SIAS

Laboratory Scientist (ST0626)

Level 6 Apprenticeship Standard

End-Point Assessment Specification

Endorsed by the Science Industry Partnership

SIP

Contents

This specification describes the end-point assessment tests, the test rules and who should be involved. Preparing for end-point assessment including gateway requirements are also covered.

SIAS is the Science Industry Assessment Service. It is part of the Cogent Skills Group. For further information about apprenticeship standards and Trailblazers please contact info@siasuk.com.

In this guide, the term "employer" is used to refer to the host employer, which is the company where the apprentice gains their competency experience. It does not refer to an organisation such as an Apprenticeship Training Agency (ATA) that has the employment contract with the apprentice.

Qualification Objective

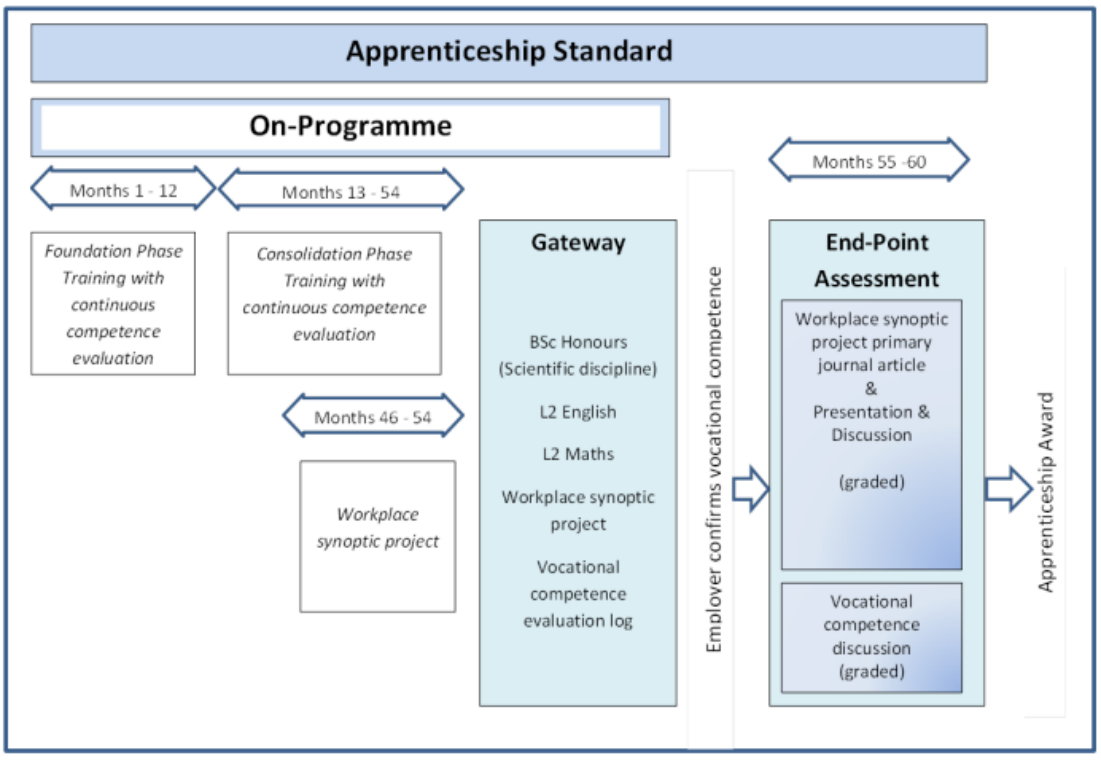
The aim of this qualification is to ensure that the apprentice is occupationally competent against the knowledge, skills and behaviours outlined in the assessment plan for this standard.

