T-LEVELS | Institute for Apprenticeships & Technical Education

T Level Technical Qualification in Healthcare Science

Occupational specialism assessment (OSA)

Assisting with Healthcare Science

Assignment 4

Mark scheme

v1.3: Specimen assessment materials
17 November 2023
603/7083/X

Internal reference: HCSci-0007-02

NCFE CACHE

T Level Technical Qualification in Healthcare Science
Occupational specialism assessment (OSA)

Assisting with Healthcare Science

Mark scheme

Assignment 4

Contents

About this document

This mark scheme has been written by the assessment writer and refined, alongside the relevant questions, by a panel of subject experts through the external assessment writing process and at standardisation meetings.

The purpose of this mark scheme is to give you:

- examples and criteria of the types of response expected from a student
- information on how individual marks are to be awarded
- the allocated performance outcomes and total marks for each question

Marking guidelines

The mark scheme for the practical assignment comprises of marking grids and indicative content.

The following marking grids should be used to assess students and award marks for their skills and underpinning knowledge. The indicative content included is for the practical assignment set for the (insert series) series only.

To understand what is required to be awarded marks, students should have already been provided with a copy of the marking grids. The marking grids are published in the tutor guidance document which can be found within this document for each task.

Assessors are reminded that they should complete an observation record form to record descriptive information and evidence of the student's skills and knowledge demonstrated during the practical assignment. The student observation record form can be found within this document for each task.

General guidelines

You must apply the following marking guidelines to all marking undertaken throughout the extended written response assessment. This is to ensure fairness to all students, who must receive the same treatment. You must mark the first student in exactly the same way as you mark the last.

The mark scheme must be referred to throughout the marking period and applied consistently. Do not change your approach to marking once you have been standardised.

Reward students positively giving credit for what content they have included within their extended written response, rather than what they might have omitted.

Utilise the whole mark range and always award full marks when the response merits them.

Be prepared to award 0 marks if the student's response has no creditworthy material.

Do not credit irrelevant material that does not answer the question, no matter how impressive the response might be.

If you are in any doubt about the application of the mark scheme, you must consult with your team leader or the chief examiner.

Guidelines for using extended response marking grids

Extended response marking grids have been designed to award a student's response holistically and should follow a best-fit approach. The grids are broken down into levels, with each level having an associated descriptor indicating the performance at that level. You should determine the level before determining the mark.

When determining a level, you should use a bottom-up approach. If the response meets all the descriptors in the lowest level, you should move to the next one, and so on, until the response matches the level descriptor. Remember to look at the overall quality of the response and reward students positively, rather than focussing on small omissions. If the response covers aspects at different levels, you should use a best-fit approach at this stage and use the available marks within the level to credit the response appropriately.

When determining a mark, your decision should be based on the quality of the response in relation to the descriptors. You must also consider the relative weightings of the assessment objectives, so as not to over/under credit a response. Standardisation materials, marked by the chief examiner, will help you with determining a mark. You will be able to use exemplar student responses to compare to live responses, to decide if it is the same, better or worse.

You are reminded that the indicative content provided under the marking grid is there as a guide, and therefore you must credit any other suitable responses a student may produce. It is not a requirement either, that students must cover all the indicative content to be awarded full marks.

Indicative content

You are reminded that the indicative content provided under the marking grid is there as a guide, and therefore you must credit any other suitable responses a student may produce. It is not a requirement either, that students must cover all the indicative content to be awarded full marks.

Extended written assessment

This assessment requires students to complete the following tasks:

Extended written task 1: maintenance of complex medical equipment

Extended written task 2: testing equipment calibration

Extended written task 3: escalation of issues related to equipment

Extended written task 4: research and innovation

	Extended written task 1	Extended written task 2	Extended written task 3	Extended written task 4	Total marks	% weightings
Performance outcome 1	20	8	16	6	50	62.5%
Performance outcome 2	0	4	4	0	8	10%
Performance outcome 3	0	8	0	14	22	27.5%
Totals	**20**	**20**	**20**	**20**	**80**	**100%**

Total duration: 2 hours

Extended written task 1: maintenance of complex medical equipment

Scenario

You are working as a healthcare scientist assistant in the medical physics and clinical engineering department.

You are asked to assist a healthcare scientist in the radiology department, checking an X-ray system maintenance schedule within a restricted clinical area. You are aware that X-ray machine maintenance is performed by an external engineering contractor and its maintenance is not within your remit. Your team are responsible for daily routine checks. Teams must comply with Ionising Radiation Regulations 2017 and Ionising Radiation (Medical Exposures) Regulations 2018 in relation to use, maintenance and servicing of equipment.

