

SEM 1: AC. YR 2019/2020



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: CPR 103: CHEMISTRY
TIME ALLOWED: TWO [2] HOURS

INSTRUCTIONS:

1. ANSWER 4 QUESTIONS IN TOTAL, 2 QUESTIONS FROM EACH SECTION
2. DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED

NOTE: THIS PAPER CONTAINS SEVEN (7) PAGES INCLUDING THIS COVER PAGE

SECTION 1: INORGANIC CHEMISTRY

QUESTION 1

- a. Distinguish the following:
- i. An atom and matter [2 marks]
 - ii. A shell and an orbital [2 marks]
 - iii. An element and a compound [2 marks]
 - iv. Exothermic and endothermic reactions [2 marks]
 - v. An electrolyte and electrolysis [2 marks]
- b. Calculate the formula mass of the mineral chromite (FeCr_2O_4) given the following information: Fe = 55.845 amu; Cr = 51.996 amu; O = 15.999 amu [5 marks]
- c. How many atoms of chlorine are in 25.5 g of iron (III) chloride (FeCl_3) [10 marks]
- [Total = 25 marks]**

QUESTION 2

- a. Calculate the atomic mass of Magnesium (Mg) in amu; given the following information of its isotopes:
- | Isotope | Abundance (%) | Mass (amu) |
|-----------------------|---------------|------------|
| $^{24}_{12}\text{Mg}$ | 51.22 | 23.985042 |
| $^{25}_{12}\text{Mg}$ | 30.55 | 24.985837 |
| $^{26}_{12}\text{Mg}$ | 18.23 | 25.982593 |
- [10 marks]
- b. Calculate the percent (%) elemental composition of Potassium Permanganate (KMnO_4) given the following information
K = 39.098 amu; Mn = 54.938 amu; O = 15.999 amu. [10 marks]
- c. Calculate the pH of the following solutions; 0.1 M HCl and 0.1 M NaOH [5 marks]
- [Total = 25 marks]**

QUESTION 3

- a. What pressure in bars could 1.9 mol of Argon gas exert in a vessel with a volume of 2.5 dm^3 at 28°C if it behaved as a perfect gas? [15 marks]
- b. You are provided with 4 M HCl stock solution, what volume of this acid would you need to prepare 500 ml of 0.21 M HCl? [5 marks]
- c. You are required to make 100 ml of 0.43 M Sodium carbonate (Na_2CO_3); calculate the mass of the solute you would need to make this solution [5 marks]
- [Total = 25 marks]**

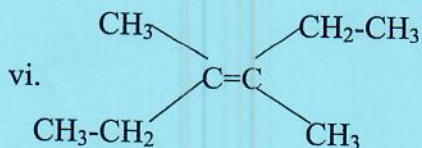
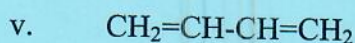
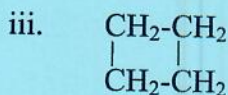
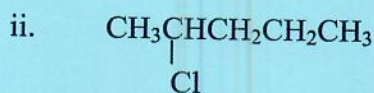
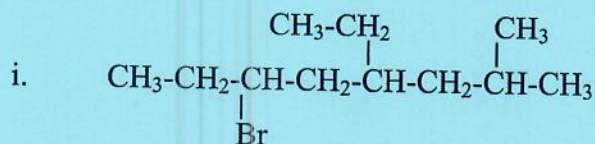
SECTION 2: ORGANIC CHEMISTRY

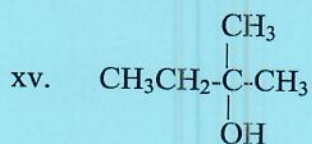
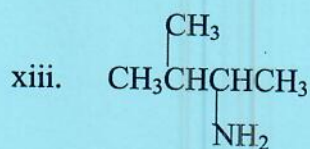
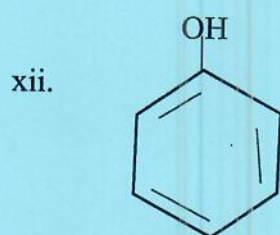
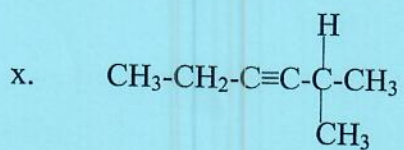
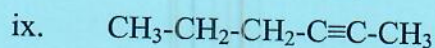
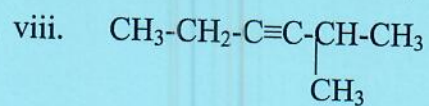
QUESTION 4