A laboratory scientist applies specialist knowledge and broad scientific understanding to carry out a range of technical and scientific activities in their specialist discipline: Chemical Science, Life Sciences, Research & Development, and Analytical. They analyse, interpret, and evaluate relevant scientific information, concepts and ideas and use these to develop subsequent experiments or investigations and to propose solutions to problems. They identify areas of business improvement and propose innovative scientific ideas. They perform practical, established, and novel laboratory procedures using standard and specialist laboratory equipment and instrumentation. Ensuring uniformity, consistency, reliability, reproducibility, quality, and integrity of scientific tests underpins their work and the working environment. In all contexts working safely and ethically is paramount. Laboratory scientists work in a wide range of organisations, including chemical, pharmaceutical, biotechnology, formulated products, consumer products, nuclear and analytical services. They work autonomously on defined projects under the supervision of a senior scientist and as part of a wider scientific team, which may include laboratory technologist and laboratory technicians. They deliver scientific value to their organisation, whilst contributing to the development of others.

Prior Learning and Qualifications

Whilst any entry requirements will be a matter for individual employers, typically, candidates will have 5 GCSEs at grade C or above, including English, maths and a science subject and hold relevant level 3 qualifications providing the appropriate number of UCAS points for entry to a level 6 Higher Education programme. Other relevant or prior experience may also be considered as an alternative.

A Summary of Laboratory Scientist End-Point Assessment



A Laboratory Scientist apprenticeship will typically require 55 months on-programme training / assessment to meet the requirements of the standard. There are two suggested on-programme phases - foundation and consolidation, which generate the pre-requisite gateway requirements for the end-point assessment (EPA).

The foundation phase, which is typically months 1-12, should focus on developing the apprentice's knowledge, skills, and behaviours (KSB), specifically around working safely, complying with internal and external regulations, and following quality procedures.

The consolidation phase, which is typically from month 13 up to the completion of all the on-programme requirements, will focus on developing further skills capability supported by further guided learning, enabling the apprentice to eventually work effectively and independently with minimum supervision. The apprentice will work towards a Bachelor's (Honours) degree in an appropriate scientific discipline. Achievement of this BSc (Honours) degree is a gateway requirement for starting the EPA, along with English and maths at level 2 - achieved either before or during the apprenticeship, the completion of a workplace synoptic project and a vocational competence evaluation log (log). The employer must confirm that the apprentice has completed the gateway requirements and is ready for the EPA.

About Competence Evaluation

During the apprenticeship, regular evaluation of the competence of the apprentice against the apprenticeship standard will help to ensure that they achieve full occupational competence by the end of their training, and they are ready for end-point assessment. Confirmation from the employer that the apprentice is fully competent is needed before end-point assessment can take place.

As competence evaluation is an in-programme activity, the process that is used for this has not been mandated. It is for the employer supported by their training provider to decide how they wish to do this. To help with this SIAS has produced the SIAS Competence Tracker.

Competence Evaluation Log (CEL)

The evidence that the apprentice is ready for end-point assessment is the signed SIAS Competence Evaluation Log (CEL). The CEL covers the knowledge, skills and behaviours specified in the apprenticeship standard. The signed log shows that the apprentice has demonstrated to the employer they are fully competent at the end of their training. It has the same status as a qualification certificate. Along with the qualification certificates, a signed completed CEL is one of the requirements for the Gateway.

Readiness for End-Point Assessment (EPA) – Gateway

Apprentices must complete the gateway requirements and provide evidence to the EPAO as detailed below before taking the EPA. On completion of the gateway requirements, the employer must confirm the apprentice as ready for the EPA

BSc (Honours) Degree

Apprentices must complete a BSc (Honours) degree. For example:

- BSc (Honours) Chemical Science
- BSc (Honours) Applied Bioscience

The range of BSc (Honours) degree qualifications may be used allowing employers / apprentices the flexibility to tailor the apprenticeship to meet their needs, whilst meeting the minimum requirements of the apprenticeship standard.

Workplace Synoptic Project

A workplace synoptic project is a substantial piece of work that will allow the apprentice to plan, develop, and implement an individual scientific work-based project. Typical project examples include implementation of a new analytical technique; experimental design to contribute to an R&D project; design of a new synthetic step within a formulation pathway.

