General Certificate for Technical Education

Examination Specification For: Royal Guard of Oman

Technical Collage

Chemistry, Physics and Mechanical Engineering

Grade (12)

September 2026

Introduction

Educational assessment is one of the fundamental processes that accompanies the teaching and learning process. It aims to improve and develop its various elements by providing essential information and data on strengths and weaknesses in these elements, thereby contributing to judgements about the effectiveness of the educational process.

Although there are various types of educational assessment, continuous assessment, including both formative and summative approaches, is considered one of the most prominent types. It helps students identify their progress, informs parents about their children's performance levels, and provides teachers with valuable insights into the extent to which their students are achieving the intended learning objectives in science subjects. It also supports teachers in improving instructional methods and fosters genuine partnership among all stakeholders in the teaching and learning process through shared roles and responsibilities aimed at achieving quality education.

This document, dear teacher, serves as your guide for implementing the continuous assessment tools for the subject you teach. It outlines a concise theoretical framework explaining the concept of continuous assessment and its related concepts, along with its principles, foundations, stages, and procedures. It also provides a practical reference that supports the effective use of assessment tools by clarifying implementation steps, the technical specifications required for each tool, and the methods for recording and reporting grades. Therefore, this document serves as an essential reference to help ensure the effective implementation of classroom assessment and the success of the teaching and learning process.

We encourage you, dear teacher, to read and reflect on this document thoroughly in order to benefit fully from it, developing your skills and enhancing the quality of assessment. We also encourage you to contribute your expertise and creativity to support the smooth and effective implementation of continuous assessment for your students, helping to achieve the intended educational goals within the parameters and guidelines set out in the General Document for Student Learning Assessment.

Assessment Objectives (AOs)

The assessment objectives for grades (12) include the following:

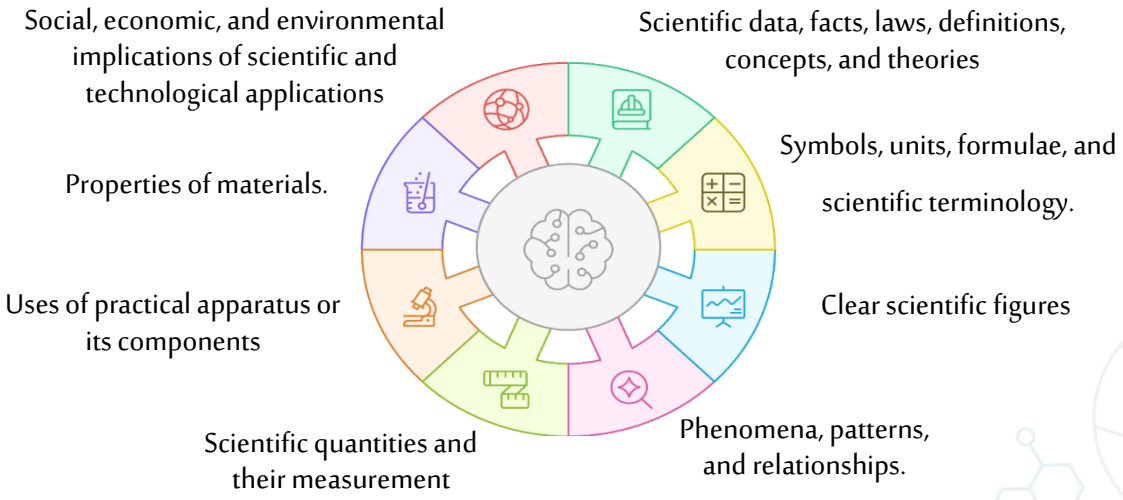
- Assessment Objective 1 (AO1): Knowledge and understanding.
- Assessment Objective 2 (AO2): Application, analysis, and evaluation.

The following provides a detailed explanation of these assessment objectives:

Assessment Objective 1 (AO1): Knowledge and Understanding

This assessment objective assesses the ability to recall and understand scientific vocabulary, concepts, facts, and related procedures, including the ability to comprehend, interpret, and explain them in a simplified manner.

This assessment objective involves knowledge and understanding of the following:



This assessment objective requires certain mathematical skills, including:

- Calculating basic geometric dimensions.
- Performing simple substitution of numbers into remembered or provided formulae.
- Determining answers from single-step calculations.
- Identifying correct data from a small set of numerical values.
- Recalling, recognising, and using formulae as outlined in the learning objective.

Assessment Objective 2 (AO2): Application, Analysis, and Evaluation

This assessment objective assesses students' ability to handle information in a way that requires them to apply their knowledge of scientific concepts in a logical and deductive manner. Students are expected to analyse data, solve or evaluate problems using their understanding and skills in new situations, reaching deeper levels of critical thinking and forming well-informed judgements or perspectives.