- a. Define or briefly describe the following terms and phrases.
- i. Cycloalkanes [2.5 marks]
 - ii. Unsaturated hydrocarbons [2.5 marks]
 - iii. An alkene [2.5 marks]
 - iv. A phenol [2.5 marks]
 - v. An alkyl group [2.5 marks]
 - vi. Alcohol [2.5 marks]
- b. Determine the molecular formula for a normal cycloalkane containing seven [7]
carbon atoms [5 marks]
- c. Determine the molecular formula for a normal alkyne containing twelve (12)
hydrogen atoms [5 marks]
- [Total = 25 marks]

QUESTION 5

- a. Give the IUPAC names of the following compounds: [1 mark each]





[15 marks]

b. Write down the structural formula for each of the following compounds:

i. Propyn [2 marks]

ii. Ethylcyclohexane [2 marks]

iii. 4-ethyl-2-methyloctane [2 marks]

iv. Pentane [2 marks]

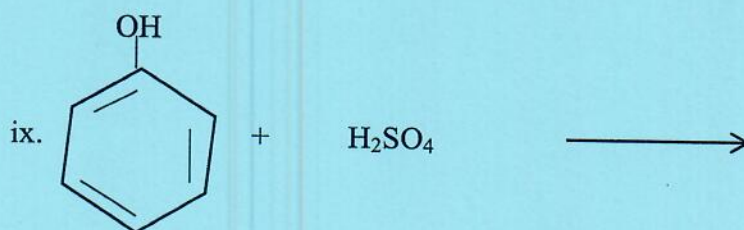
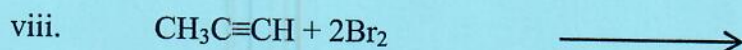
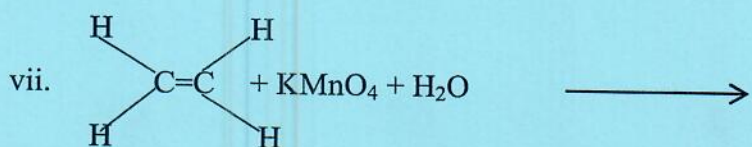
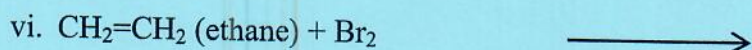
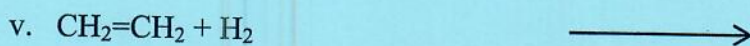
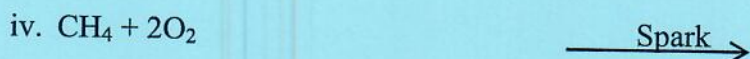
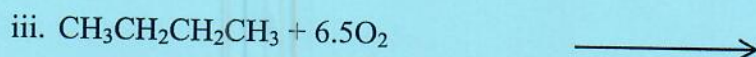
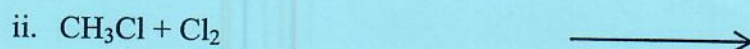
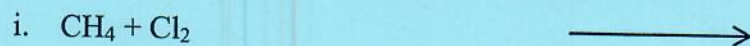
v. 2-methyl-3-pentene [2 marks]

[Total = 25 marks]

QUESTION 6

1. Complete the following chemical equations:

[2 marks each]



[20 marks]

2. How would you treat someone poisoned by carbon monoxide (CO)? [5 marks]

[Total = 25 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. $K = ([\text{C}]^p [\text{D}]^q) / ([\text{A}]^m [\text{B}]^n)$
8. $X = p/K$
9. $F = k(\text{C}_1 \times \text{C}_2)/r^2$
10. $\Delta G = \Delta H - T\Delta S$
11. $\text{C}_1\text{V}_1 = \text{C}_2\text{V}_2$

1	2	IIa
1 H 1.0079 -259.14 -252.87 2.2	2 He 4.0026 -273.15 -268.93	
3 Li 6.941 1347 10 1.5	4 Be 9.0122 2870 10 1.5	
11 Na 22.990 97.81 882.9 10 1.2	12 Mg 24.305 648.8 1090 1.2	
19 K 39.098 634.5 959.6 1.0	20 Ca 40.078 839 1484 1.0	
37 Rb 85.468 337.2 688 1.0	38 Sr 87.62 779.5 1384 1.0	
55 Cs 132.91 28.40 678.4 0.9	56 Ba 137.33 725 1640 1.0	
87 Fr 223.02 27 677 0.9	88 Ra 226.03 700 1140 1.0	

