

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

APPLIED PHYSICS DEPARTMENT

RADIOGRAPHIC IMAGING I - SRA 2101

EXAMINATION

BSc HONOURS PART II : DECEMBER 2004 DURATION : 3 HOURS

ANSWER **ALL** QUESTIONS 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) With reference to intensifying screen/film combinations, explain the term *speed classification*. [2]
- (b) State *three* reasons why optical density is used to indicate radiographic density. [3]
- (c) With reference to processing chemistry, differentiate giving examples in each case, between the terms *restrainer* and *preservative*. [2]
- (d) Explain why x-ray film - screen combinations have an average gradient greater than 1. [3]
- (e) (i) If a solution A has a pH value of 10, solution B a pH of 9, how much more alkaline is solution A than solution B. [1]
- (ii) Explain why it is important for the pH of fixer to be maintained within a narrow range. [2]
- (f) (i) Distinguish between the terms *fluorescence* and *phosphorescence*. [2]
- (ii) Explain the significance of the two terms in (i) in imaging. [2]
- (g) State *four* desirable physical characteristics for the base material suitable for transparency radiographic film. [2]
- (h) Differentiate between *subject contrast* and *film contrast*. [4]
- (i) Define the term *aerial oxidation* and explain how the problem can be minimized in developer solutions. [3]

- (j) Explain the effect of adverse storage conditions on:
 - (i) film contrast,
 - (ii) gross fog. [2]
- (k) Outline a cassette maintenance procedure in an imaging department. [3]
- (l) Outline the factors upon which a successful examination depends when using automatic exposure control (AEC). [3]
- (m) Explain the phenomenon of *superadditivity*. [3]
- (n) (i) Define the term *archival permanence*. [1]
- (ii) State how archival permanence is improved during the processing cycle. [2]

SECTION B

- 2. Following development and fixation in processing, a film is washed and dried.
 - (a) Explain why a film should be washed in the processing cycle. [5]
 - (b) Briefly outline the film washing process. [3]
 - (c) State and explain the factors that affect the efficacy of the washing and drying processes. [12]
- 3. (a) Discuss the available methods for producing characteristic curves in an imaging department. [15]
- (b) Explain the relationship between:
 - (i) film contrast and film latitude.
 - (ii) kVp and exposure latitude. [5]
- 4. (a) Explain the function and action of developer in film processing. [4]
- (b) A newly prepared developer solution produces images with high chemical fogging. Outline giving reasons, the steps you would take to rectify the situation. [4]

- (c) The following chemicals are constituents of a fixer or developer solution suitable for use in an automatic processor. State the function of each constituent and briefly explain its action during processing;
- (i) potassium hydroxide,
 - (ii) ammonium thiosulphate,
 - (iii) water,
 - (iv) potassium metabisulphite. [12]
5. (a) Discuss the pros and cons of various materials used in the construction of cassette fronts. [10]
- (b) With respect to intensifying screens, explain the following terms:
- (i) quantum detection efficiency,
 - (ii) broad band emitter. [4]
- (c) Explain why screens are kVp dependent and its significance in radiographic practice. [5]
- (d) State *two* advantages of rare earth screens. [1]
6. (a) Discuss the stock control procedures that can be used in an imaging department to ensure availability of adequate film levels. [12]
- (b) Discuss the challenges facing the Zimbabwean radiography manager today with respect to film stock control. [8]

END OF EXAMINATION PAPER