

SEMESTER 1

ACADEMIC YEAR 2020/2021



UNIVERSITY OF ESWATINI
FACULTY OF AGRICULTURE

FINAL EXAMINATION

PROGRAMMES:

B.Sc. AGRON: YEAR I
B.Sc. ABE: YEAR 1
B.Sc. AGRIC. ECON. & AGBMNGT: YEAR I
B.Sc. ANI. SCI. (DAIRY OPTION): YEAR I
B.Sc. AGRIC. EXT.: YEAR I
B.Sc. AGRIC. ED.: YEAR I
B.Sc. ANI. SCI.: YEAR I
B.Sc. CONS. SCI.: YEAR I
B.Sc. CONS. SCI. ED.: YEAR I
B.Sc. FSNT: YEAR I
B.Sc. HORT.: YEAR I
B.Sc. TADM: YEAR I

COURSE CODE AND TITLE: CPR103: CHEMISTRY
TIME ALLOWED: TWO [2] HOURS

INSTRUCTIONS:

1. ANSWER 4 QUESTIONS IN TOTAL; QUESTION 1 (WHICH IS COMPULSORY) AND ANY OTHER 3 OF YOUR CHOICE
2. DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED

NOTE THAT THIS PAPER CONTAINS FIVE (5) PAGES INCLUDING THIS COVER PAGE

QUESTION 1 (COMPULSORY)

[Total marks = 25]

Write down the letter bearing the correct answer for each of the following questions

- 1.1. Which phase of matter that can be compressed to occupy a smaller volume and can be expanded to occupy a larger one?
- A. The liquid phase
 - B. The gas phase
 - C. The solid phase
 - D. Both liquid and gas phases
- 1.2. The dynamic equilibrium between all three phases of water called the 'triple point' occurs at which temperature and pressure?
- A. At a temperature of 0.1°C and at a pressure of 0.6 atm
 - B. At a temperature of 1°C temperature and at a pressure of 6 atm
 - C. At a temperature of 100°C temperature and at a pressure of 1 atm
 - D. At a temperature of 0.01°C temperature and at a pressure of 0.006 atm
- 1.3. A compound is a pure substance that consists of;
- A. One element
 - B. Matter
 - C. Two or more different kinds of elements that are present in constant proportions by mass and are chemically by bonds
 - D. Three or more different kinds of elements that are present in constant proportions by mass and are not chemically combined by bonds
- 1.4. A solute is best described as;
- A. The substance which is present in smaller amounts in a solution.
 - B. The substance which is present in larger amounts in a solution.
 - C. A mixture.
 - D. A solvent.
- 1.5. Which statement below correctly defines what a catalyst is?
- A. A catalyst is an electrolyte substance that takes part in a chemical reaction
 - B. A catalyst is an acid in a chemical reaction.
 - C. A catalyst is a salt resulting from the reaction of an acid and a base
 - D. A catalyst is a substance that increases the rate of a chemical reaction without itself getting used up
- 1.6. According to your understanding, how can you define alkanes?
- A. These are unsaturated hydrocarbons with single covalent bonds between carbon atoms
 - B. These are saturated hydrocarbons with the carbon atoms joined in rings by single covalent bonds
 - C. These are saturated hydrocarbons with single covalent bonds between carbon atoms
 - D. These are unsaturated hydrocarbons with the carbon atoms joined in rings by single covalent bonds

1.7. Which of the following four statements is correct about a phenol?

- A. A phenol is a compound with no group attached to an aromatic ring.
- B. A phenol is a compound with an aromatic ring.
- C. A phenol is a compound with an OH group attached to an aromatic ring.
- D. A phenol is a compound without an aromatic ring.

1.8. How would you define proteins?

- A. Proteins are polymers of amino acids contained in all dead cells.
- B. Proteins are polymers of amino acids contained in all living cells.
- C. Proteins are cells of all living things.
- D. Proteins are polymers.

1.9. A hydrocarbon is referred to as;

- A. A compound that contains only carbon and hydrogen atoms.
- B. A compound that contains only carbon atoms.
- C. A compound that contains only hydrogen atoms.
- D. A compound that contains no atoms.

1.10. How will you define amines?

- A. Amines are inorganic compounds containing bivalent nitrogen atoms bonded to one or more carbon atoms.
- B. Amines are compounds containing trivalent nitrogen atoms bonded to one or more carbon atoms.
- C. Amines are organic compounds containing bivalent nitrogen atoms bonded to one or more carbon atoms.
- D. Amines are organic compounds containing trivalent nitrogen atoms bonded to one or more carbon atoms.

QUESTION 2

[Total marks = 25]

2.1 Calculate the atomic mass of Oxygen (O) in amu; given the following information of its isotopes: [10 marks]

- Oxygen 16 [^{16}O] with abundance of 99.757 %
- Oxygen 17 [^{17}O] with abundance of 0.038 %
- Oxygen 18 [^{18}O] with abundance of 0.205 %

2.2. Calculate the percent (%) elemental composition of Sulphuric Acid (H_2SO_4) given the following information: H = 1 amu; S = 32 amu; O = 16 amu. [10 marks]

2.3. What is the molecular formula of an alkane containing nine [9] carbon atoms [5 marks]

QUESTION 5

[Total marks = 25]

5.1. Calculate the equilibrium constant of the reaction of CO and H₂O to produce CO₂ and H₂ given that the concentrations are as follows; [CO] = 0.0044 M, H₂O = 0.0044 M, CO₂ = 0.0033 M and [H₂] = 0.0033 M at 1000°C. [10 marks]

5.2. What pressure (in bars) could 2.5 mol of argon gas exert in a vessel of volume 1500 ml at 27°C if it behaved as an ideal or a perfect gas? [10 marks]

5.3. Calculate the equivalent mass of Fe³⁺. Where: Fe = 55.845 amu. [5 marks]

EXTRA INFORMATION

1. Equation of a perfect gas: $pV = nRT$
2. Gas constant (R) = $8.31447 \times 10^{-2} \text{ L bar K}^{-1} \text{ mol}^{-1}$
3. Avogadro's constant: $6.02214 \times 10^{23} \text{ mol}^{-1}$
4. Density of water: 1 g/cm^3
5. $\text{pH} = \log 1/[\text{H}^+] = -\log [\text{H}^+]$
6. $m\text{A} + n\text{B} \rightleftharpoons p\text{C} + q\text{D}$
7. $K = \frac{[\text{C}]^p [\text{D}]^q}{[\text{A}]^m [\text{B}]^n}$
8. $X = p/K$
9. $F = k(C_1 \times C_2)/r^2$
10. $\Delta G = \Delta H - T\Delta S$
11. $C_1V_1 = C_2V_2$
12. $K = \text{Temperature } (^\circ\text{C}) + 273.15$