1	2	3	4	5	6
100.91	12.01	15.999	19.00	23.004	26.982
100.91	12.01	15.999	19.00	23.004	26.982
100.91	12.01	15.999	19.00	23.004	26.982
100.91	12.01	15.999	19.00	23.004	26.982
100.91	12.01	15.999	19.00	23.004	26.982

Periodic Table of the Elements



- 1 Atomic number
- 2 Element symbol
- 3 Relative atomic mass
- 4 Melting point
- 5 Boiling point
- 6 Electronegativity (Allred, Rochow)
- 7 Oxidation states
- 8 Electron configuration



Saatchi & Saatchi

3	4	5	6	7	8	9	10	11	12
IIb	IVb	Vb	VIb	VIIb	VIII	VIII	VIII	IB	IIB
21 Sc 44.956 1541 2831 1.2	22 Ti 47.88 1660 3287 1.3	23 V 50.942 1817 3400 1.5	24 Cr 51.996 1817 2672 1.6	25 Mn 54.938 1817 2180 1.5	26 Fe 55.845 1817 2732 1.8	27 Co 58.933 1817 2709 1.9	28 Ni 58.693 1817 2732 1.9	29 Cu 63.546 1817 2835 1.9	30 Zn 65.39 1817 2835 1.9
39 Y 88.906 3342 3342 1.1	40 Zr 91.224 1852 4372 1.2	41 Nb 92.906 1847 4545 1.2	42 Mo 95.94 2637 4637 1.3	43 Tc 98.906 2472 4537 1.3	44 Ru 101.07 2607 4687 1.4	45 Rh 102.91 2687 4787 1.5	46 Pd 106.42 2617 4827 1.4	47 Ag 107.87 2640 4942 1.4	48 Cd 112.41 2640 4942 1.5
57 La 138.91 921 3457 1.1	72 Hf 178.49 2227 4002 1.2	73 Ta 180.95 2996 5425 1.3	74 W 183.84 3422 5690 1.4	75 Re 186.21 3180 5897 1.5	76 Os 190.23 3047 5942 1.5	77 Ir 192.22 3047 5942 1.5	78 Pt 195.08 3047 5942 1.5	79 Au 196.97 3047 5942 1.5	80 Hg 200.59 3047 5942 1.5
89 Ac 227.03 1090 3200 1.0	104 Db 261.11 261.11 261.11 1.0	105 Jl 262.11 262.11 262.11 1.0	106 Rf 263.12 263.12 263.12 1.0	107 Bh 264.12 264.12 264.12 1.0	108 Hs 265.12 265.12 265.12 1.0	109 Mt 266.12 266.12 266.12 1.0	110 Ds 267.12 267.12 267.12 1.0	111 Rg 268.12 268.12 268.12 1.0	112 Cn 269.12 269.12 269.12 1.0

Ds Dubnium
 J J Joliotium
 Rf Rutherfordium
 Bh Bohrium
 Hs Hassium
 Mt Meitnerium

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Lanthaniden Lanthanides Lantánidos	58 Ce 140.12 799 3426 1.1	59 Pr 140.91 931 3312 1.1	60 Nd 144.24 1012 3068 1.1	61 Pm 144.91 1012 3068 1.1	62 Sm 150.36 1077 2797 1.1	63 Eu 151.96 1597 2557 1.0	64 Gd 157.25 1326 3266 1.1	65 Tb 158.93 1326 3266 1.1	66 Dy 162.50 1412 2557 1.1	67 Ho 164.93 1474 2557 1.1	68 Er 167.26 1497 2557 1.1	69 Tm 168.93 1545 1947 1.1	70 Yb 173.04 819 1194 1.1	71 Lu 174.97 1663 3395 1.1
Actiniden Actinides Actínidos	90 Th 232.04 1750 4790 1.1	91 Pa 231.04 1600 3818 1.1	92 U 238.03 1122 3818 1.2	93 Np 237.05 1122 3818 1.2	94 Pu 244.06 641 3332 1.3	95 Am 243.06 994 2607 1.2	96 Cm 247.07 1340 3271 1.3	97 Bk 247.07 1340 3271 1.3	98 Cf 251.08 251.08 251.08 1.2	99 Es 252.08 252.08 252.08 1.2	100 Fm 257.10 257.10 257.10 1.2	101 Md 258.10 258.10 258.10 1.2	102 No 259.10 259.10 259.10 1.2	103 Lr 262.11 262.11 262.11 1.2