



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

**KAKAMEGA (MAIN) CAMPUS**

**UNIVERSITY EXAMINATIONS  
2020/2021 ACADEMIC YEAR**

**FIRST YEAR SECOND TRIMESTER MAIN EXAMINATIONS**

**FOR THE DEGREES  
OF  
BACHELOR OF SCIENCE IN MEDICAL LABORATORY SCIENCES,**

**BACHELOR OF SCIENCE IN MEDICAL BIOTECHNOLOGY**

**COURSE CODE: BML 121**

**COURSE TITLE: Inorganic Chemistry**

**DATE: 7<sup>TH</sup> DECEMBER 2020**

**TIME: 2.00 -4.00PM**

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**INSTRUCTIONS TO CANDIDATES**

1. This paper consists of three sections A, B and C
2. Write your registration number only on the answer booklet
3. Write your registration number on every new leaf of the paper

**TIME: 2 Hours**

**MMUST observes ZERO tolerance to examination  
cheating**

*This Paper Consists of 4 Printed Pages. Please Turn Over*

**SECTION A: MULTIPLE CHOICE QUESTIONS (MCQs)**

**Instructions to the candidate**

1. This section has twenty (20) multiple choice questions (MCQs)
2. Each question has a stem and four (4) options
3. Indicate the correct options(s) for each question by writing the corresponding letter
4. Use the provided university examination booklet only

SECTION A: MULTIPLE CHOICE QUESTIONS (MCQs)

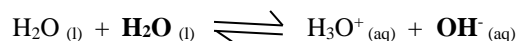
- Q1. Which of the following is not a spectroscopic method of chemical analysis?
- UV/Vis spectroscopy
  - Gravimetric spectroscopy
  - NMR spectroscopy
  - Infrared spectroscopy
- Q2. Which of the following gas laws assumes constant pressure?
- Charles law
  - Grahams law of diffusion
  - Kinetic theory of gases
  - Boyles law
- Q3. The rate equation for a certain reaction is  $R = k[A]^2[B]^3$ . State the overall order of the reaction
- 2
  - 5
  - 3
  - 6
- Q4. The region inside an atom where an electron is most likely to be found is called
- a sub shell
  - an energy level
  - a nucleus
  - An orbital
- Q6. A Lewis base is
- A proton donor
  - A proton acceptor
  - An electron pair donor
  - An electron pair acceptor
- Q7. When a covalent bond between two atoms of same electronegativity breaks,,,,,,
- Free radicals are formed
  - Ions are formed
  - Molecules are formed
  - All the above
- Q8. Which of the following factors does not affect equilibrium position of a system?
- Change in pressure of one of the reactants
  - Change in concentration
  - Change in pressure
  - Addition of a catalyst
- Q5. A reaction is said to be of zero order with respect to a given reactant if
- It results in no change in temperature
  - the concentration of the reactant reduces to zero by the end of the reaction
  - a change in concentration of the reactant has no effect on the reaction rate
  - all the reactants are used up
- Q9. A positively charged ion is formed when
- there are more protons than electrons
  - there are more neutrons than electrons

- c) there are more electrons than protons
  - d) there are more electrons than neutrons
- Q10. Elements in the same period of the periodic table have the same....
- a) atomic number
  - b) mass number
  - c) number of energy shells
  - d) number of electrons in the valence sub level
- Q11. Magnetism that comes about as a result of unpaired electrons in a substance is called
- a) Paramagnetism
  - b) ferromagnetism
  - c) ferrimagnetism
  - d) Diamagnetism
- Q12. The oxidation number of Nitrogen in NO is
- a) 4
  - b) 1
  - c) 3
  - d) 2
- Q13. The positively charged end of a polar molecule is called
- a) An electrophile
  - b) A cation
  - c) A nucleophile
  - d) A proton
- Q14. Which of the following statements is true about a sigma bond?
- a) It is formed when any two s orbitals have sufficient overlap
  - b) It is formed when any two p orbitals overlap head on
  - c) It is stronger than a pi bond
  - d) all the above
- Q15. The principal quantum number specifies
- a) The orientation of an electron in an orbital
  - b) The energy level on which an electron is found
  - c) The angular momentum of an electron
  - d) The sub shell on which an electron is found
- Q16. It is impossible to find any two electrons in an atom with the same set of all four quantum numbers. This statement is famously known as
- a) Hund's rule
  - b) Kletchkowski's rule
  - c) Pauli's exclusion principle
  - d) Henderson-Hasselbach rule
- Q17. How many electrons are required to fill all the orbitals in the 5<sup>th</sup> energy level?
- a) 50
  - b) 72
  - c) 48
  - d) 60
- Q18. Which atomic orbital has a spherical shape?

