Technical University of Mombasa

Faculty of Applied and Health Sciences

DEPARTMENT OF PURE AND APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF TECHNOLOGY IN INDUSTRIAL MICROBIOLOGY AND BIOTECHNOLOGY

BIMBT 12 S

SCH 2107 : INORGANIC CHEMISTRY

SPECIAL/SUPPLEMENTARY EXAMINATION

July 2013 SERIES   2 HOURS

Instructions to candidates:

This paper consist of **FIVE** questions
Answer question **ONE** (compulsory) and any other **TWO** questions

Question ONE

    a)   Define the following terms clearly and concisely

       (i)   Mixture   **(2marks)**

       (ii)   Element   **(2marks)**

    b) Explain the difference between

       (i)   Mass and weight   **(2marks)**

       (ii)   Atomic weight and atomic mass unit   **(4marks)**

       (iii)   Nuclear fission and nuclear fusion   **(2marks)**

    c) $25cm^3$ of a solution of NaOH required $28cm^3$ of one molar H_2SO_4 to neutralize it. Calculate the molarity of NaOH.   **(4marks)**

    d) (i)   State the quantum theory   **(2marks)**

       (ii)   A green line of wavelength 486nm is observed in the emission spectrum of hydrogen. Calculate the energy of one photon of this green light. **(3marks)**

e) (i) Define the term empirical formula **(2marks)**

   (ii) A common product found in nearly every kitchen contains 27.3% sodium, 1.20% hydrogen 14.30% carbon and 57.14% oxygen. Find the empirical formula of the compound. **(5marks)**
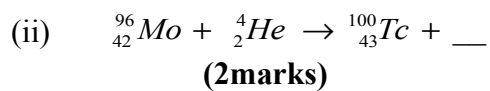
Question TWO

a) State the following rules

   (i) Hund's rule **(3marks)**

   (ii) Aufbau rule **(3marks)**

   (iii) Pauli exclusion principle **(3marks)**

b) Write the electronic configuration of

   (i) ^{74}W **(3marks)**

   (ii) ^{41}Nb **(3marks)**

   (iii) $^{80}Hg^{31}$ **(3marks)**

c) Draw the emission spectra of hydrogen atom indicating all the line series **(5marks)**

Question THREE

a) Describe the general trends in the following properties across the period

   (i) Metallic character **(4marks)**

   (ii) Electron affinity **(4marks)**

   (iii) Atomic radii **(4marks)**

b) Give FOUR differences between ionic compounds and covalent compound **(8marks)**

Question FOUR

a) Define the following terms:-

   (i) Nuclide **(2marks)**

   (ii) Isotope **(2marks)**

b) Using examples explain the factors that determine / affect the stability of nuclei (8marks)

c) Fill in the missing symbols in the following nuclear reactions.

(i) $^{23}_{11}Na + \underline{\hspace{1cm}} \rightarrow {}^{23}_{12}Mg + {}^{1}_{0}n$ **(2marks)**

(ii) $^{96}_{42}Mo + {}^{4}_{2}He \rightarrow {}^{100}_{43}Tc + \underline{\hspace{1cm}}$

(2marks)

(iii) $^{209}_{83}Bi + \underline{\hspace{1cm}} \rightarrow {}^{100}_{43}Po + {}^{1}_{0}n$ **(2marks)**

(iv) $^{228}_{88}Ra \rightarrow {}^{228}_{89}Ac + \underline{\hspace{1cm}}$ **(2marks)**

Question FIVE

a) Define the term Mass deficiency **(3marks)**

b) Describe FOUR applications of radioactivity **(8marks)**

c) A piece of wood taken from a cave dwelling in new mexico is found to have a carbon-14 activity (per gram of carbon) only 0.636 times that of wood cut today. Estimate the age of the wood. The half-life of carbon-14 is 5730 years. **(9marks)**