure that it, and its content, are fit for purpose. The questions relating to the underpinning knowledge, skills and behaviours, must be varied yet allow assessment of the relevant KSBs.

EPAOs must ensure that apprentices have a different set of questions in the case of re-sits/re-takes.

Independent assessors must be developed and trained by the EPAO in the conduct of professional discussion and reaching consistent judgement.

EPAOs will produce the following material to support this assessment method:

- A question bank as outlined above.
- Assessment recording documentation
- Guidance for apprentices, employers and training providers

Assessment Method 3: Knowledge Test (This Method has 1 component)

Method **3** Component **1**: **Knowledge test**

Overview

The rationale for this assessment method is:

• Key knowledge elements assigned to this component can be accurately assessed using a test
• It complements the other assessment methods as it efficiently tests underpinning knowledge in a systematic way.

Test Format

The test can be:

· Computer based
· Paper based

It will consist of 16 questions.

These questions will consist of:

· Data-handling questions
· Graphical or diagrammatic questions
· Closed response questions (e.g. multiple-choice questions)

Test administration

Apprentices must have 60 minutes to complete the test.

The test is closed book which means that the apprentice cannot refer to reference books or materials.

The questions will consist of 16 closed response multiple choice questions. Apprentices must choose one correct answer from a choice of four. Each question answered correctly will be awarded one mark. Any incorrect or missing answers must be assigned zero marks. Apprentices must have one-hour to complete the test. The test is closed book, which means that the apprentice cannot refer to reference books or materials.

Apprentices must take the test in a suitably controlled environment that is a quiet space, free of distractions and influence, in the presence of an invigilator. The invigilator may be the independent assessor or another external person employed by the EPAO or specialised (proctor) software, if the test can be taken on-line. The EPAO is required to have an invigilation policy that will set out how the test/examination is to be carried out. This will include specifying the most appropriate ratio of apprentices to invigilators to best take into account the setting and security required in administering the test/examination.

The EPAO is responsible for ensuring the security of testing they administer to ensure the test remains valid and reliable (this includes any arrangements made using online tools). The EPAO is responsible for verifying the validity of the identity of the person taking the test.

This assessment method will be carried out as follows:

The EPAO must verify the suitability of the venue for taking the test and the identity of the person taking the test.

Marking

Tests must be marked by independent assessors or markers employed by the EPAO following a marking guide produced by the EPAO. Alternatively, marking by computer is permissible where questions types allow this, to improve marking reliability.

Question and resources development

Questions must be written by EPAOs and must be relevant to the occupation and employer settings. It is recommended that this be done in consultation with employers of this occupation. EPAOs should also maintain the security and confidentiality of their questions when consulting employers. EPAOs must develop a 'test specification' and 'question banks' of sufficient size to prevent predictability and review them regularly (and at least once a year) to ensure they, and the test specification and questions they contain, are fit for purpose. Predictability of questions may also be reduced by questions being taken from a question bank prepared by the EPAO which is of sufficient size to prevent predictability as described earlier in this plan.

Required supporting material

As a minimum EPAOs will produce the following material to support this method:

- A test specification
- sample tests and mark schemes
- live tests and mark schemes
- analysis reports which show areas of weakness for completed tests/exams and an invigilation policy.

Weighting of assessment methods

All assessment methods are weighted equally in their contribution to the overall EPA grade.

Grading

Assessment method 1: Work Based Project comprising of Project Report, Presentation and Questioning

KSBs	Fail	Pass	Distinction
K3 K9 K10 K13 K15 K16 **S1 S2 S3 S5 S6 S8 S10** **B2 B4 B5 B7 B9 B10**	Does not meet the pass criteria	The candidate must meet all of the pass grading criteria mapped to this assessment method (See Annex A)	The candidate must meet at least 7 of the distinction criteria mapped to this assessment method (See Annex A)

Assessment method 2: Professional Discussion

KSBs	Fail	Pass	Distinction
K4 K5 K6 K11 K14 K18 **S4 S7 S9** **B1 B3 B6 B8 B10 B11**	Does not meet the pass criteria.	The candidate must all of the pass criteria mapped to this assessment method (See Annex A)	The candidate must meet at least 6 of the 8 distinction criteria mapped to this assessment method (See Annex A)

Assessment method 3: Knowledge Test

The following grade boundaries apply to the test:

Grade	Minimum score (out of 16 available marks)	Maximum score (out of 16 available marks)
Pass	10	16
Fail	0	9

Overall EPA grading

All EPA methods must be passed for the EPA to be passed overall.