Task

Discuss the importance of adhering to an X-ray machine maintenance schedule with reference to the existing regulations detailed in the scenario. You should consider how medical X-rays operate when being used on patients, and the risks associated with clinical staff working within this environment when maintenance schedules are not maintained.

Give some examples of how regular maintenance of complex medical equipment limits the risks associated with X-ray equipment. Consider the levels of maintenance performed by different teams and the purpose of specific regulations as discussed in the scenario and how they support healthcare professionals in using and managing specialist X-ray equipment.

(20 marks)

Band	Mark	Descriptor *The student's response*
5	17–20	Shows a full and comprehensive understanding of the importance of equipment maintenance with an excellent ability to consider the potential risks to the patient and operator associated with the use of the device, including through highly relevant and well-explained examples of how regular maintenance can limit risks. Shows an excellent understanding of the underlying principles of operation of the device (system) and a thorough knowledge of the different parts of the system that need to be included in the maintenance checks. Shows an excellent understanding of how legislation and regulations support patients and healthcare staff safety through device maintenance requirements. It also shows a comprehensive understanding of what the regulations expect of healthcare professionals, in relation to adhering to maintenance schedules of complex medical systems Is fully relevant to the task and is structured in a way that addresses the specific scenario extremely well.

Band	Mark	Descriptor *The student's response*
4	13–16	Shows a well-developed understanding of equipment maintenance with a very good level of consideration of the potential risks to the patient and operator associated with the use of the device, including through relevant examples of how regular maintenance can limit risks. Shows very good understanding of the underlying principles of operation of the device (system) and a very good level of knowledge of the different parts of the system that would need to be included in the maintenance checks. Shows very good understanding of how the regulations support patients and healthcare staff safety through device maintenance requirements. It also shows very good understanding of what the regulations expect of healthcare professionals, in relation to adhering to maintenance schedules of complex medical systems. Is highly relevant to the task and is structured in a way that addresses the specific scenario to a degree that shows very good understanding.
3	9–12	Shows a developed understanding of importance of equipment maintenance with a good consideration of the potential risks to the patient and operator associated with the use of the device, including through examples of how regular maintenance can limit risks. Shows a good understanding of the underlying principles of operation of the device (system) and a good level of knowledge of different parts of the system that would be included in the maintenance checks. Shows a good understanding of how the regulations support patients and healthcare staff safety through device maintenance requirements. It also shows a good understanding of what the regulations expect of healthcare professionals, in relation to adhering to maintenance schedules of complex medical systems. Is clearly relevant to the task and is structured in a way that addresses the specific scenario to a degree that shows good understanding.
2	5–8	Shows a reasonable understanding of equipment maintenance with adequate consideration of the potential risks to the patient and operator associated with the use of the device including through at least one example of how regular maintenance can limit risks. Shows a reasonable understanding of the underlying principles of operation of the device (system) and a reasonable level of knowledge of different parts of the system that would be included in the maintenance checks. Shows a reasonable understanding of how the regulations support patients and healthcare staff safety through device maintenance requirements. It also shows a reasonable understanding of what the regulations expect of healthcare professionals, in relation to adhering to maintenance schedules of complex medical systems. Is mostly relevant to the task and is structured in a way that addresses the specific scenario to a degree that shows reasonable understanding.

Band	Mark	Descriptor *The student's response*
1	1–4	Shows a basic understanding of equipment maintenance with minimal consideration of the potential risks to the patient and operator associated with the use of the device and no, or poor examples of how regular maintenance can limit risks. Shows that there is a basic understanding of the underlying principles of operation of the device (system) and a basic level of knowledge of different parts of the system that would be included in the maintenance checks. Shows a basic understanding of how the regulations support patients and healthcare staff safety through device maintenance requirements. It also shows a basic understanding of what the regulations expect of healthcare professionals, in relation to adhering to maintenance schedules of complex medical systems. Contains some relevance to the task and is structured in a way that addresses the specific scenario to a degree that shows limited understanding.
	0	No creditworthy material.

Indicative content

- consideration of risk or harm to the patient and operator when using the X-ray system, for example, over exposure
- elements of the medical system that require routine inspection and servicing
    - hardware
    - mechanical checks
    - electrical checks
    - use of phantoms
    - software
    - network compatibility/inoperability
- reasons behind the legal requirement for employers to ensure robust maintenance process of complex medical systems are put in place to guarantee patient and healthcare staff safety
- patient and staff health and safety
- regulatory requirement for performance checks on medical devices including user checks
- frequency of routine checks (daily/weekly/annually)
- requirement to report any damage or faults of equipment to the relevant team
- requirement to report missed maintenance checks

Extended written task 2: testing the equipment medication

Scenario

As part of a quality assurance and audit within a laboratory, you are asked to assist a healthcare scientist in testing calibration of automatic pipettes using a balance and the density of water.

