

-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

Hanover House
24 Douglas Street
GLASGOW G2 7NQ

NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number-	3171302	-Session-	1992-93
-Superclass-	RC		

-Title-	ELECTROMAGNETISM (x¹/₂)
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-DESCRIPTION-

Purpose	This module is designed to extend the skills and knowledge required in the field of electromagnetism. It is suitable for candidates in a wide range of occupational areas, and in conjunction with Stage 2 and other Stage 3 Physics modules, could be a preparation for Higher Education.
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Preferred Entry Level	3171121 Electricity or Higher Grade Physics and Higher Grade Mathematics or equivalent.
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Outcomes	The candidate should: 1. apply and interpret the concepts of electromagnetism to explain electromagnetic phenomena; 2. perform, predict and report on experiments relating to electromagnetism.
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Assessment Procedures	Acceptable performance in this module will be satisfactory achievement of all the Performance Criteria specified for each Outcome.
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The following abbreviations are used below:

PC Performance Criteria
IA Instrument of Assessment

Note: The Outcomes and PCs are mandatory and cannot be altered. The IA may be altered by arrangement with SQA. (Where a range of performance is indicated, this should be regarded as an extension of the PCs and is therefore mandatory.)

OUTCOME 1 APPLY AND INTERPRET THE CONCEPTS OF ELECTROMAGNETISM TO EXPLAIN ELECTROMAGNETIC PHENOMENA

PCs

- (a) The use of the given terms in explanations is correct.
- (b) The application of the concepts of electromagnetism to describe, or predict a situation is correct.
- (c) The application of the concepts of electromagnetism to situations involving calculations or equations is correct with respect to the use of units, and obtaining a solution to the appropriate level of significance.
- (d) The prediction and explanation of given electromagnetic phenomena is consistent with the concepts involved.

IA Structured Questions and Extended Response

2 structured questions and 1 extended response question to assess the candidate's ability to apply and interpret the concepts of electromagnetism to explain electromagnetic phenomena under closed book conditions.

The 2 structured questions should be allocated to Performance Criteria (a), (b) and (c) and the extended response question should be allocated to Performance Criterion (d).

All the items listed below must be contained within the 2 structured questions:

- (a) terms: inductor, self inductance, henry, magnetic flux density (B) tesla.
- (b) concepts: self induced e.m.f., spatial relationship between force, current and magnetic flux density.
- (c) calculations: $F = I\ell B_{\perp}$ or $F = BQv$ and
self-induced e.m.f. = $-L \frac{dI}{dt}$.

The extended response question must cover: the result of a current carrying coil in close proximity to a similar coil or permanent magnet. The candidate should produce a response of between 200 and 400 words.

Satisfactory achievement of the Outcome will be demonstrated by the student achieving all the Performance Criteria within the 3 questions.

**OUTCOME 2 PERFORM, PREDICT AND REPORT ON
EXPERIMENTS RELATING TO ELECTROMAGNETISM**

- PCs
- (a) The setting up of the equipment is in accordance with the given specification.
 - (b) The experimental procedures carried out are correct and safe.
 - (c) The recording of the procedures, relevant observations and measurements is complete and accurate with numerical uncertainties where appropriate.
 - (d) The presented data is in an appropriate format.
 - (e) The identification of valid experimental errors in absolute and percentage terms is correct.
 - (f) The calculation and presentation of the overall uncertainty is correct and in the appropriate format.
 - (g) The conclusion(s) and prediction(s) drawn are valid within the limits of experimental uncertainty.

IA Assignment

An assignment to assess the candidate's ability to perform, predict and report on experiments relating to electromagnetism.

The candidate will be required to carry out a specified experiment and prepare a scientific report to cover Performance Criteria (c) to (g). The report must be structured and include the following sections: aims, procedures, readings and results, uncertainties and conclusions.

A checklist should be devised to ensure a reliable interpretation of the candidate's practical performance in relation to Performance Criteria (a) and (b).

Satisfactory achievement of the Outcome will be demonstrated by the candidate achieving all the Performance Criteria.

The following sections of the descriptor are offered as guidance. They are not mandatory.

CONTENT/CONTEXT

Corresponding to Outcomes 1-2:

1.
 - (a) Correct use of the following terms: magnetic flux density (B) at the centre of a loop, a coil, a solenoid, tesla, permeability of free space (μ_0), self-inductance, henry, transient, inductor.
 - (b) Application of: magnetic field due to a long straight conductor, the ampere in fundamental units, self-induced e.m.f., time constant, spatial relationship between force current and magnetic flux density.
 - (c) Calculations involving: $F = I\ell B_{\perp}$; $F = BQv$;
self-induced e.m.f. = $-L \frac{dI}{dt}$.
 - (d) phenomena: electromagnetic repulsion and attraction.
2. Experiments could include: $\frac{e}{m}$, transience, Hall effect, self-inductance.

SUGGESTED LEARNING AND TEACHING APPROACHES

A candidate-centred, resource-based learning approach is recommended. Concepts should be developed and reinforced by practical work integrated throughout the module. Teaching strategies designed to encourage independent study should be employed.

A range of experimental work should be included within the module to allow a selection of an assignment to be presented for summative assessment purposes. The candidate should be encouraged to document all observations and results of experiments in a folio of work.

During the work of the module candidates should have several opportunities to develop their practical and problem-solving skills. Each candidate should be assessed at appropriate points throughout the module. Where a candidate is unsuccessful in achieving an Outcome, provision should be made for remediation and reassessment.

Safety should be given due consideration at all times.