In order to achieve a pass, all assessment methods must be passed.
In order to achieve a distinction, all assessment methods must be passed and the apprentice must have achieved a distinction in both AM1 (Project, Presentation and Questioning) and AM2 (Professional Discussion).

Grades from individual assessment methods should be combined in the following way to determine the grade of the EPA as a whole:

Assessment method 1 Project, Presentation & Questioning	Assessment method 2 Professional Discussion	Assessment method 3 Knowledge Test	Overall grading
Pass	Pass	Fail	Fail
Pass	Fail	Pass	Fail
Fail	Pass	Pass	Fail
Pass	Pass	Pass	Pass
Pass	Distinction	Pass	Pass
Distinction	Pass	Pass	Pass
Pass	Distinction	Pass	Pass
Distinction	Distinction	Pass	Distinction
Distinction	Pass	Pass	Pass
Distinction	Distinction	Pass	Distinction
Pass	Pass	Pass	Pass
Fail	Fail	Pass	Fail
Fail	Pass	Fail	Fail
Pass	Fail	Fail	Fail
Distinction	Fail	Fail	Fail
Fail	Fail	Pass	Fail
Fail	Distinction	Fail	Fail

Roles and responsibilities

Role	Responsibility
Apprentice	Complete the on-programme elements of the apprenticeship prior to the Gateway. Prepare for the EPA. Attend and complete the EPA.
Employer	Supervise and support the candidate through the programme giving timely feedback as appropriate. Identify when the apprentice is ready to pass the Gateway and undertake their EPA. Notify the EPAO that the apprentice has passed the gateway.
EPAO	As a minimum EPAOs should: Appoint administrators/invigilators and/or assessors/markers to administer/invigilate, and mark the EPA. Provide training and CPD to the independent assessors they employ to undertake the EPA. Utilise conflict of interest policy by having no direct connection with the apprentice, their employer or training provider. Utilise processes to conduct internal quality assurance and do this on a regular basis. Implement standardisation activities in accordance with this plan's IQA section. Organise and conduct moderation of independent assessors' marking in accordance with this plan. Have in place and operate an appeals process.
Independent assessor	As a minimum an Independent assessor should: Be independent of the apprentice, their employer, and training provider(s) i.e. there must be no conflict of interest. Hold or be working towards an independent assessor qualification e.g. A1 and have had training from their EPAO in terms of good assessment practice, operating the assessment tools and grading. Have the capability to assess the apprentice at this level.Attend the required number of EPAOs standardisation and training events per year (as defined in the IQA section).
Training provider	As a minimum the training provider should: Work with the employer to ensure that the apprentice is given the opportunities to develop the KSBs outlined in the standard and monitor their progress during the on-programme period. Advise the employer, upon request, as to the apprentice's readiness for EPA prior to the gateway Play no part in the EPA itself.
Invigilator	Monitor candidates to ensure that they complete assessment methods to time and without assistance

Internal Quality Assurance (IQA)

Internal quality assurance refers to the requirements that EPA organisations must have in place to ensure consistent (reliable) and accurate (valid) assessment decisions. EPA organisations for this EPA must:

- Appoint independent assessors who have knowledge of the following occupational areas: Recent relevant experience of the occupation/sector in the last two years
- Appoint independent assessors who are members of relevant professional bodies
- Appoint independent assessors who are competent to deliver the end-point assessment
- Provide training for independent assessors in terms of good assessment practice, operating the assessment tools and grading
- Have robust quality assurance systems and procedures that support fair, reliable and consistent assessment across the organisation and over time
- Operate induction training and standardisation events for independent assessors when they begin working for the EPAO on this standard and before they deliver an updated assessment method for the first time.