This assessment objective includes the ability to:

- Solve problems.
- Use figures or models to demonstrate their knowledge.
- Calculate and process numerical and other forms of data.
- Explain observations, phenomena, patterns, and relationships.
- Link knowledge of scientific concepts to unfamiliar contexts.
- Demonstrate awareness of the limitations of physical theories and models.
- Use information to identify patterns, describe trends, and draw conclusions.
- Make predictions, construct arguments to support hypotheses, and evaluate information and hypotheses.
- Present and interpret information visually, including in tables, graphs, images, figures, or charts.
- Locate, select, organise, and present information from a variety of sources in a scientific manner, including in tables, graphs, images, figures, or charts.

This assessment objective may require some mathematical skills, such as:

- Performing multi-step calculations.
- Rearranging formulae and processing given data or numerical values.
- Identifying correct data from a large set of numerical values provided in the question.
- Interpreting and applying data from graphs and using this data in mathematical formulae.

Levels of Demand

An item's level of demand is determined by the highest level of thinking required to reach the correct answer, rather than by the length of the text, the number of marks allocated, or the familiarity of the topic alone. Not all indicators associated with a particular level need to be present. Where indicators from more than one level are present, the item is assigned to the higher level. Each item is classified under one assessment objective and one level of demand.

First: Levels of Demand for Assessment Objective 1 (AO1)

Level of Demand	Indicators
Low	1. Recall a scientific fact, definition, term, relationship, or a direct description of a single piece of information or concept. 2. Identify a part, or recognise a unit or symbol, on a familiar figure. 3. Give a simple explanation or a direct clarification without linking concepts. 4. A direct response that relies on recalling or recognizing information, without linking information or providing an explanation. 5. Perform a single-step numerical substitution or read a value directly, without the need to select or recall a formula.
Medium	1. Interpret or explain a scientific concept that requires linking two ideas together. 2. Show a deeper understanding of two or more concepts, with a simple distinction or comparison, such as one similarity or one difference. 3. Recall a formula and carry out a direct substitution of numbers in a single step. 4. Use scientific terms correctly in more than one situation or representation, such as text, a figure, a simple table, or an equation, etc.
High	1. Show a detailed understanding of several concepts within the same topic, with a high degree of precision in scientific terms. 2. Make a detailed comparison between two concepts, requiring the recall and organisation of several points of similarity and difference. 3. Describe a complex scientific phenomenon requiring the use of scientific terms in a logical sequence.

Second: Levels of Demand for Assessment Objective 2 (AO2)

Level of Demand	Indicators
Low	1. Extract information directly from a table, graph, figure, or simple text. 2. Convert information directly from one form to another, such as describing the motion of an object from a graph. 3. Solve a simple problem within a narrow scope and with clear guidance, not requiring multiple steps. 4. Apply a rule or scientific relationship in a familiar situation with specific and clear data, similar to the examples or exercises in the textbook.
Medium	1. Apply scientific concepts or relationships in a partially familiar situation. 2. Analyse data from a table, graph, chart, or equation to deduce a relationship or a result. 3. Interpret information presented in a text, representation, chart, or graph to deduce a relationship and provide a reasoned explanation based on the data given. 4. Carry out calculations requiring the rearrangement of a formula or the conversion of units in a moderately complex problem involving multiple steps and partially familiar or modified situations.
High	1. Apply multiple interconnected scientific concepts in an unfamiliar situation. 2. Evaluate an explanation, hypothesis, or scientific procedure, or choose between alternatives or multiple explanations, giving a clear justification. 3. Solve complex, multi-step problems in unfamiliar contexts. 4. Analyse data or representations to deduce more than one relationship or result, or to construct a suitable solution pathway in an unfamiliar situation.

Types of Items and Principles for Their Construction

An **item** is the smallest independent assessment unit, assigned one or more marks.