All project topics must be approved by the employer and the project plan must be signed off by the employer as complete and submitted to the EPAO at Gateway. The EPAO will review the project plan to ensure that the scope of the completed tasks is sufficient to meet the EPA requirements. If these are found to be insufficient the apprentice will not meet the gateway requirements and will not proceed to EPA.

The apprentice will have to show critical analysis of appropriate literature and own data and the development of investigative and work orientated skills. The scope of the project must cover, but need not be limited to:

1. Planning, Design and Organisation Planning and design of project programme of work including recognition of resource implications, ethics, risk assessment, Control of Substances Hazardous to Health (COSHH) and other work-based and stakeholder requirements.
2. Review of Literature Use of databases to assess relevant project literature. Critical assessment of original work-based and other literature. Transfer of literature knowledge into experimental plan of work.
3. Project Implementation Competent implementation of project work, including experimental design, recognition of safe working practices and recording of work and project progress via a reflective record. Feedback of reflection into planning and implementation process.
4. Results and Conclusions Appropriate, timely and concise reporting of project work including data analysis and drawing conclusions via written and oral media.

The project should be undertaken towards the end of the consolidation phase, once the majority of learning is complete. It must be of sufficient depth and complexity to require a minimum of 100 hours of work with an additional 50 hours for project reporting. However, the apprentice should not limit the scope of their project to meet this requirement. The project should be conducted as part of an apprentice's normal scientific work. The apprentice may choose to use their research project completed as partial fulfilment of the BSc so long as it meets the criteria described in this plan. Collaboration between the employer and the Higher Education Institution (HEI) is encouraged with mentoring support for the apprentice from both the employer and the HEI.

Vocational Competence Evaluation Log (CEL)

A summary record of on-programme vocational competence evaluation, signed off by a technical expert nominated by the apprentice's employer, must be recorded in a log. This reflects the industry practice of competence management through on-going employer competence evaluation.

A log must list what evidence was used to confirm the apprentice demonstrated competence, where it is recorded, how it was evaluated and by whom against all KSBs in the apprenticeship standard. There is no need to capture the evidence itself in the log. However, the log must provide a reference to where the evidence is held. Typical evidence may include for example, a course assessment portfolio, a company workbook, performance review record or certificate of training. During the vocational competence discussion, the apprentice must have the opportunity to refer to the log and evidence referenced within it to evidence their answers.

This signed log will be used as the evidence that the employer has confirmed the apprentice has developed all the KSBs defined in the apprenticeship standard. This must be signed off by the technical expert and must be provided to SIAS at gateway in order for EPA to go ahead.

English and Maths Level 2

Apprentices must hold a minimum of level 2 English and maths, achieved either before or during the apprenticeship, before completing the EPA.

Stages of End-Point Assessment

EPA methods must be successfully completed during a maximum 6-month period. The EPA comprises assessment of:

- workplace synoptic project primary journal article & presentation with questioning
- vocational competence discussion

Requirements for each assessment method are detailed below

Workplace synoptic project Primary Journal Article

A scientific paper based on the workplace synoptic project must be prepared by the apprentice at the start of the EPA period and submitted to the EPA panel via the independent assessor by the end of month 2 of the EPA period. It should:

- be in the format and style of a primary journal article
- show the ability to design a work-based independent investigation
- demonstrate innovative / creative-thinking and analytical skills
- cover experimental design, methods, results, data analysis and evaluation, conclusions, and recommendations
- provide references to a comprehensive literature review

The article must contain a maximum 3000 words inclusive of abstract, main text, figures, tables, and boxes but not including references. It should be submitted as a pdf document. The article will be reviewed by the independent assessor. The independent assessor may seek clarification from the technical expert on any of the science and technology or business contexts that are referenced in the article. The independent assessor will decide if the article meets the above criteria before the presentation of the primary journal article to EPA panel can be undertaken.