Re-sits and re-takes

Apprentices who fail one or more assessment method will be offered the opportunity to take a re-sit or a re-take. A re-sit does not require further learning, whereas a re-take does.

Apprentices should have a supportive action plan to prepare for the re-sit or a re-take. The apprentice's employer will need to agree that either a re-sit or re-take is an appropriate course of action.

An apprentice who fails an assessment method, and therefore the EPA in the first instance, will be required to re-sit any failed assessment methods only.

The timescales for a resit/retake is agreed between the employer and EPAO. A resit is typically taken within 2 months of the EPA outcome notification. The timescale for a retake is dependent on how much re-training is required and is typically taken within 3 months of the EPA outcome notification.

Re-sits and re-takes are not offered to apprentices wishing to move from pass to merit/distinction or merit to distinction.

Where any assessment method has to be re-sat or re-taken, the apprentice will be awarded a maximum EPA grade of distinction, unless the EPAO determines there are exceptional circumstances requiring a re-sit or re-take.

Affordability

Affordability of the EPA will be aided by using at least some of the following practice:

· Online assessment
· Using an employer's premises
· Assessing multiple apprentices simultaneously
. Completing presentation and professional discussion on the same day and implementing 'assessment days' where all elements of the EPA can be assessed on the same day.

Professional body recognition

This apprenticeship is designed to prepare successful apprentices to meet the requirements for registration as Materials Science Technologist with
The Institute of Materials, Minerals, and Mining (IOM3)

Reasonable adjustments

The EPAO must have in place clear and fair arrangements for making reasonable adjustments for this apprenticeship standard. This should include how an apprentice qualifies for Reasonable Adjustment and what Reasonable Adjustments will be made. The adjustments must maintain the validity, reliability and integrity of the assessment methods outlined in this assessment plan.

Mapping of knowledge, skills and behaviours (KSBs)

Assessment method 1: Work Based Project comprising of Project Report, Presentation and Questioning

Knowledge
K3 Systems and processes such as, but not limited to, CRM systems, client handling, profit and loss, and planning, in project management, business improvement, proof of concept, and scale up.
K9 Contemporary research and developments in the materials science community in terms of understanding different perspectives, methodologies, and schools of thought as well as the theoretical stances that underpin them.
K10 Materials applications including theories, techniques and relevant calculations to understand related disciplines and be able to work in a collaborative or cross-functional environment in more than one materials context.
K13 Systematic approaches to cost benefit analysis, including contextual financial understanding using industry standard metrics. Awareness of marketplace dynamics.
K15 Report writing techniques, including how to synthesise information and write concisely using a formal or neutral language register and vocabulary appropriate to the target reader.
K16 Management techniques and theories, including problem solving methodologies, effective decision making, delegation and planning methods, time management, organisational awareness, motivational techniques, and conflict resolution.

Skills
S1 Utilise cognitive and practical skills in conjunction with adaptability and versatility in technical support both in-house and to clients to improve manufacturing processes, problem solving, innovation, and scale up formulations.
S2 Determine and use industry standard and emerging digital technologies and data analysis tools to complete work activities and address problems that are ill defined or involve numerous interacting factors.
S3 Critically evaluate actions, methodologies, and results and their implications in analysing materials against parameters in product specifications.
S5 Write clear and succinct technical and analytical reports.
S8 Maintain a working knowledge of a range of project management and financial management techniques to complete projects relevant to their discipline.
S6 Research, adapt and test new technologies through materials characterisation feedback.
S10 Communicate effectively with colleagues and stakeholders using the appropriate language register both verbally and in writing.

Behaviours
B2 Clear and concise communicator – influence with integrity and exercise judgement.
B4 Demonstrate personal and professional commitment to enhance the reputation of employer and the profession through interaction with internal and external customers alike.
B5 Results orientated – thoughtful and methodical planner, delivering successful outcomes utilising results and feedback in future activities.
B7 Collaborative – team player, and leader when appropriate, who works with a range of stakeholders to achieve goals.
B9 Take personal responsibility to initiate and lead tasks, manage time and resources.
B10 Health and safety conscious at all times – strict adherence to regulations, incorporating up-to-date knowledge into planning.

