# TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

**UNIVERSITY EXAMINATION FOR:**

BTAC

ACH 4307 : MATERIAL CHEMISTRY

END OF SEMESTER EXAMINATION

**SERIES: Special/Supplementary Examinations**

**TIME:** 2 HOURS

**DATE:** Pick Date Select Month 2017

**Instructions to Candidates**

You should have the following for this examination

*-Answer Booklet, examination pass and student ID*

This paper consists of **FIVE** questions. Answer question ONE (Compulsory) and any other TWO questions.

**Do not write on the question paper.**

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**Question ONE**

(a) Tabulate the seven crystal systems giving the restrictions of axes and angles (9 marks)

(b) What is:

(i) A biomaterial (1 mark)

(ii) Biocompatibility (1 mark)

(c) What is a laser? (1 Mark)

What is the structure of semiconducting laser? (1 mark)

(d) How does the Band Theory help us understand what makes conductor, insulator, or semiconductor? (4 marks)

(e) What is:

(i) A Superconductor? (2 marks)

(ii) The Critical Temperature for Superconductors (3 marks)

(f) What kind of information do the following analytical techniques give:

(i) X-Ray Diffraction

(ii) Neutron Diffraction

(iii) Solid State NMR
(iv) Scanning Electron Microscopy
(v) Transmission Electron Microscopy
(vi) Elemental dispersion analyzer – using X-rays
(vii) IR Spectroscopy
(viii) X-ray fluorescence spectroscopy
(1 mark each)

**Question TWO**

With the aid of diagrams, describe the 14 Bravais lattices (20 marks)

**Question THREE**

(a) Give a comparison of the properties of liquid crystal and other phases of matter (4 marks)
(b) Describe with the aid of diagrams the characteristics and type of ordering in the following phases of liquid-crystals:
  (i) Nematic phase (4 marks)
  (ii) Smectic phase (4 marks)
  (iii) Cholesteric phase (Chiral nematic phase) (4 marks)
  (iv) Discotic phase (4 marks)

**Question FOUR**

Write notes on Zeolites with reference to:

(a) Mineralogy (5 marks)
(b) Common properties (7 marks)
(c) Describe:
  (i) The manufacture of ZeoPro from a natural source of clinoptilolite (4 marks)
  (ii) How ZeoPro works (4 marks)

**Question FIVE**

Tabulate the physical and structural properties associated with : Ionic ; Covalent; Metallic ; and van der Waals bonds (20 marks)