



MASENO UNIVERSITY
UNIVERSITY EXAMINATIONS 2016/2017

**FIRST YEAR FIRST SEMESTER EXAMINATIONS FOR THE
DEGREE OF BACHELOR OF SCIENCE IN INDUSTRIAL
CHEMISTRY WITH INFORMATION TECHNOLOGY**

MAIN CAMPUS

SCH 102: BASIC INORGANIC CHEMISTRY

Date: 12th December, 2016

Time: 3.30 - 6.30 pm

INSTRUCTIONS:

- Answer ANY FIVE questions.



Some Useful Information

$$h = 6.626 \times 10^{-34}$$

$$R = 1.097 \times 10^7 \text{ m}^{-1}$$

$$c = 3.0 \times 10^8 \text{ ms}^{-1}$$

$$pH = -\log(\dots)$$

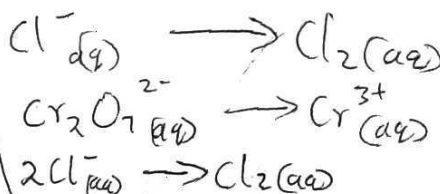
1. a) State and differentiate between the three type of acids (3 marks).

b) If $[H^+]$ of a given solution is given as $2.5 \times 10^{-4} \text{ M}$, calculate its; (3 marks);

i) pH

ii) pOH

iii) $[OH^-]$

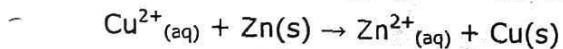


c) Balance the following reduction-oxidation reaction in basic solution (5marks)



d) Differentiate between the terms oxidation and reduction (1 mark)

e) Identify the reducing agent in the equation below (1 mark)



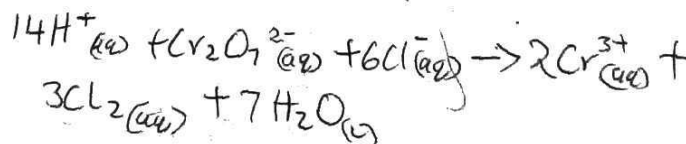
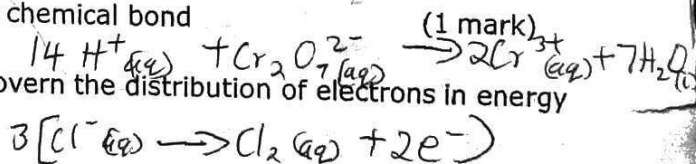
f) Differentiate between any two chemical bond (1 mark)

2 (a) The following principles/rules govern the distribution of electrons in energy levels of an atom.

(i) Pauli Exclusion principle

(ii) Hund's Rule

(iii) Principle of Least Energy



Briefly state the significance of each of these principles/rules in filling electrons into orbitals/energy levels of an atom? (3 marks)

(b) The fifth energy level is fully occupied by electrons in atoms of some chemical elements.

(i). State the sub energy levels present in the fifth energy level of an atom

(2 marks)

(ii). What is the maximum number of electrons for each sub energy level in the fifth energy level?

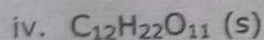
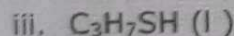
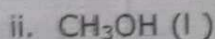
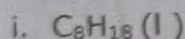
(2 marks)

iii. Work out the radius of the third orbit in hydrogen atom using Bohr's theory
(3 marks)

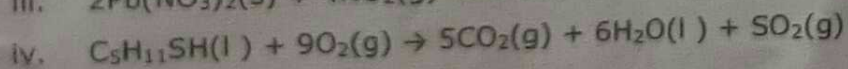
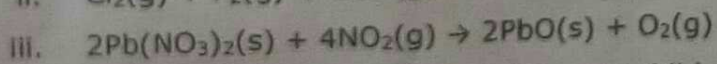
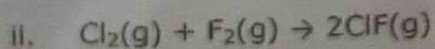
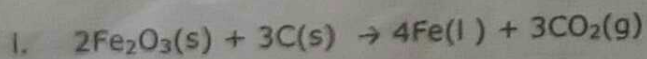
b) i. Calculate the de Broglie wavelength associated with a body of mass ^{500g} moving with a velocity of 700 ms^{-1}
(3 marks)

ii. How much energy in joules (J) required for an electron in a hydrogen atom to make a transition from $n=2$ to $n=3$
(2 marks)

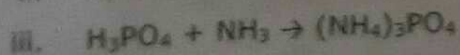
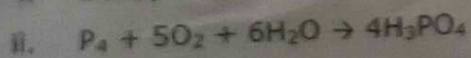
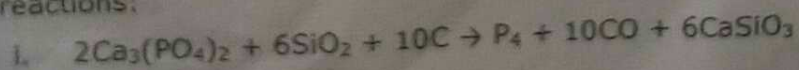
5. a) Write balanced equations for the complete combustion of the following organic molecules
(4 marks)



b) Discuss each of the following reactions with respect to the following categories: combination reaction, decomposition reaction, combustion reaction, and single-displacement reaction
(4 marks)



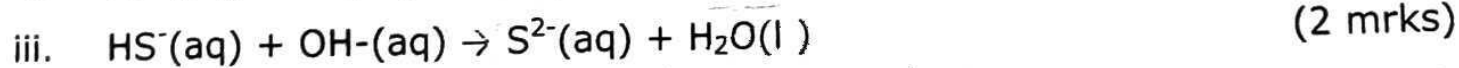
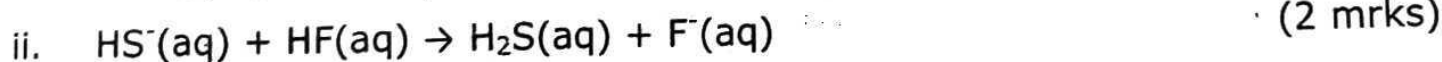
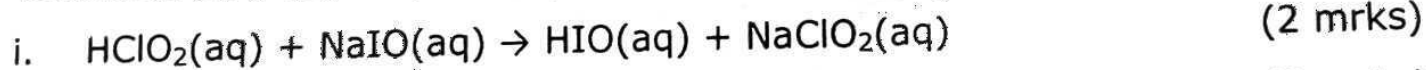
c) The formation of ammonium phosphate fertilizers involves the following reactions:



Write complete redox reactions with oxidation numbers for each element shown and the reduced/oxidized species indicated
(6 marks)

6.

a) The following reactions involve Brønsted-Lowry Acid and Brønsted-Lowry Base forward reactions. In each reaction, discuss why the chemical species can be identified as a Brønsted-Lowry Base or Brønsted-Lowry Acid. (7 marks)



b) i. What is the wavelength of a photon emitted when an electron in Bohr's hydrogen atom makes a transition from $n=4$ to $n=2$ (3 marks)

ii. What is the colour of the radiation? (1 mark)

c) What is the energy of a photon of light with a wavelength of 656.1 nm? (3 marks)