Assessment method 2: Professional Discussion

Knowledge
K4 Current design and production of composite materials and additive manufacturing with the ability to engage with and evaluate complex theories and processes.
K5 Bonding technologies utilising, for example, metals, ceramics, polymers, rubbers and glasses and full understanding of positive and negative interactions between materials.
K6 Material component forming methods and how these contribute to effective production methods, problem solving innovations, and novel product development.
K11 How engineering materials are manufactured and processed including understanding of UK and international materials standards, procedures and specifications across a range of operations and contexts.
K14 How IT and emerging digital technologies such as 3D printing can be applied to enhance materials science work practices.
K18 Up-to-date ethical and environmental impact of materials science applications and innovations.

Skills
S4 Conduct and interpret failure analysis of engineering components using relevant methodologies and systems such as but not limited to, for example, microscopy, macroscopy, and chemical analysis.
S7 Interpret, develop and implement UK and international materials standards, procedures and specifications across a range of operations and contexts.

S9 Utilise emotional intelligence and identify a range of supervisory, management, and leadership skills in developing the ability to mentor, direct or lead teams or individuals.

Behaviours
B1 Self-starter committed to continuing professional and personal development, refreshing and expanding knowledge of materials science and technology through a variety of methods.
B3 Respond to others' feelings with emotional intelligence and take responsibility for work areas, people, and resources within their remit.
B6 Anticipate situations and problems, finds appropriate contemporary solutions and grasps opportunities.
B8 Recognise interdependencies and combine commercial and technical sensibility to assist employer/client in capitalising on opportunities exercising broad autonomy and refined judgement.
B10 Health and safety conscious at all times – strict adherence to regulations, incorporating up-to-date knowledge into planning.
B11 Data hygienic and security sensitive when handling employer or client data.

Assessment method 3: Knowledge Test

Knowledge
K1 Contemporary chemical and physical properties of materials including: metals, ceramics, polymers, adhesives, glass, construction materials, composites, and new future materials and their key performance properties.
K2 Up-to-date conceptual and practical chemical and physical properties of materials and how these react to testing and synthesis including the chemical composition of a range of materials such as advanced ceramics, metals, glass, polymers, and their structural manipulation and transformation and problems and advances that may arise during change at a microstructural level.
K7 Practical, conceptual, and technological knowledge of thermodynamics; structural chemistry; solid state chemistry; rheology; micro structures; analytical chemistry; organic chemistry; inorganic chemistry.
K8 Intellectual property rights issues and the implications and importance of patent, non-disclosure issues, and GDPR regulations.
K12 How materials fail in terms of fatigue, wear, impairment, corrosion, stresses, cracking, embrittlement, abrasion and cavitation erosion, including risk and mitigation factors. Understanding and ability to conduct failure testing using, for example, microscopy, macroscopy, and chemical analysis.
K17 Relevant materials science Health & Safety legislative and regulatory requirements relating to employees and clients in an industrial, laboratory, and/or field setting

Annex A

Grading descriptors for each assessment method

Work Based Project Report, Presentation & Q&A		
Grouping	Pass Criteria In order to achieve a pass all of the pass criteria must be met	Distinction Criteria In order to achieve a distinction, all of the pass criteria must be met, plus at least 6 of the 8 distinction boxes must be fully achieved
Systems and processes K3, S1, B5	Manages planning and delivery with regard to systems and processes in place, taking account of governance, implementation and relevant risk management procedures. Makes use of appropriate project management tools. Analyses and explains what they have learned during the project with specific reference to the project plan and whether this was implemented and how this learning can be applied in future projects.	Investigates innovative systems and processes and evaluates their suitability for use within the context of the project. Justifies the use of the tools and techniques, explaining how they support the organisation's aims.
Research K9, S6	Demonstrates evidence that the correct selection of the available research is aligned with the problem being addressed within the work-based project, with reference to the initial project plan. Well-structured approach to carrying out research and how this is integrated into the project, including evidence of adapting and testing new technologies.	Critiques the various research options as well as consider and justify their preferred selection.
Application of materials science K10, S3	Applies appropriate theories, techniques and calculations to materials problems and solutions in more than one materials context.	Appraises solutions and explains the risks and implications of the process, alternative approaches and ways to address them