Presentation of Workplace synoptic project Primary Journal Article to EPA Panel

The presentation will be made to an assessment panel, followed by questioning.

The presentation must cover, but need not be limited to:

- Scientific approach:
    - experimental design, methods, results, data analysis, challenging assumptions, drawing conclusions & making recommendations

Apprentices are free to select the format for the presentation. The apprentice may choose to use presentation aides, such as PowerPoint, multimedia, and video.

The formal presentation will then be followed immediately with a structured discussion. Each apprentice will be formally interviewed by the assessment panel. There will be questions on these themes:

- Scientific approach

- Project management
- Stakeholder management
- Change management
- Their use of personal and professional skills to support delivery of the project.

The independent assessor will select and ask questions from a bank of standardised competency type questions to ensure a consistent approach is adopted. The independent assessor or the technical expert may ask follow-up questions to seek clarification where required. The primary journal article, presentation and structured discussion will be collectively assessed against the knowledge, skills and behaviours as outlined below.

The presentation will typically last 20 -30 minutes and the discussion 45-60 minutes; together they must be no longer than 90 minutes.

A full list of the assessment rules can be found in the assessment plan.

Vocational Competence Discussion

Apprentices will take part in a vocational competence discussion with an independent assessor. The purpose is to determine the extent to which the apprentice understands the requirements of his / her role as defined by the standard.

There will be a question bank of eight categories of open competence-based questions. The categories are:

- Compliance with internal and external regulation
- Ethical practice and codes of conduct
- Meeting internal or external customers' requirements
- Record keeping and data integrity
- Applying quality standards
- Creative thinking & problem solving
- Meeting targets • Continuous performance improvement

The independent assessor will select one question from each of the categories selected from the EPAO's question bank. The apprentice must answer each question with examples from their own practice. Examples of these questions are as follows:

- Describe what constitutes the quality management system in which your organisation operates and the role you play within that?
- Explain your understanding of continuous improvement within your organisation and illustrate using a relevant example, describing your role and tools used?
- Describe what 'good practice' in relation to compliance with internal and external regulation is applicable to your organisation and how this impacts your role?
- What steps would you need to take on introduction of a new technology or novel process and what are the key considerations within the regulated environment?

The VCD must:

a. be in the format of a 1:1 discussion with the independent assessor; this may be via videoconferencing.

b. comprise 8 questions one from each of the 8 categories listed above.

c. typically last 2 hours up to a maximum of 2 hours and 15 minutes.

d. take place in a room, free from distractions with no other people present, except quality assurance personnel where required.

e. be documented and recorded electronically. Where it is not possible to use electronic equipment because of site restrictions this must be agreed in advance with SIAS, and an alternative venue should be used.

The apprentice may bring along their vocational competence evaluation log and evidence referenced in it to refer to during the VCD.

A full list of the assessment rules can be found in the assessment plan.

Moderation

Assessment organisations will undertake moderation of independent examiner and technical experts' decisions through observations and examination of documentation on a risk sampling basis, i.e., a minimum of 20% for experienced examiners / technical experts and 100% for new examiners / experts or where inconsistencies have been identified or where the technical expert has been recruited from the employer due to site requirements. Results cannot be confirmed until moderation has been completed.

Re-takes / re-sits

Apprentices who fail an EPA method(s) will be offered the opportunity to take a re-sit / retake. The employer will need to agree that a re-sit / re-take is an appropriate course of action. Any EPA component re-sit / re-take must be taken during the maximum 6-month EPA period; otherwise, the entire EPA must be retaken. They are not offered to apprentices wishing to move from pass to distinction. Re-sits / re-takes will not be awarded a grade higher than pass, unless the assessment organisation determines there were exceptional circumstances accounting for the fail. Apprentices should have a supportive action plan to prepare for the re-sit / re-take.

