MURANG'A UNIVERSITY COLLEGE

(Constituent College of Jomo Kenyatta University of Agriculture and Technology)

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
CERTIFICATE   IN   AUTOMOTIVE   ENGINEERING-MODULE I
APPLIED SCIENCE   CODE: SEM0103

END OFTERM III EXAMINATIONS
 CLASS: CAE/14C

DATE: 27H MARCH 2015   **TIME:** 2HOURS

Attempt All Questions

QUESTION ONE

(a) Distinguish between the following pair of terms

   (i) Proton and neutron

   (ii)   Atomic number and mass number   **(4 marks)**

(b) (i) Distinguish between ionic bond and covalent bond

   (ii)   State **fou**r properties of covalent compounds   **(6marks)**

(c) Define a metallic bond and give **two** physical properties of metals   **(4 marks)**

 (d) Explain the following observations

    (i)   Ionic compounds have high melting and boiling points

(ii) Molten sodium chloride conducts electricity while solid sodium chloride does not

(iii) Aluminum is used in making overhead electrical cables while copper is used in making underground electrical cables   **(6marks)**

QUESTION TWO

(a) Define an acid and give **three** properties of acids   **(4marks)**

(b) (i) Define an alkali giving **two**examples.   **(2marks)**

(ii) Distinguish between a normal salt and an acid salt giving **one**example of each.**(4marks)**

(c) State **five**uses of salts   **(5marks)**

(d) Using sketches show how a co-ordinate bond is formed between ammonia
    molecule and a hydrogen ion   **(5marks)**

QUESTION THREE

(a) State the laws of reflection of light **(4marks)**

(b) The figure below comprises three plane mirrors AB,BC and CD arranged perpendicularly
    to each other. A ray of light at 40^0 is incident to mirror AB. Complete the ray diagram and
    determine the angle of incidence on:

        (i)   mirror BC

        (ii)   mirror CD   **(5 marks)**

(c) The angle of incidence for a ray of light travelling from air to water is 40^0 and the angle
    of refraction is 29^0. Calculate the refractive index of water.   **(3 marks)**

(d) White light is incident on a triangular prism,show the refraction of light in the prism and
indicate the following

 (i)   incident ray

 (ii)   emergent ray

 (iii)   angle of deviation   **(3 marks)**

(e) The velocity of light in air is $3x10^8$m/s and in water is $2.25x10^8$m/s.Calculate

(i)   the refractive index of water

(ii)   the angle of refraction of light in water for a ray of light passing from air to water at an angle of incidence of 30^0. **(5 marks)**

QUESTION FOUR (20marks)

(a) Define the term density and state it's SI unit **(2 marks)**

(b) A piece of metal 100mm long,80mm wide and 20mm thick has a mass of 1280g.Determine the density of the metal in SI units **(4marks)**

(c) Describe briefly how to determine the density of an irregularly shaped solid **(4marks)**

(d) State Archimedes' Principle **(2 marks)**

(e) A body weighs 2760N in air and 1925N when completely immersed in water of density 1000kg/m^3. Calculate
   (i)   The volume of the body
   (ii)   The density of the body **(6 marks)**

(f) Define pressure and state it's unit of measurement **(2 marks)**