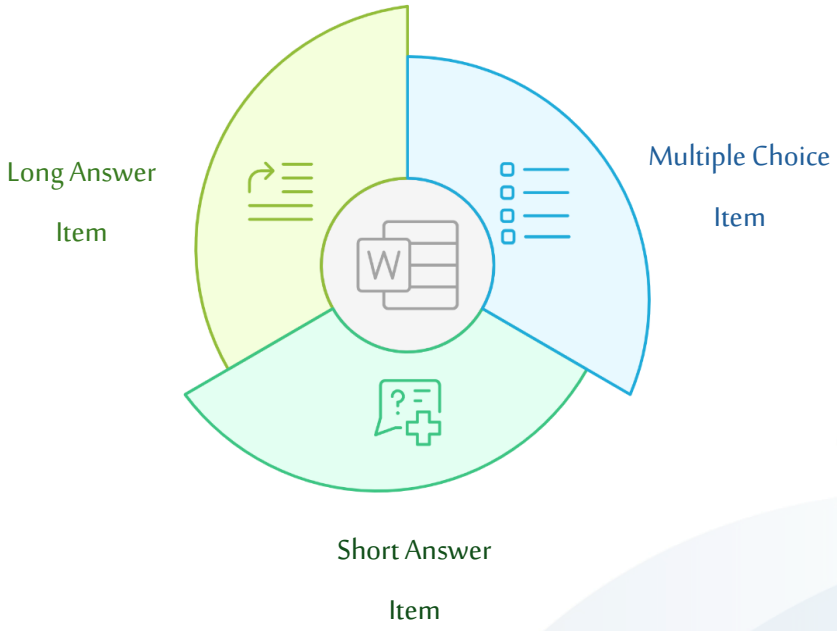
A **question** is a broader construct consisting of one or more items (compound question) and is typically presented within a defined cognitive context, known as the stem.

When constructing items, consideration must be taken to ensure that the guessing rate does not exceed 25%, to maintain the accuracy of measurement and fairness in assessment.

Closed-ended items, such as "Is the unit of mass (kg)?", must not be constructed, as they allow a 50% chance of a correct response by guessing, without demonstrating the student's understanding or their ability to accurately distinguish scientific concepts.

Assessment items—whether constructed for homework, short tests, or final examination papers—are developed to measure the achievement of curriculum-based learning outcomes. They fall into three types, none of which require separate categorisation.

Any type may be placed in any position among the other types, either as a stand-alone item or within a compound question.



The following table outlines these three types:

Multiple Choice Item	Short Answer Item	Long Answer Item
▪ Each item is assigned one mark only. ▪ Each item measures one learning outcome only. ▪ Each item requires selecting one correct answer from four options. ▪ Incorrect alternatives (distractors) must be plausible, yet completely wrong. ▪ All options must be independent and clear; avoid choices such as "all of the above," "none of the above," only options A and B,". ▪ Options should be arranged in a clear and logical order (alphabetically, chronologically, numerically, or by option length).	▪ Each item is assigned one to three marks, with no half marks awarded. ▪ Each item requires brief answers such as symbols, words, numbers, short sentences, definitions, explanations, completing equations, or adding information to networks, tables, figures, or graphs.	▪ Each item assigned 4–6 marks for Grade 11, and 4–8 marks for Grade 12, with no half marks awarded. ▪ Each item requires a detailed response, which may involve explanations, descriptions of properties, presenting facts or evidence, analysing data, writing equations, or solving problems step-by-step. ▪ Demands higher-order thinking and analytical interpretation of scientific concepts, rather than simple recall or listing. To achieve this, imperative verbs such as explain, analyse, discuss, interpret should be used instead of list, name, identify.

There are several general principles that should be observed when drafting the items: Language:

- All items should be based on the curriculum for the relevant grade.
- Only scientific, technical, and mathematical terms included in the curriculum should be used.
- Do not use double negatives; an item must not contain two negation words or particles.
- Avoid negation where possible; if necessary, highlight the negation word or particle, such as "not" or "no."
- Items should be presented clearly using concise and short sentences, with simple language and correct grammar.
- Use bold for keywords, e.g., "Provide **one** example...," "Describe **two** steps...," "Present **two** pieces of evidence..."

Command Words:

- The command word should align with the learning objective, the assessment objective, and the level of demand.
- Items should be formulated using a command word unless the nature of the item requires a direct interrogative style.
- The command word should be clear and specific, and should indicate precisely the response required from the student.
- As a rule, an item should contain one command word; it may contain two interrelated command words that serve a single integrated requirement.
- If each command word measures an independent requirement, the item should be divided into two separate items.

Figures:

- Figures and their data should be presented clearly.
- Should include only the necessary information for answering the items.
- Should be used only if they contribute to the answer or clarify the question or part of it.
- A key may be added to the figure to clarify the meaning of symbols or data, especially if they are new to the student.
- Figures and tables should be labelled clearly and consistently, in line with the labelling used in the student's textbook and referenced correctly in the questions.

Graphs:

- Axes should be defined and labelled, where appropriate, with correct scales and origins.
- Any labelling should be added as needed, e.g., equations of lines/curves or specific points.
- Table titles and graph axis labels should include units so that numbers in the table or on the graph are dimensionless.

Units:

- Measurement units should be appropriate and specified in relevance to the curriculum.
- All data should be rounded to the appropriate number of significant figures.
- Units should be included in the answer space unless a separate mark is allocated for them.

Item Formatting:

- Specify the required extent of the answer and the steps or components it should include.
- For all types of items, the mark should be written at the end of the answer space, in square brackets [ ].