Final Grade

Performance in the EPA will determine the apprenticeship grade – fail, pass or distinction. A fail will be awarded where the apprentice fails one or more assessment method. A pass will be awarded to individuals that achieve a pass or distinction in both assessment methods. A distinction will be awarded to individuals that achieve a distinction in both assessment methods. The independent assessor will combine the results from each assessment method to determine the EPA / apprenticeship grade. Both assessment methods will have equal weighting in determining the final grade. Grades will not be confirmed until after moderation.

Certification

The outcomes from the end-point assessment will be reviewed and a grade conferred by SIAS in accordance with SIAS QA procedures, which are available from SIAS. SIAS will notify the employer of the outcome of each of the assessments.

SIAS will apply for the apprentice's certificate, which will be sent to the employer. The certificate confirms that the apprentice has passed the end-point assessment, has demonstrated full competency across the standard and is job-ready.

Assessment Specification

The assessment specification can be found in the published assessment plan for the standard. Details of which elements of the apprenticeship standard will be tested by each test are given in the Assessment Method by Element of the Standard section of this document.

Assessment Method by Element of the Standard

KEY:	
Primary Journal Article & Presentation Discussion	PJ / PD
Vocational Competence Discussion	VCD

KSB	KSBs	EPA Method
Knowledge		
1	The underlying scientific principles, principal theories, concepts, and terminology of laboratory-based experimentation, including laboratory techniques relevant to the specialist discipline.	PJ / PD
2	The ways in which advanced science and technology is developed, established techniques of scientific enquiry and research methodologies.	PJ / PD
3	The theoretical basis for application of the science relevant to one specialist discipline including how to apply this during experimental design and implementation of research programmes.	PJ / PD
4	The requirements for the development and validation of analytical methods and instrumentation, including suitable sampling methods as appropriate to the specialist discipline.	PJ / PD
5	How to use statistical techniques, probability distributions, significance testing & confidence limits, regression & correlation and hypothesis testing to evaluate results, design experiments and draw evidence-based conclusions.	PJ / PD
6	How to independently implement new processes according to the literature, data mining results and input from colleagues.	PJ / PD
7	How to initiate, plan, execute and close a project and incorporate the organisation's project management procedures into the scientific work environment working with team members.	PJ / PD
8	The internal and external regulatory environment pertinent to the science sector and area of specialisation, for example Medicines & Healthcare Products Regulatory Authority (MHRA), Control of Major Accident Hazards (COMAH), Good Laboratory Practice (GLP).	VCD
9	The business environment in which the company operates including personal role within the organisation, ethical practice, and codes of conduct.	VCD
10	The requirements of internal or external customers and how to recommend the appropriate workflows, improvements, or scientific solutions	VCD
Skills		
11	Identify and use the scientific approaches appropriate to one specialist discipline required to solve problems, support new investigations and follow-up experiments in the laboratory.	PJ / PD
12	Appraise scientific experimentation, independently design, and implement new processes according to relevant literature and other data sources interrogated using data mining techniques using input from colleagues	PJ / PD

