

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF
SCIENCE IN BIOMEDICAL AND TECHNOLOGY**

BMET 444: BIOMEDICAL INSTRUMENTATION

STREAMS:

TIME: 2 HOURS

DAY/DATE: MONDAY 27/09/2021

2.30 P.M. – 4.30 P.M.

INSTRUCTIONS

- **Answer question one and any other two questions**

Question one

- Explain why, soft tissue organs such as the spinal cord, kidneys, bladder, gut and blood vessels are very poorly resolved by a single projection X-ray. (5 marks)
- Explain how imaging of the outline of the gut can be enhanced. (5 marks)
- Using an example, explain how dose related effects of ionizing radiations limit X-ray investigations. (5 marks)
- Explain the advantages that the CT scan would have over X-ray during clinical investigations. (5 marks)
- Explain how imaging is achieved for patients undergoing a heart scan. (5 marks)
- A clinician wants to investigate cerebral blood flow in the foetus. Explain the imaging techniques he should opt for. (5 marks)

Question two

- Describe the application of the various types of ^{99m}Tc labelled radionuclide in clinical investigations. (10 marks)

- b) Besides pregnancy, describe the use of ultrasound in other clinical investigations and explain specific clinical situations where it cannot be used. (10 marks)

Question three

- a) Describe the advantages of magnetic resonance imaging (MRI) over computer tomography (CT) in clinical investigations. (10 marks)
- b) Describe how interventional radiological procedures have transformed clinical investigations. (10 marks)

Question four

- a) Describe any clinical or research applications for which PET and SPECT offer a significant advantage over fMRI. (10 marks)
 - b) Describe the technical difficulties that need to be overcome for fMRI and EEG to be recorded simultaneously and provide complementary spatial and temporal information. (10 marks)
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