MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCE

FIRST YEAR THIRD SEMESTER EXAMINATION FOR

DIPLOMA BUILDING TECHNOLOGY

PHYSICAL SCIENCE

DATE:18/12/2020 **TIME: 2.30-5.30 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) Complete the table below (4 marks)

Particle	**Number of Electrons**	**Number of Neutrons**	**Number of protons**	**Mass number**
P^{2+}		12	12	
Q	35	45		
R^{2-}	18			32
S			13	27

2. a). Explain, using water, 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) Write the molecular, ionic and net equation for the reaction between Calcium Hydroxide and sulphuric acid (3 marks)

f) Demonstrate that the water molecule is electrically charged (4 marks)

3. a). Define the four laws of reflection (8 marks)

b). With the aid of simple sketches explain the characteristics of images formed by concave mirrors with the object at the following;

i. Infinity

ii. Beyond 'C'

iii. At 'C'

iv. Between 'C' and 'F'

v. At 'F'

vi. Between 'F' and 'C' (12 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;

i). Natural and synthetic polymers,

ii). Linear and branched polymers

iii). Addition and condensation polymerization (6 marks)