KSB	KSBs	EPA Method
13	Support appraisal of scientific experimentation with numerical and statistical analysis.	PJ / PD
14	Work autonomously to analyse, interpret, and evaluate scientific data and present the results of laboratory work and problem solving clearly and concisely in written and oral form.	PJ / PD
15	Comply with regulations including compliance with business rules pertaining to record keeping, data integrity, traceability & confidentiality.	VCD
16	Promote and ensure the application of quality standards, safe working practices and compliance with risk management systems relevant to the workplace in own work and the work of others.	VCD
17	Use creative thinking and problem-solving techniques such as root cause analysis, to challenge assumptions, innovate, make new proposals, and build on existing ideas.	VCD
18	Autonomously plan and prioritise tasks, review and evaluate progress against objectives and investigate alternative scenarios.	PJ / PD
19	Contribute to the development of specific technical projects across multi-disciplinary teams.	PJ / PD
20	Ensure that targets are met and maintained, within own area of responsibility, whilst complying with defined company procedures and legislative requirements.	VCD
21	Lead continuous performance improvement within the scientific and technical environment using process mapping & analysis, root cause analysis that is informed by other appropriate lean, six sigma, project, and change management principles.	VCD
Behaviours		
22	Communicates effectively to a scientific and non-scientific audience using oral presentation, scientific debate & technical writing skills.	PJ / PD VCD
23	Demonstrates reliability, integrity, and respect for confidentiality on work related and personal matters, including appropriate use of social media and information systems.	PJ / PD
24	Works autonomously and interact effectively including challenging assumptions within a wide, multi-disciplinary project team.	PJ / PD
25	Takes account of the impact of work on others, especially where related to diversity and equality.	PJ / PD
26	Manages time effectively, being able to plan and complete work to schedule.	PJ / PD
27	Responds positively to change management processes and promotes change within work group.	PJ / PD
28	Takes responsibility for continuing personal and professional development, demonstrating commitment to learning and self-improvement and supports the development of others as appropriate.	PJ / PD

A full list of the competencies can be found in the Work Based Learning Guide.

Primary Journal Article & Presentation of Primary Journal Article to EPA Panel Assessment Criteria

KSB	Assessment Element	Fail	Pass	Distinction
12	Literature Review	Literature review lacks evidence and structure, uses outdated results or inappropriate scientific data	A systematic analysis of relevant scientific literature within a justified timeframe	A critical analysis of relevant scientific literature across the field evaluating the evidence of relevance to their research
7 18	Project scope & definition	Lack of clarity on project scope and boundary definition ill defined	Project scope and boundaries clearly defined. Aims and objectives articulated to customer	The project scope and boundaries are defined to allow predicted and unforeseen outcomes to be realised
3 4 6 11 12	Experimental design	Limited understanding of experimental design	Clear explanation of use of experimental design to develop hypothesis and design practical work	Use of statistical techniques to define design space and project positioning within
5 14	Data analysis	Misinterprets data and uses inappropriate statistical tools to analyse data	Well-structured data analysis using at least one appropriate statistical technique such as probability distributions, significance testing & confidence limits, regression & correlation	Systematic data analysis using a range of appropriate advanced statistical technique such as t-test, chi-square test, multivariate analysis, predictive models
5 13 14	Drawing conclusions	Inapposite conclusions based on misinterpretation of literature and data	Reasoned conclusions based on previous literature critiques and appropriate data analysis	Cogent scientific conclusions leading to logical recommendations for future experimentation
1 2 3 11 12	Scientific Approach	Uses inappropriate scientific approach to project	Identifies and uses appropriate scientific approach to project	Scientific approach shows understanding of the relationship of the project to the wider context of the work of the laboratory / business
6	Recommendations	Unable to explain recommendations based on conclusions	Recommendations for immediate next steps for project justified with reference to conclusions	Logical recommendations for future new experimentation linked to scientific conclusions

KSB	Assessment Element	Fail	Pass	Distinction
18	Project Management	Little demonstration of project planning and management	Clear project plan showing consideration of resources. Evidence of systematic evaluation of project progress and risk assessment	Effective management of project risk and mitigating actions
24	Stakeholder management	Project communication is vague or poor, difficulty conveying meaning to others	Tools used to define project stakeholders internal & external to the project	Clear management of all stakeholders' expectations and use of scientific judgement to influence project direction
19 27	Change management	Unable to provide examples of challenging assumptions within a wide, multidisciplinary project team	Provides two examples of challenging assumptions within a wide, multidisciplinary project team and promoting change within work group.	Provides two examples of leading change and challenging practice to improve own work and work of others
25	Teamwork	Unable to provide examples of contributing to teamwork and interacting effectively including taking account of the impact of work on others	Provides two examples of building working relationships within a team and interacting effectively including taking account of the impact of work on others	Provides two examples of leading a team to achieve project objectives
26 23	Use of personal / professional skills	Overall approach to project does not demonstrate use of personal / professional skills and good working practices within the context of the work-based project activity	Overall approach to project demonstrates use of personal / professional skills and good working practices within the context of the work-based project activity	Seeks to influence others to use personal / professional skills and good working practices within the context of the work-based project activity
22 28	Presentation	Unable to effectively present technical project elements and personal viewpoints	Confident, articulate presentation. Able to respond to technical questioning with ability to respect opinion of others	Proactively seeks feedback to improve scientific analysis and personal performance

