



MACHAKOS UNIVERSITY

University Examinations 2020/2021

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

FIRST YEAR FIRST SEMESTER EXAMINATION

DIPLOMA BUILDING TECHNOLOGY & CIVIL ENGINEERING

2601/102/PS: PHYSICAL SCIENCE

DATE: 3/9/2021

TIME: 2:00 – 4:00 PM

INSTRUCTIONS:

1. Write your Registration number on the answer booklet
2. Answer *all* questions

1.
 - a) Briefly describe the three (3) main properties of metals that arise from the nature of metallic bonding. (6 marks)
 - b) List elements as they appear in the electrochemical series (6 marks)
 - c) Write the molecular equation for the reaction between Hydrochloric Acid and Calcium metal (2 marks)
 - d) Explain the difference between a strong acid and a weak acid (2 marks)
 - e) Write the molecular, ionic and net equations for the reactions between Hydrochloric acid and Sodium Hydroxide (3 marks)
 - f) Write the number of protons, neutrons and electrons for the following:- (1 mark)
 - i) ${}_{26}^{56}\text{Fe}^{3+}$
 - ii) ${}_{53}^{127}\text{I}$
2.
 - a) Explain, using the water molecule, how polarity occurs in chemical molecules (5 marks)
 - b) Using Chlorine and Sodium show how atoms react (3 marks)
 - c) With examples describe monoprotic, diprotic and triprotic acids. (3 marks)

- d) Explain how a covalent bond is formed. (2 marks)
- e) Explain why the reaction between Calcium Carbonate and sulphuric acid stops a short while after starting (3 marks)
- f) Demonstrate that the water molecule is electrically charged. (4 marks)
3. a) Calculate the relative molecular mass of the following organic compounds (8 marks)
- Ethyl Acetate- $C_4H_8O_2$
 - Acetaldehyde- C_2H_4O
 - Hexane- C_6H_{14}
 - Carbon (iv) Oxide- CO_2
- b) Work out the mass of carbon in Ethyl Acetate (3 marks)
- c) Calculate the percentage mass of Hydrogen in Hexane (3 marks)
- d) Make a list of chemical elements as they appear on the electrochemical series (6 marks)
4. a) i) Briefly describe the mole concept. (3 marks)
- ii) Calculate the mole of Calcium Chloride that is contained in 4 grammes (3 marks)
- iii) Calculate the mass of Magnesium Chloride that is contained in 0.02 mole solution. (4 marks)
- iv) Find the concentration of a solution that is made by dissolving 3grammes of Calcium Nitrate in $100cm^3$ of water. (4 marks)
(Calcium 20, Magnesium 23, Chlorine 35, Sulphur 16)
- b) Explain why paint is used to coat most metallic surfaces (3 marks)
- c) Giving an example, state what is meant by redox reaction (3 marks)
5. a) State the difference between temporary and permanent hardness of water (4 marks)
- i) Using chemical equations, show how each of the types of hardness of water in 5 (a), above is removed (6 marks)
- ii) State two commercial and one health disadvantages of hard water (4 marks)
- b) Differentiate between the following;
- Natural and synthetic polymers,
 - Linear and branched polymers
 - Addition and condensation polymerization (6 marks)