- if the accuracy value lies in the 99 to 101% range, the pipette is considered normal and calibrated – calculating accuracy is done by using the formula $A = 100 \times V_{avg}/V_0$, where A is the accuracy of the pipette, V_{avg} is the average calculated volume and V_0 is the theoretical volume you tried to dispense
- you have performed the required steps of pipette calibration for a volume of 10µL of water at a temperature of 23°C (item A)
- the formula for calculating the volume dispensed by the pipette is V = w * Z where w is the weight of the water, Z is the conversion factor based on the density of the water, and V is the calculated volume of how much water was dispensed (item B)

Task

Using the formulas provided as well as the information in item A and item B from the insert provided, calculate the accuracy of the pipette and recommend if the device is in calibration or not. You should also explain the difference between accuracy and precision.

Discuss how audits contribute to the accreditation process and consider why this is important for clinical areas, patients, quality and safety.

(20 marks)

Band	Mark	Descriptor *The student's response*
5	17–20	Shows an excellent understanding of the importance of audits (internal and external) and associated standards in relation to obtaining/maintaining accreditation. Shows a fully comprehensive appreciation of why regular audits are important for clinical areas, patients, quality and safety. Shows an excellent understanding of the steps needed when testing calibration of laboratory equipment in the specified setting, including the relevant calculations. It also shows excellent and accurate use of formula and an excellent level of understanding of the tolerance in calibration testing. Shows an excellent and convincing appreciation of the difference between accuracy and precision. Is fully relevant to the task and is structured in a way that addresses the specific scenario to degree that shows excellent understanding.

Band	Mark	Descriptor *The student's response*
4	13–16	Shows very good understanding of the importance of audits (internal and external) and associated standards in relation to obtaining/maintaining accreditation. Shows a very good appreciation of why regular audits are important for clinical areas, patients, quality and safety. Shows that there is a very good understanding of the steps needed when testing calibration of laboratory equipment in the specified setting, including the relevant calculations. It also shows very good use of formula and understanding of the tolerance in calibration testing. Shows very good appreciation of the difference between accuracy and precision. Is highly relevant to the task and is structured in a way that addresses the specific scenario to a degree that shows very good understanding.
3	9–12	Shows good understanding of the importance of audits (internal and external) and associated standards in relation to obtaining/maintaining accreditation. Shows a good appreciation of why regular audits are important for clinical areas, patients, quality and safety. Shows that there is a good understanding of the steps needed when testing calibration of laboratory equipment in the specified setting, including the relevant calculations It also shows good use of formula and understanding of the tolerance in calibration testing. Shows a good understanding of the difference between accuracy and precision. Is clearly relevant to the task and is structured in a way that addresses the specific scenario to a degree that shows good understanding.
2	5–8	Shows reasonable understanding of the importance of audits [internal and external] and associated standards in relation to obtaining/maintaining accreditation. Shows reasonable appreciation of why regular audits are important for clinical areas, patients, quality and safety. Shows that there is a reasonable understanding of the steps needed when testing calibration of laboratory equipment in the specified setting, including the relevant calculations. It also shows reasonable use of formula and understanding of the tolerance in calibration testing. Shows a reasonable understanding of the difference between accuracy and precision. Is mostly relevant to the task and is structured in a way that shows reasonable relevance to the specific scenario.
1	1–4	Shows a limited understanding of the importance of audits (internal and external) and associated standards in relation to obtaining/maintaining accreditation. Shows a limited appreciation of why regular audits are important for clinical areas, patients, quality and safety. Shows that there is a limited understanding of the steps when testing calibration of laboratory equipment in the specified setting, including the relevant calculations. It also shows limited use of formula and understanding of the tolerance in calibration testing. Shows a limited understanding of the difference between accuracy and precision. Has some relevance to the task and is structured in a way that has limited relevance to the specific scenario.

Band	Mark	Descriptor *The student's response*
	0	No creditworthy material.

