-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

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NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number- **3171021** **-Session- 1991-92**
-Superclass- **RC**

-Title- **INTRODUCING RADIOACTIVITY ($x^1/_2$)**

-DESCRIPTION-

Purpose

This module is designed to introduce the student to the basic concepts of radioactivity. It is suitable for students in a wide range of vocational areas. It could be used in conjunction with other Stage 1 Physics modules.

Preferred Entry Level

No formal entry requirements.

Outcomes

The student should:

1. use the concepts of radioactivity to solve given problems;

2. perform experiments or simulations relating to radioactivity.

Assessment Procedures

Acceptable performance in the module will be satisfactory achievement of all the Performance Criteria specified for each Outcome.

The following abbreviations are used below:

IA Instrument of Assessment
PC Performance Criteria

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 **USE THE CONCEPTS OF RADIOACTIVITY TO SOLVE GIVEN PROBLEMS**

PCs

(a) The use of the given terms in explanations is correct.
(b) The use of the concepts of radioactivity to describe or explain a given situation is correct.
(c) The use of the concepts of radioactivity to situations involving a calculation or equation is correct with respect to the use of units and obtaining a solution.

IA Structured Questions

3 structured questions to assess the student's ability to use the concepts of radioactivity to solve given problems under closed book conditions.

There should be 1 structured question on each of the following topics:

(i) properties of alpha and beta particles and gamma radiation, half-life;
(ii) safety precautions and biological effects;
(iii) power stations.

The questions must contain all the items listed below:

(i) PC
(a) terms: alpha particles, beta particles, gamma radiation, activity, background radiation, ionisation;
(b) concepts: range and absorption of alpha and beta particles and gamma radiation in a comparative situation;
(c) calculations: half-life from data/graphs.

(ii) PC
(a) terms: dose equivalent; warning sign;
(b) concepts: safety precautions when handling and storing radioactive material.

(iii) PC
(a) terms: chain reaction, radioactive waste;
(b) concepts: main energy transformation at each stage in a nuclear power station;
(c) calculations: energy transformation and efficiency in nuclear power stations and comparison with coal/oil/gas and hydroelectric power stations.

Satisfactory achievement of the Outcome will be demonstrated by the student achieving all the Performance Criteria specified for each question.

OUTCOME 2 **PERFORM EXPERIMENTS OR SIMULATIONS RELATING TO RADIOACTIVITY**

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 recorded observations and measurements are complete and accurate.
(d) The presented data is in an appropriate format.
(e) The identification of possible sources of error is valid.
(f) The conclusions drawn are valid.

IA Assignment

An assignment to assess the student's ability to perform experiments or simulations relating to radioactivity.

The student will be required to carry out a specified experiment and prepare evidence to cover Performance Criteria (c) - (f).

A checklist should be devised to ensure a reliable interpretation of the student's practical performance in relation to Performance Criteria (a) and (b). If a demonstration is to be carried out, students should be assessed by short answer questions covering these Performance Criteria.

Satisfactory achievement of the Outcome will be demonstrated by the student achieving all the Performance Criteria for the assignment.

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

CONTENT/CONTEXT

Corresponding to Outcomes 1-2:

1. (a) The correct use of the following terms: alpha particles; beta particles; gamma radiation; x-rays; activity; half-life; background radiation; ionisation; range; absorption; warning sign; dose equivalent; chain reaction; radioactive waste; and units where appropriate.

   (b) Uses of: safety precautions; range and absorption of alpha, beta and gamma; biological effects of radiation; energy transformations in thermal, hydroelectric and nuclear power stations; industrial and medical use of radiation.

   (c) Calculations involving: half-life from data/graph; energy transformation and efficiency.

2. Experiments could include: range and absorption of alpha, beta, gamma; half-life determination; measurement of background count.

SUGGESTED LEARNING AND TEACHING APPROACHES

A student-centred, resource-based learning approach is recommended. Concepts should be developed and reinforced by practical work integrated throughout the module.

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 student should be encouraged to document all observations and results of experiments in a folio of work.

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

For Outcome 2, where for safety or other considerations student practical work is not possible, some aspects of the experiments could be achieved by demonstration or simulation. Reference should be made to the appropriate regulations relating to the use of ionising radiation.