A pass will be awarded where the apprentice meets pass expectations for all primary journal article and presentation elements.

A distinction will be awarded where the apprentice meets distinction expectations for all primary journal article and presentation elements.

VCD Assessment Criteria

KSB	Assessment Element	Fail	Pass	Distinction
16	Applying quality standards	Cannot explain the application of quality standards within own work or the work of others	Can explain the impact on own role of applying quality standards in the workplace and linkages to safe working practices and compliance with risk management systems Supports explanation with example from own practice	Can explain how the application of quality standards impacts on the wider business Supports explanation with example of impact on the business
8 15	Compliance with internal and external regulation	Cannot explain impact of compliance with internal and external regulation on own role	Can explain impact of compliance with internal and external regulation on own role Supports explanation with example from own practice	Can explain how compliance with internal and external regulation impacts on the wider business Supports explanation with example of impact on the business
9	Ethical practice and codes of conduct	Cannot explain their organisation's ethical practices and codes of conduct	Explains their organisation's ethical practices and codes of conduct Provides example from own practice of compliance with organisation's ethical practices and codes of conduct	Explains how compliance with organisation's ethical practices and codes of conduct impacts on the business Supports explanation with example of impact on the wider business
10 22	Meeting internal or external customers' requirements	Cannot explain how meeting the requirements of internal or external customers impacts on workflows, improvements, or scientific solutions	Can explain how meeting the requirements of internal or external customers impacts on workflows, improvements, or scientific solutions Supports explanation with example from own practice	Can explain how meeting the requirements of internal or external customers impacts on the business Supports explanation with example of impact on the wider business
15	Record keeping and data integrity	Cannot explain good practice in record keeping and data integrity.	Can explain good practice in record keeping and data integrity	Can explain how good practice in record keeping and data integrity impacts on the wider business

KSB	Assessment Element	Fail	Pass	Distinction
		Does not demonstrate understanding of rules pertaining to traceability & confidentiality	Shows understanding and use of rules pertaining to traceability & confidentiality Supports explanation with example from own practice	Supports explanation with example of impact on the business
8 20	Meeting targets	Cannot explain how complying with defined company procedures and legislative requirements impacts on setting and meeting targets	Can explain how complying with defined company procedures and legislative requirements impacts on setting and meeting targets Supports explanation with example from own practice	Can explain how complying with defined company procedures and legislative requirements impacts on the wider business use of targets setting and performance management Supports explanation with example of impact on the business
17	Creative thinking & problem solving	Cannot explain own use of problem-solving techniques such as root cause analysis	Can explain own use of problem-solving techniques such as root cause analysis, to challenge assumptions, innovate, make new proposals, and build on existing ideas Supports explanation with example from own practice	Can explain how problem-solving techniques such as root cause analysis impacts on the wider business Supports explanation with example of impact on the business
21	Continuous performance improvement	Cannot explain processes used to lead continuous improvement and own use of change management principles	Can explain processes used to lead continuous improvement and own use of change management principles Supports explanation with example of leading continuous improvement from own practice	Can explain how continuous improvement and change management processes impacts on the wider business Supports explanation with example of impact on the business

Fail = fails to meet pass standard for any discussions area

Pass = achieves pass standard for all discussion areas

Distinction = achieves distinction in all discussion areas

Further Information

For information about SIAS policies, quality assurance, re-sits, appeals, complaints and general enquiries please see our website: **www.siasuk.com**

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