Cost Benefits: K13	Demonstrates a systematic approach to planning, analyzing and achieving cost benefits for the business.	Justifies their analysis of the projects cost benefits for the business by comparing the costs benefits of their choice with alternative solutions that they considered, but disregarded.
Communication: K15, S5, S10, B2	Presents and communicates the key content and messages clearly. Defends plan and methods selected. Report and verbal communication takes account of the target audience, is grammatically correct and cohesive.	
Management and Leadership K16, B4,B7, B9	Demonstrates understanding of management techniques and theories and describes how they have applied this theory to interact with and lead individuals, stakeholders and teams to help them achieve their goals, treating them with respect and valuing their views.	Applies theory with insight and awareness of risks and rewards, describing how theory/technique was applied with clear analysis of the impact and risks.
Digital and Data S2	Demonstrates evidence that the correct selection of industry standard and emerging digital technologies and data analysis tools have been applied to address ill-defined problems.	Justifies their choice of technology and tools, explaining the benefits and risks associated with them in comparison to at least one alternative approach.
Health and safety B10	Clearly articulates the importance of safe working practices, with reference to appropriate regulation. Project outputs and initial planning make clear reference to health and safety factors.	Extends answers to include in-depth examples of applications of legislation in real-world situations and implications of implementation.
Project and financial management S8	Articulates a clear understanding of the financial methodological implications of their work and can show examples of how this can affect project completion.	Fluently describes the use of a comprehensive suite of methods and can assess the relative benefits of same.

Professional Discussion		
Grouping	Pass Criteria In order to achieve a pass all of the pass criteria must be met	Distinction Criteria In order to achieve a distinction, all of the pass criteria must be met, plus at least 6 of the 8 distinction boxes must be fully achieved
Design and Production K4, K11, S7	Describes current design and production processes which underpin production and manufacture of composite material and additive manufacturing, including the UK and international standards and procedures that apply to each. Illustrates with 2 examples.	Compares and evaluates alternative approaches, describing their relative merits and limitations.
Bonding Technology K5	Explains the positive and negative reactions that can occur during bonding, using two examples.	Explains ways to mitigate or rectify negative reactions.
Material Components K6, K18, B6, B8	Demonstrates an understanding of material component forming methods and explains how these contribute to effective production methods, problem solving innovations and novel production development, with an example for each. Describes the ethical and environmental impact of their solutions.	Articulates a range of impacts of component forming regimens and real and likely impact of choices made in their own experience and practice.
Digital Technology K14	Demonstrates an understanding of how new and emerging IT technologies are being applied to materials science work.	Compares and contrasts the traditional method of work with the new technological approach, highlighting benefits, drawbacks and risks.
Failure Analysis S4	Demonstrates that they can conduct and interpret failure analysis of an engineering	Interprets and incorporates results into forward-thinking and articulates tangible examples of how their

	component using relevant methodologies.	analyses have affected production procedures.
Working With Others S9, B3	Describes the range of supervisory, management and leadership skills they have deployed when mentoring or directing others. Provides a minimum of two examples. Provides an example of when they have responded to others' feelings with emotional intelligence.	Justifies their approach and explains alternative solutions and their reasons for disregarding them.
Continuous Professional Development B1	Projects self-confidence in their ability to articulate how CPD has been and will continue to inform their working practices.	Projects a dynamic demeanor in terms of how CPD has been inextricably linked to their success and will continue to be vital in informing and underpinning their working practices.
Health and Safety B10	Clearly articulates the importance of safe working practices, with reference to appropriate regulation.	Verbalises the efficacy of H&S regulation via direct experiences in testing, production, and innovation.
Data Control B11	Describes the importance of handling employer and client data sensitively, with reference to legislation and an explanation of the risks and implications of getting this wrong.	