Indicative content

- consideration of how following standards contributes to accreditation
  - SOPs ensure high quality
  - high efficiency
  - improved safety
  - consistency
- consideration of how audits (internal, external) contribute to safety and quality
- consideration of the equipment and method (steps) required for testing calibration of the specific laboratory equipment
  - water and balances for testing calibration of an automatic pipette
  - formulas
  - use of provided resources to calculate pipette's accuracy
- explain the difference between accuracy and precision in relation to calibration of laboratory equipment
- correctly recommend if the device is in calibration or not based on the calibration test result and the provided tolerance limits
- select appropriate information as part of the audit

Extended written task 3: escalation of issues related to equipment

Scenario

You are asked to perform a functional check on some devices stocked in the medical equipment library. You have found that one of the tympanic thermometers is showing an error message after turning it on and its audible alarm is very quiet. You have spoken to the user who has confirmed the device has not been dropped. The user has stated that there are no spare devices in their clinical area and this item is needed for the next clinic. You decided to replace the batteries but that has not resolved the issue. You have not been trained to conduct any further checks on a fault such as this one.

Task

Describe how to perform a basic (daily) functional check on a tympanic thermometer and discuss the actions you should take to address this situation.

(20 marks)

Band	Mark	Descriptor *The student's response*
5	17–20	Shows an excellent understanding of factors and situations that should be escalated to senior colleagues in relation to setting up and the use of medical devices, and/or preparing the patient for a measurement/test with an excellent consideration of the role of the healthcare science assistant. Shows an excellent understanding of how the device should be set up and operated correctly (and/or questions that should be asked to verify patient's fitness for the test/procedure). It also shows an excellent consideration of potential risks and consequences of the situation to the patients and others in this environment. Shows an excellent consideration of information that should be communicated when reporting an issue/emergency. Shows they can provide excellent recommendations of immediate safety actions to protect people in this environment. Is fully relevant to the task and is structured in a way that addresses the specific scenario to a degree that shows excellent understanding.

Band	Mark	Descriptor *The student's response*
4	13–16	Shows a very good understanding of factors and situations that should be escalated to senior colleagues in relation to setting up and the use of medical devices, and/or preparing the patient for a measurement/test with a very good consideration of the role of the healthcare science assistant. Shows a very good understanding of how the device should be set up and operated correctly (and/or questions that should be asked to verify patient's fitness for the test/procedure). Shows a very good consideration of potential risks and consequences of the situation to the patients and others in this environment. Shows a very good consideration of information that should be communicated when reporting an issue/emergency. Shows they can provide highly refined recommendations of immediate safety actions to protect people in this environment. Is highly relevant to the task and is structured in a way that addresses the specific scenario to a degree that shows very good understanding.
3	9–12	Shows a good understanding of factors and situations that should be escalated to senior colleagues in relation to setting up and the use of medical devices, and/or preparing the patient for a measurement/test with a good consideration of the role of the healthcare science assistant. Shows a good understanding of how the device should be set up and operated correctly (and/or questions that should be asked to verify patient's fitness for the test/procedure). Shows good consideration of potential risks and consequences of the situation to the patients and others in this environment. Shows good consideration of information that should be communicated when reporting an issue/emergency. Shows they can provide good recommendations of immediate safety actions to protect people in this environment. Is clearly relevant to the task and is structured in a way that addresses the specific scenario to a degree that shows good understanding.

Band	Mark	Descriptor *The student's response*
2	5–8	Shows a reasonable understanding of factors and situations that should be escalated to senior colleagues in relation to setting up and the use of medical devices, and/or preparing the patient for a measurement/test with a reasonable consideration of the role of the healthcare science assistant. Shows a reasonable understanding of how the device should be set up and operated correctly (and/or questions that should be asked to verify patient's fitness for the test/procedure). Shows reasonable consideration of potential risks and consequences of the situation to the patients and others in this environment. Shows a reasonable consideration of information that should be communicated when reporting an issue/emergency. Shows they can provide reasonable recommendations of immediate safety actions to protect people in this environment. Is mostly relevant to the task and is structured in a way that addresses the specific scenario to a reasonable degree.
1	1–4	Shows a limited understanding of factors and situations that should be escalated to senior colleagues in relation to setting up and the use of medical devices, and/or preparing the patient for a measurement/test with a limited consideration of the role of the healthcare science assistant. Shows a limited understanding of how the device should be set up and operated correctly (and/or questions that should be asked to verify patient's fitness for the test/procedure). Show limited consideration of potential risks and consequences of the situation to the patients and others in this environment. Shows a limited consideration of information that should be communicated when reporting an issue/emergency. Shows they can provide limited recommendations of immediate safety actions to protect people in this environment. Contains limited relevance to the task and is structured in a way that has very limited relevance to the details in the brief and insert.
	0	No creditworthy material.

