

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

APPLIED PHYSICS DEPARTMENT

EXAMINATION

SRA 2101 – RADIOGRAPHIC IMAGING

BSc HONOURS PART II: DECEMBER 2005 DURATION: 3 HOURS

ANSWER **ALL** PARTS OF QUESTION **ONE** IN SECTION A AND ANY **THREE** QUESTIONS FROM SECTION B. SECTION A CARRIES 40 MARKS AND SECTION B CARRIES 60 MARKS.

SECTION A

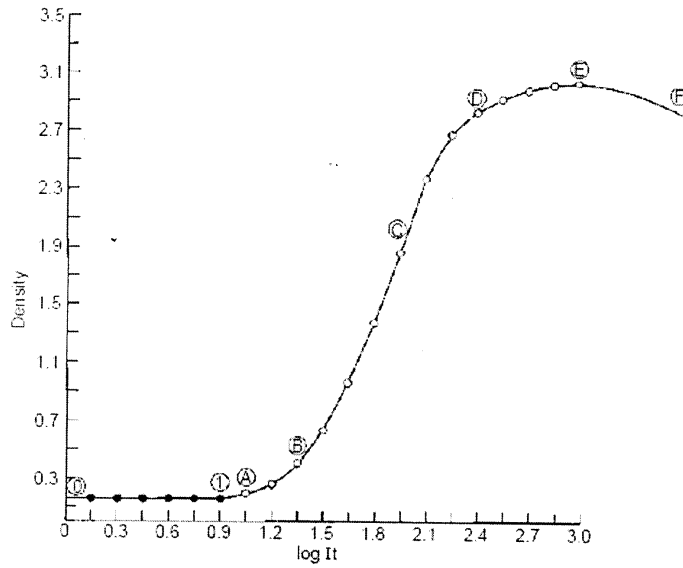
1. (a) A radiograph is obtained using a focus to film distance of 100cm with a focal spot size of 1.8mm x 1.8mm. The object to film distance is 10cm.
- (i) Calculate the:
 - (a) width of the penumbra, [2]
 - (b) magnification of the image. [1]
 - (ii) Explain 2 practical measures that can be taken to reduce the size of the penumbra. [2]
- (b) Justify the use of kV_ps between 80 -105 for rare earth intensifying screens. [5]
- (c) Explain the effect of grain size and grain size distribution on two characteristics of a film emulsion. [5]
- (d) Justify the use of the term log relative exposure in preference to absolute exposure in sensitometry. [5]
- (e) (i) Describe the desirable characteristics of a developer for the processing of radiographic film. [3]
- (ii) Explain how aerial oxidation can be minimised in developer solutions. [2]
- (f) (i) Differentiate between the terms halation and irradiation. [2]
- (ii) Explain how two design features of a film or a screen minimise halation and irradiation [3]

- (g) Define the electromagnetic spectrum and explain its significance in radiographic imaging. [5]
- (h) Warm and running water should be used for washing the film in processing. Do you agree with this statement? Justify your answer. [5]

SECTION B

2. With reference to film stock control:
- (a) Evaluate 3 film ordering methods that could be used by a central hospital in Zimbabwe. [15]
- (b) How may the current problems of film stocks be minimised in a city like Bulawayo [5]
3. (a) Justify the actions you would take in rectifying the following processing faults;
- (i) overall high density on films, [10]
- (ii) films coming out of the processor wet [10]
- (b) Explain the process of fixation. [10]
4. (i) Discuss sources of unsharpness in an image. [15]
- (ii) Illustrate how unsharpness may be minimised. [5]
5. Discuss how the following factors have contributed to reducing patient radiation dose and/or improving image quality
- (i) advancements in film grain technology,
- (ii) cassette designs,
- (iii) automatic exposure devices,
- (iv) light absorbing dyes. [20]

6. (a) Evaluate 2 methods that can be used to produce characteristic curves in an imaging department. [10]
- (b) From the characteristic curve below, briefly explain the information and its significance that could be obtained from the indicated points [10]



Characteristic curve