



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

APS 2150: PHYSICAL SCIENCE FOR ENGINEERS

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: SEPTEMBER 2018

TIME: 2HOURS

DATE: Pick DateSep2018

Instructions to Candidates

You should have the following for this examination

-Examination pass and student ID

This paper consists of five questions. Attempt any THREE questions.

Do not write on the question paper.

QUESTION ONE

- a) Balance the following chemical equations:-
- (i) $\text{Ag NO}_3 \rightarrow \text{Ag}_2\text{O} + \text{NO}_2 + \text{O}_2$
 - (ii) $\text{CuSO}_4 + \text{KI} \rightarrow \text{CuI} + \text{I}_2 + \text{K}_2\text{SO}_4$
 - (iii) $\text{Pb (NO}_3)_2 + \text{K}_2 \text{CrO}_4 \rightarrow \text{PbCrO}_4 + \text{KNO}_3$
 - (iv) $\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$ **(10marks)**
- b) An Iron ring has a cross-sectional area of 0.005m^2 and a mean length of 1.2m . It is uniformly wound with a coil of 900 turns. If a current of 2A in the coil produces a flux density of 1.1T in the ring, calculate.
- (i) The total flux in the iron
 - (ii) The magnetic field strength
 - (iii) The relative permeability of the iron under these conditions **(10marks)**
- c) (i) Distinguish between **isothermal change** and **isobaric change**
(ii) An aluminium pan of mass 0.5kg and containing 3kg of water is heated from 10°C to 100°C . Calculate the amount of heat received by the pan and its contents. Assume the specific heat capacity of water and aluminium are $4200 \text{ J/Kg}^\circ\text{C}$ and $920 \text{ J/Kg}^\circ\text{C}$, respectively. **(10marks)**

QUESTION TWO

- a) Define **wave** **(1mark)**
- b) Describe
- (i) Transverse wave
 - (ii) Longitudinal wave **(4marks)**
- c) State **five** conditions necessary for the establishment of a stationary wave **(5Marks)**
- d) Explain an experiment which can be used to determine the wavelength in air of the note emitted by a tuning fork **(10marks)**

QUESTION THREE

- a) Define **resonance** (1mark)
- b) State **three** degrees of damping (3marks)
- c) Calculate the length of cord needed for a simple pendulum to have a periodic time of 2 seconds (4marks)
- d) A body of mass 2kg oscillates in a straight line with simple harmonic motion. The maximum restoring force applied to the mass is 200N and the amplitude of the oscillation is 800mm. Calculate
- (i) the frequency
 - (ii) the time for one oscillation
 - (iii) the maximum acceleration (12marks)

QUESTION FOUR

- a) Sketch structures for
- (i) methanol
 - (ii) ethanol (2marks)
- b) State
- (i) **One** characteristic of aromatic compounds
 - (ii) The main source of organic compounds
 - (iii) The systematic names for the cyclo-alkanes C_7H_{13} and C_7H_{14} (4marks)
- c) Compare and contrast
- (i) alkanes and alkenes
 - (ii) saturated hydrocarbons and unsaturated hydrocarbons (6marks)
- d) Explain the fractional distillation of crude oil (8marks)

QUESTION FIVE

- a) State any **three** methods used to detect X-rays (3marks)

- b) With the aid of a labelled diagram, explain the structure of an element with atomic number 14 and mass number 28 **(7marks)**
- c) Explain the basis of nuclear reactions. **(10marks)**