

PRIMARY EXAMINATION

**BIOCHEMISTRY**

Tuesday, 3 December 2002

Time allowed: Two hours

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INSTRUCTIONS TO CANDIDATES

Question 1 in Section A is compulsory.

Answer **three** of the questions in Section B, including one from questions 5 & 6.

Use diagrams and formulae wherever possible.

Maximum marks: 75.

Please answer each of your four questions in a **separate** book.

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**Section A (15 marks)**

**This question is compulsory.**

1. Write short explanatory answers to **THREE** of the following questions:

- (a) Collagen is the main structural protein in the human body. Explain why its function and structure is so important in oral tissue.
- (b) It has been known for over 150 years that rickets could be cured either by taking cod liver oil or by exposure to sun light. Explain this apparent paradox. What is the main function of the active principle, 1,25-dihydroxcholecalciferol?
- (c) A patient with a science background is concerned about the reactive oxygen species (ROS) which can be produced by a dental x-ray. Reassure her by describing the mechanisms which tissues use to protect themselves from these molecules.
- (d) Describe the mechanism of action of the anti cancer drug, methotrexate, and explain how it induces deficiencies in the levels of the deoxy-nucleotide triphosphates.
- (e) Describe the potential mechanisms by which fruit and vegetable consumption protects from chronic disease.

**Section B (60 marks)**

**Answer THREE of the following FIVE questions.**

**All questions are of equal value**

**This MUST include at least one from questions 5 and 6**

2. Describe the structure of haemoglobin and discuss the mechanism which causes it to have a sigmoidal oxygen dissociation curve, allowing tissues to be well supplied with oxygen under a variety of metabolic demands.
3. A patient has been found after four days following a bomb blast. He has suffered facial and dental trauma but no other obvious injuries. Explain how he was able to survive without any food and with a minimum amount of water. Describe the metabolic stages that would have taken place. When would it be safe to proceed with dental procedures?
4. Low density lipoprotein (LDL) is a recognised risk factor for coronary heart disease. Describe the metabolic origin of LDL and outline the circumstances which lead to its atherogenicity.
5. Most organisms use double stranded DNA as genetic material, and proteins to carry out the functions required for life. Explain how the biochemical features of DNA and proteins suit these functions AND discuss briefly whether RNA is ever used for these purposes.
6. Imagine you isolate a new virus that contains only three genes. Describe how you might go about raising anti-bodies to the proteins encoded by these genes AND explain how these anti-bodies might be useful.

End of Paper