



MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

CERTIFICATE IN ELECTRICAL AND ELECTRONICS ENGINEERING

CERTIFICATE IN BUILDING AND CIVIL ENGINEERING

CERTIFICATE IN MECHANICAL ENGINEERING

BCE BT 103: CHEMISTRY

DATE: 2/6/2017

TIME: 2 HOURS

INSTRUCTIONS

Answer questions one and any other two.

USE: Atomic numbers for: H=1, N=7, Ca=20, Sc=21, K=19, S=16, Cl= 17, Na= 11

SECTION A (COMPULSORY)

QUESTION ONE (30 MARKS)

- a)
 - (i) Define the term pH (1 mark)
 - (ii) Calculate the pH of 0.01 M HCl acid. (2 marks)
- b)
 - (i) Give an example each of a weak acid and a strong acid and write equations to show how they dissociate in water.
 - (ii) Using s p d f orbital, write down the electronic configuration of an atom Y with atomic number 15. (5 marks)
- c) Define an acid using Bronsted-Lowry and Arrhenius theory. (4 marks)

- e) Using dots and crosses draw the electronic structures for Ammonia molecule NH_3 , Ethane C_2H_6 , water and calcium chloride. (10 marks)
- f) Explain why Calcium and Sulpur are in different blocks of the periodic table. (4 marks)
- g) Define : (i) Normal salt
(ii) Acid salt (4 marks)

SECTION B: ANSWER ANY OTHER TWO QUESTIONS

QUESTION TWO (20MARKS)

- a) Explain what is meant by covalent bonding. Show how covalent bonding is formed in a water molecule. (3 marks)
- b) Using dots and crosses draw diagrams to show electronic structures of:
- (i) K_2S
 - (ii) NaCl
 - (iii) C_2H_4 (8 marks)
- c) The atomic nuclei of atoms A and B contain:
- A- 40 neutrons, 20 protons
- B- 8 neutrons, 8 protons
- (i) State with reasons the Group and Period to which A and B belong.
 - (ii) Using s p d f orbital write the electronic configuration of A and B.
 - (iii) Draw the electronic structure formed when A combines with B. (9 marks)

QUESTION THREE (20 MARKS)

- a) (i) Define a base using the Arrhenius and Bronsted-Lowry theories.
- (ii) State two advantages under the Arrhenius theory. (4 marks)

- b) Show by writing an appropriate equation how HSO_4^{-1} can act as Bronsted-Lowry acid and Arrhenius acid. (4 marks)
- c) State the basicity of the following acids and calculate their pH values.
- 0.1 M H_2SO_4
- 10^{-2} M H_3PO_4 (10 marks)

QUESTION FOUR (20 MARKS)

- a) Three elements A,B and C have atomic numbers 9, 20 and 16 respectively. Draw using dots and crosses the structures formed between: (i) A and B (ii) A and C. Name the types of bonds formed. (8 marks)
- b) Define dative (coordinate) bond.
- Show how the dative bond is formed when Ammonia combines with Hydrogen ion.
Name the substance formed. (6 marks)
- c) Q is an element with electronic configuration 2.8.8.1
- (i) Write down the atomic number of Q.
- (ii) State with reasons whether Q is a metal or a non-metal.
- (iii) Give the valency of element Q. Explain. (6 marks)

QUESTION FIVE (20 MARKS)

- a) Explain the following terms.
- b) (i) Basic salt (ii) Double salt (6 marks)
- c) (i) Explain clearly how sodium chloride can be prepared from a salt and a base. (6 marks)
- (ii) Write equation for the above reaction. (4 marks)
- d) Give four differences between a compound and a mixture. (4 marks)