- a) f orbital
- b) d orbital
- c)
- d)

s orbital  
p orbital

Q19. Consider the chemical equation below



The species in bold on the left hand side of the equation is participating in the reaction as

- a) A neutral solvent
- b) A bronsted acid
- c) Lewis acid
- d) An arrhenius acid

Q20. An electrochemical cell in which electrical energy is used to make a non-spontaneous reaction to take place is known as

- a) A galvanic cell
- b) A voltaic cell
- c) An electrolytic cell
- d) A primary cell

### SECTION B (40 Marks)

Q1. Use the standard electrode Potentials (S.E.P) in the table below to answer the following questions

Half Equation	S.E.P (Volts)
$\text{A}^{2+}_{(aq)} + 2\text{e}^- \rightarrow \text{A}_{(s)}$	+2.8
$\text{B}^+_{(aq)} + \text{e}^- \rightarrow \text{B}_{(s)}$	-1.5
$\text{C}^{3+}_{(aq)} + 3\text{e}^- \rightarrow \text{C}_{(s)}$	-3.3
$\text{D}^{2+}_{(aq)} + 2\text{e}^- \rightarrow \text{D}_{(s)}$	+0.7
$\text{E}^{2+}_{(aq)} + 2\text{e}^- \rightarrow \text{E}_{(s)}$	-1.1

- a) Calculate the E.M.F of the electrochemical cell that will be formed between half cells of the following elements (6 marks)
  - i. A and D
  - ii. B and C
  - iii. D and E
- b) Identify (3 marks)
  - i. The strongest reducing agent

- ii. The element that has the highest tendency to gain electrons
- iii. The combination of half cells that would form an electrochemical with highest EMF

- c) Predict whether a reaction would occur when an aqueous solution containing  $A^{2+}$  ions is kept in a container made of metal C (4 marks)

Q2. State one role of chemistry in medical laboratory sciences (1 mark)

Q3. Define the term spectroscopy (2 marks)

Q4. Describe briefly how titanium is extracted from rutile ore (impure  $TiO_2$ ) (5 marks)

Q5. A gas occupies  $50\text{ cm}^3$  at 27K and 750 mmHg Pressure. Calculate the new volume if its pressure is adjusted to 800 mmHg and temperature decreased to 15K (2 marks)

Q6. Write the electron configuration of the each of the following (6 marks)

Iron (28)

Chromium (Cr=25)

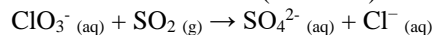
$Zn^{+}$  (Zn=30)

Q7. Solution K is prepared by dissolving 10 grams of sodium hydroxide in  $500\text{ cm}^3$  of distilled water.  $20\text{ cm}^3$  of solution K required exactly  $7.5\text{ cm}^3$  of dilute hydrochloric acid for complete neutralization. Calculate the molarity of the acid used. (Molar mass of NaOH = 40g) (4 marks)

Q8. Outline the major steps involved in inorganic chemical analysis (7 marks)

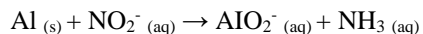
### SECTION C (40 Marks)

Q1. Balance the following redox reaction in acidic conditions (10 marks)



Hint: use the half equations method

Q2. Balance the following redox reaction in basic conditions (10 marks)



Hint: use the half equations method

Q3. A stock solution of sulphuric acid has the following specifications from the manufacturer

Specific gravity=1.3

Molar mass=36.46

Percentage purity = 36% to 38%

By showing all calculations involved, explain how you would prepare  $800\text{ cm}^3$  of dilute HCl with concentration of 2 Moles/ $Dm^3$  (4 marks)

Q4. a) Calculate the pH of 0.02M  $H_2SO_4$  (2 marks)

b) Calculate the pH of 0.5M NaOH (2 marks).

c) Calculate the molarity of a certain strong acid  $H_3X$  given that it has a PH of 2.5 (4 marks)

Q5. A buffer solution contains 0.10 moles of ethanoic acid and 0.13 moles of sodium ethanoate in 1 litre of solution. Calculate the pH of the buffer if  $K_a$  of ethanoic acid is  $1.8 \times 10^{-5}$  (5 marks)

Q6. Distinguish between qualitative and quantitative analysis (3marks)