

-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

**Hanover House
24 Douglas Street
GLASGOW G2 7NQ**

NATIONAL CERTIFICATE MODULE DESCRIPTOR

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| -Module Number- | 2320010 | -Session- | 1990-91 |
| -Superclass- | ZF | | |

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| -Title- | PRINCIPLES OF THE SHIP'S MAGNETIC COMPASS |
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-DESCRIPTION-

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| Purpose | The module enables the student to gain an understanding of the principles of the ship's magnetic compass. It provides an introduction to the factors which will disturb compass readings and how to correct the readings. |
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| Preferred Entry Level | 89030 Physics 1 and (or) Standard Grade Science at 3. |
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| Outcomes | The student should: <ol style="list-style-type: none">1. describe the terrestrial magnetic field;2. apply concepts of permanent and induced magnetism to the ships magnetic field;3. apply concepts of P, Q, R forces to compass readings and compass corrections;4. state selected factors disturbing the compass;5. perform calculations on compass deviation. |
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| Assessment Procedures | Acceptable performance in the module will be satisfactory achievement of all the Performance Criteria specified for each Outcome. |
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The following abbreviations are used below:

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| 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 DESCRIBE THE TERRESTRIAL MAGNETIC FIELD

- PCs
- (a) A sketch of the terrestrial magnetic field is drawn and correctly labelled.
 - (b) Terms used to defined the terrestrial magnetic field are correctly described.
 - (c) Changes in the terrestrial magnetic field are correctly identified.
 - (d) The horizontal component of the earth's magnetic field is calculated given total field and the angle of dip.

IA Short answer questions

The student will be presented with 11 short answer questions to assess the recall of knowledge relating to terrestrial magnetism.

The questions should be allocated as follows:

- (i) drawn and labelled sketch 1 question;
- (ii) definition of terms 4 questions;
- (iii) identification of changes 3 questions;
- (iv) calculations 3 questions.

Satisfactory achievement of the Outcome will be demonstrated by the student producing 8 correct responses to the objective questions with a correct response to (i), at least 3 correct responses to (ii) and at least 2 correct responses to each of (iii) and (iv).

OUTCOME 2 APPLY CONCEPTS OF PERMANENT AND INDUCED MAGNETISM TO THE SHIP'S MAGNETIC FIELD

- PCs
- (a) Typical hysteresis loops for hard and soft magnetic materials are correctly identified.
 - (b) Remanance and coercivity are accurately defined.
 - (c) The magnetism which a vessel acquires during its construction is predicted for a given heading and latitude.

IA Short Answer Questions

The student will be presented with 8 short answer questions to assess the recall and application of knowledge relating to the ship's magnetic field.

The questions will be allocated as follows:

- (i) identification of hysteresis loops 2 questions;
- (ii) definition of remanance and coercivity 2 questions;
- (iii) prediction of magnetic field acquired during building, given heading and latitude 4 questions.

Satisfactory achievement of the Outcome will be demonstrated by the student producing 7 correct responses; 2 correct responses for (i) and (ii) and at least 3 correct responses for (iii).

OUTCOME 3**APPLY CONCEPTS OF P, Q, R FORCES TO COMPASS READINGS AND COMPASS CORRECTIONS**

PCs

- (a) The P, Q and R forces and the sign convention are correctly defined.
- (b) The effect of P and Q forces and corrections for these effects are deduced for a vessel on the cardinal headings.
- (c) The effect of the R component on a vessel which is rolling is deduced.

IA Short Answer Questions

The student will be presented with 14 short answer questions to assess the recall and application of knowledge relating to P, Q and R forces. The questions will be allocated as follows:

- (i) definition of P, Q and R forces and sign convention 4 questions;
- (ii) deduction of the effect of P forces and correction for a vessel on the cardinal headings 4 questions;
- (iii) deduction of the effect of Q force and corrections for a vessel on the cardinal headings 4 questions;
- (iv) deduction of the R force on a vessel which has rolled to one side 2 questions.

Satisfactory achievement of the Outcome will be demonstrated by the student producing 10 correct responses to the objective questions, with at least 3 correct responses for (i), (ii) and (iii) and 1 correct response for (iv).

OUTCOME 4 STATES SELECTED FACTORS DISTURBING THE COMPASS

- PCs
- (a) Ship's fittings including rerouted wiring which can cause magnetic disturbance are listed.
 - (b) Moveable items which can cause magnetic disturbance are listed.

IA Multiple Choice Questions

Students will be presented with 6 Multiple Choice Questions under the categories fixed and moveable objects, rating the degree risk.

Satisfactory achievement of the Outcome will be based on all Performance Criteria being met. This will be demonstrated by the student correctly rating the risk for 2 fixed and 4 moveable objects.

OUTCOME 5 PERFORM CALCULATIONS ON COMPASS DEVIATION

- PCs
- (a) The deviation produced by a wire carrying dc current is calculated.
 - (b) A deviation card is drawn given compass bearings on 8 equally spaced headings.

Calculation Exercise

The student will be presented with two calculation exercises to assess the ability to perform calculations on compass deviation.

The questions should be allocated as follows:

- (i) Deviation produced by a wire carrying dc current for a vessel on the 4 cardinal headings given the earth's total magnetic field;
- (ii) Production of a deviation card given compass bearings on 8 equally spaced headings.

Satisfactory achievement of the Outcome will be based on all Performance Criteria being met. Answers must be correct to the nearest whole degree.

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

CONTENT/CONTEXT

Corresponding to Outcomes 1-5:

1. Variation, dip, relationship between H, Z and dip, secular and lunar change.
 2. Hysteresis loops for hard and soft magnetic materials; remanance and coercivity, permanent magnetism due to building and the effect of heading and latitude (North and South hemispheres).
 3. P, Q and R forces and sign convention. Effect of P and Q forces for vessel on the cardinal headings. Corrections for P and Q forces.

Effect of roll on R component.
 4. Magnetic disturbances; wire carrying dc current.
 5. Method of producing a deviation card.
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SUGGESTED LEARNING AND TEACHING APPROACHES

A combination of group discussion and practical work, involving the dip circle, plotting the field around a wire carrying dc current and demonstration using the binnacle.

Solution of numerical problems and construction of deviation card by calculation.

Practical work should include the use of Admiralty Charts 5378 and 5379.

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