

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

APPLIED PHYSICS DEPARTMENT

SRA 2101 – RADIOGRAPHIC IMAGING

Supplementary Examination

BSc HONOURS PART II: JULY 2005

DURATION: 3 HOURS

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

SECTION A

1. (a) Define the electromagnetic spectrum and explain its significance in radiographic imaging. [5]
- (b) A radiograph is obtained using a focus to film distance of 100cm with a focal spot size of 1.8 mm x 1.8 mm. The object to film distance is 10cm.
- Calculate the:
- (i) width of the penumbra [2]
- (ii) magnification of the image [1]
- (iii) explain two measures that can be taken to reduce the size of the penumbra. [2]
- (c) Identify the contents of the individual containers for both developer and fixer liquid concentrates and explain why different containers are required. [5]
- (d) Explain why the term log relative exposure is used in preference to absolute exposure in sensitometry. [5]
- (e) (i) Indicate how the emulsion side of a single emulsion film is identified. [1]
- (ii) Justify the arrangement of film and screen when a single intensifying screen is used. [4]
- (f) Describe five features of day to day handling and storage of x-ray cassettes aimed at prolonging their working life. [5]

- (g) With reference to the film emulsion, discuss how advancements in grain technology have positively affected radiographic imaging. [5]
- (h) (i) Define the term noise in image quality. [1]
- (ii) Differentiate between structure and quantum mottle. [4]

SECTION B

- 2. (a) Differentiate between intensity and time scale sensitometry. [5]
- (b) Discuss three available methods/options for producing characteristic curves. [15]
- 3. (a) Justify the actions you would take in rectifying the following processing faults:
 - (i) films coming out of the processor wet
 - (ii) overall high density on films
 - (iii) brown stain on storage. [15]
- (b) Explain the washing process in film processing. [5]
- 4. (a) Explain the following terms:
 - (i) fluorescence
 - (ii) phosphorescence
 - (iii) thermoluminescence. [6]
- (b) Discuss factors which influence effective conversion efficiency of intensifying screens [10]
- (c) With the aid of a graph, describe how light emission from a calcium tungstate intensifying screen is matched with the spectral sensitivity of the film emulsion. [4]

5. (a) The following chemicals are constituents of a fixer or developer solution for use in an automatic film processor. State the function of each constituent and briefly explain its action during processing:
- (i) sodium sulphite
 - (ii) phenidone
 - (iii) aluminium chloride
 - (iv) potassium metabisulphite. [12]
- (b) Justify the use of automatic film mixers in an imaging department. [5]
- (c) Explain the phenomenon of superadditivity. [3]
6. (a) Using one of the common theories, explain the formation of a latent image. [5]
- (b) Discuss how each of the following affects radiographic image quality;
- (i) use of a displacement band
 - (ii) an increase in KVP
 - (iii) an increase in developer temperature. [15]

- END OF EXAMINATION -