Indicative content

- consideration of appropriate equipment
    - accessories – cradle, case,
    - consumables for collection of clinical measurements to include
        - single-use plastic tips
        - batteries

- knowledge of the functional checks of medical devices
    - self-calibration/ accuracy verification
    - changing the batteries
    - error message
    - visual inspection e.g damage to case, contamination
    - initial start up
    - on screen messages
- being able to explain the potential risk to
    - the patients
    - themselves
    - staff
    - and public
    - there being no available equipment for the clinic
- consideration of healthcare science (HcS) assistant role in the specific scenario
- consideration of situations/tasks outside of their scope of practice
- being able to recommend immediate actions that are within HcS assistant's scope of practice especially relating to health and safety and risk management
- discussion of key information that should be reported to the senior member of staff
    - what device?
    - description of fault
    - what actions they have already taken
    - when/urgency?
    - where is it now?
    - is an alternative required immediately?

Extended written task 4: research and innovation

Scenario

You are working as a healthcare science assistant in a respiratory clinic. You have been given an opportunity to contribute to a diagnostic research and innovation project led by your department.

The study will examine if 30 minutes of light-intensity physical activity (for example, fast-paced walk) performed 2 hours before sleep have a positive effect on the sleep quality of the patients with sleep apnoea (a type of sleep disorder). Only adults with a mild condition will be included in the study. Sleep quality will be assessed in an overnight study (using a finger probe pulse oximeter). The study will be carried out over a period of 8 weeks.

The research lead must prepare the study participant information sheet and consent form for the Health Research Authority approval showing that the study proposal is safe, legal and ethical. You have been asked to contribute to the participant information leaflet.

Task

Discuss the information that should be included in the document, considering the following:

- study information
- patient involvement
- possible effects for patients
- additional supporting information
- information about consent and participation
- information about use of patient data
- accessibility requirements

(20 marks)

Band	Mark	Descriptor *The student's response*
5	17–20	Shows an excellent understanding of the ethical principles of research that demonstrates student's excellent familiarity with the Health Research Authority (HRA) approval process. Shows an excellent ability to select key information for the participant information leaflet from the provided scenario. Shows an excellent consideration of the language appropriate to the audience and any special adjustments that may be required to communicate with different patient groups. Is fully relevant to the task and is structured in a way that addresses the specific scenario to an excellent degree.

Band	Mark	Descriptor *The student's response*
4	13–16	Shows a very good understanding of the ethical principles of research that demonstrates student's high level of familiarity with the HRA approval process. Shows a very good ability to select key information for the participant information leaflet from the provided scenario. Shows very good consideration of the language appropriate to the audience and any special adjustments that may be required to communicate with different patient groups. Is highly relevant to the task and is structured in a way that addresses the specific scenario to a degree that shows very good understanding.
3	9–12	Shows a good understanding of the ethical principles of research that demonstrates student's familiarity with the HRA approval process. Shows a good ability to select key information for the participant information leaflet from the provided scenario. Shows good consideration of the language appropriate to the audience and any special adjustments that may be required to communicate with different patient groups. Is clearly relevant to the task and is structured in a way that addresses the specific scenario to a degree that shows good understanding.
2	5–8	Shows a reasonable understanding of the ethical principles of research that demonstrates student's reasonable level of familiarity with the HRA approval process. Shows a reasonable ability to select key information for the participant information leaflet from the provided scenario. Shows reasonable consideration of the language appropriate to the audience and any special adjustments that may be required to communicate with different patient groups. Is mostly relevant to the task and is structured in a way that addresses the specific scenario to a reasonable degree.
1	1–4	Shows limited understanding of the ethical principles of research that demonstrates student's limited familiarity with the HRA approval process. Shows a limited ability to select key information for the participant information leaflet from the provided scenario. Shows limited consideration of the language appropriate to the audience and any special adjustments that may be required to communicate with different patient groups. Contains minimal relevance to the task and is structured in a way that addresses the specific scenario to a limited degree.
	0	No creditworthy material.

Indicative content

Consideration of:

- ensures informed consent
- ensures participants are informed about the risks
- safeguards participants
- protects participant confidentiality
- General Data Protection Regulations (GDPR)
- formatting to cover language/brail/audio versions
- avoidance of jargon

Look for information covered to include:

- title of the study
- invitation to the study and summary of the study
- what would taking part involve?
- what are possible benefits of participating and any risks?
- any other additional information to support patient's decisions
- agreement to informed consent; agreement to voluntary participation; agreement to personal information collection and processing

The student can use a format of their choice but should cover the points above.

.

Document information

Owner: Head of Assessment Design

Change History Record

Version	Description of change	Approval	Date of Issue
v1.0	Post approval, updated for publication.		January 2021
v1.1	NCFE rebrand.		September 2021
v1.2	OS review Feb 23		February 2023
v1.3	Sample added as a watermark	November 2023	17 November 2023