Marking Scheme:

- Marks must be integer numbers (0, 1, 2,...), not fractions or half marks.
- The mark awarded should reflect the level of effort, steps taken, and skills demonstrated.
- Acceptable correct scientific responses not explicitly listed in the curriculum should be included in the additional information column.
- The mark scheme should be accurate, complete, clear, and free from ambiguity.
- The answer provided in the mark scheme may include additional valid content beyond what is required from the student, provided that this is clearly indicated in the Additional Information column.
- The additional information section is essential to ensure that markers apply a clear and consistent marking approach.

End-of-Semester Examination

The end-of-semester examination is a summative assessment tool that aims to assess students' level of attainment and to measure the extent to which the learning objectives of the subject have been achieved. It is prepared according to specific and standardised specifications and is administered at the end of each semester. The following guidelines must be considered when preparing the examination:

- The use of calculators is permitted, provided they are not advanced models that allow programming (PRGM), graph plotting (Graph), or equation solving (Solve).
- The examination may include the following (as needed):
  - All formulas and laws that students are not required to **memorise** (not listed in the learning objectives).
  - The periodic table of elements (Chemistry).
  - The standard reduction potential series (Chemistry).
  - The colours and approximate pH ranges of some chemical indicators (Chemistry).

End-of- Semester Exam Specifications for Grade Chemistry and physics (12))	
Number of items	35-45 items
Total mark	70 marks
Duration of the Exam	Three hours
Marks According to Assessment Objectives	Assessment Objective 1 (AO1): 24 marks. Assessment Objective 2 (AO2): 46 marks
Marks According to Level of Demand	Low: 28 marks (40%) Medium: 28 marks (40%) High: 14 marks (20%)
Types of Items	- Twelve multiple choice items, each worth one mark, ensuring a variety across Assessment Objective 1 (AO1) and Assessment Objective 2 (AO2). - At least two long answer items. - The remaining marks are distributed across short answer items, ensuring the total number of items falls within the specified range.

End-of- Semester Exam Specifications for Mechanical Engineering Grade	
Number of items	15-20 items
Total mark	30 marks
Duration of the Exam	2 hours
Marks According to Assessment Objectives	Assessment Objective 1 (AO1): (Knowing and Understanding): 15 marks. Assessment Objective 2 (AO2): (Application, Analysis, and Evaluation): 15 Marks
Marks According to Level of Demand	Low: 12 marks (40%) Medium: 12 marks (40%) High: 6 marks (20%)
Types of Items	- six multiple-choice items, each worth one mark, ensuring a variety across Assessment Objective 1 (AO1) and Assessment Objective 2 (AO2). - At least one extended-response items. - The remaining marks are distributed across short-response items, ensuring the total number of items falls within the specified range. (15-20 items)

Weighting of the End of Semester Examination Paper

1. **Weighting of the End of Semester Examination Paper for Chemistry.**

Semester One:

Grade	Subject	Semester	The Unit	Weighting (%)	Marks According to Assessment Objectives		Mark
					AO1	AO2	
12	Chemistry	One	First	33	24	46	23
			Second	36			25
			Third	31			22
			Total	100	70		70

Semester Two:

Grade	Subject	Semester	The Units	Weighting (%)	Marks According to Assessment Objectives		Mark
					AO1	AO2	
12	Chemistry	Two	First	31	24	46	22
			Second	15			11
			Third	54			37
			Total	100	70		70

2. **Weighting of the End of Semester Examination Paper for** Physics.

Semester One:

Grade	Subject	Semester	The Unit	Weighting (%)	Marks According to Assessment Objectives		Mark
					AO1	AO2	
12	Physics	One	First	44	24	46	31
			Second	18			12
			Third	18			13
			Fourth	20			14
			Total	100	70		70

Semester Two:

Grade	Subject	Semester	The Unit	Weighting (%)	Marks According to Assessment Objectives		Mark
					AO1	AO2	
12	Physics	Two	First	22	24	46	15
			Second	11			8
			Third	13			9
			Fourth	20			14
			Fifth	34			24
			Total	100	70		70

3. **Weighting of the End of Semester Examination Paper for Mechanical Engineering.**

Semester One:

Grade	Subject	Semester	The Unit	Weighting (%)	Marks According to Assessment Objectives		Mark
					AO1	AO2	
12	Mechanical Engineering	One	First	30	15	15	8
			Second	39			10
			Third	14			6
			Fourth	17			6
			Total	100	30		30

Semester Two:

Grade	Subject	Semester	The Unit	Weighting (%)	Marks According to Assessment Objectives		Mark
					AO1	AO2	
12	Mechanical Engineering	Two	First	34	15	15	10
			Second	27			8
			Third	23			7
			Fourth	16			5
			Total	100	30		30