



NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES

SCHOOL OF HEALTH SCIENCES

DEPARTMENT OF CLINICAL HEALTH SCIENCES

QUALIFICATION: BACHELOR OF ENVIRONMENTAL HEALTH SCIENCES BACHELOR OF SCIENCES IN HEALTH SYSTEMS INFORMATION MANAGEMENT BACHELOR OF MEDICAL LABORATORY SCIENCES BACHELOR OF HUMAN NUTRITION	
QUALIFICATION CODE: 08BEHS 07BHIS 08BMLS 08BOHN	LEVEL: 5
COURSE CODE: HSC511S	COURSE NAME: HEALTH SCIENCE CHEMISTRY
SESSION: JULY 2023	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
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INSTRUCTIONS	
<ol style="list-style-type: none">1. Answer ALL the questions.2. Write clearly and neatly.3. Number the answers clearly.	

PERMISSIBLE MATERIALS
Non-programmable Calculators

THIS QUESTION PAPER CONSISTS OF 9 PAGES (Including this front page and Periodic Table)

QUESTION 1: Multiple Choice Questions

- *There are 20 multiple choice questions in this section. Each question carries 3 marks.*
- *Answer ALL questions by selecting the letter of the correct answer.*
- *Choose the best possible answer for each question, even if you think there is another possible answer that is not given.*

1.1 Convert 12300 to scientific notation.

- A. 1,2300
- B. 1.2300
- C. 1.2300×10^4
- D. 1.23×10^4

1.2 An object has a volume of 0.0010 m^3 . Its volume given in cm^3 is:

- A. 0.10
- B. 1000
- C. 100
- D. 10

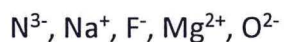
1.3 The isotope atoms differ in?

- A. number of neutrons
- B. atomic number
- C. number of electrons
- D. atomic weight

1.4 Which of the following classifications of elements is NOT correct (is FALSE)?

- A. Ba ($Z = 56$) is an alkali metal
- B. As ($Z = 33$) is a metalloid
- C. I ($Z = 53$) is a halogen
- D. Kr ($Z = 36$) is a non-metal

1.5 List the following ions in order of increasing ionic radius:



- A. $\text{Na}^+, \text{Mg}^{2+}, \text{F}^-, \text{O}^{2-}, \text{N}^{3-}$
- B. $\text{Mg}^{2+}, \text{Na}^+, \text{F}^-, \text{O}^{2-}, \text{N}^{3-}$
- C. $\text{F}^-, \text{O}^{2-}, \text{N}^{3-}, \text{Mg}^{2+}, \text{Na}^+$
- D. $\text{Mg}^{2+}, \text{Na}^+, \text{N}^{3-}, \text{O}^{2-}, \text{F}^-$

1.6 Arrange the following atoms in order of increasing electronegativity:

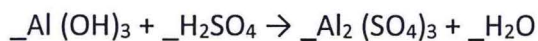


- A. I, Te, Sb, Sn
- B. Sb, I, Sn, Te
- C. Sn, Sb, Te, I
- D. Sn, Te, Sb, I

1.7 Give the condensed electron configuration of the following element: K^+

- A. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
- B. $[\text{Ar}] 4s^1$
- C. $1s^2 2s^2 2p^6 3s^2 3p^6$
- D. $[\text{Ar}]$

1.8 Balance the following equation by providing the missing coefficients:



- A. 1, 3, 1, 2
- B. 2, 3, 2, 6
- C. 2, 3, 1, 6
- D. 2, 6, 1, 3

1.9 Which statement about the noble gases is correct?

- A. Noble gases are diatomic molecules.
- B. Noble gases are reactive gases.
- C. Noble gases have full outer electron shells.
- D. The noble gases are found on the left-hand side of the Periodic Table.

1.10 How many molecules are in 0.63 moles of molecules?

- A. 8.3×10^{21} molecules
- B. 4.1×10^{26} molecules
- C. 3.8×10^{24} molecules
- D. 3.8×10^{23} molecules

1.11 How many liters are required to make 800 mL of a 2.0 M H_2SO_4 solution, starting with a 6.0 M stock solution?

- A. 26.1 L
- B. 0.62 L
- C. 0.26 L
- D. 12.4 L

1.12 Which of the following combination of oxidation numbers is correct for the following compound: NaIO_3 ?

- A. Na = +1, O = -2, I = +5
- B. Na = +1, O = -3, I = +5
- C. Na = +2, O = -3, I = +6
- D. Na = +1, O = -4, I = +3

1.13 The most electronegative element among the following is:

- A. bromine
- B. fluorine
- C. oxygen
- D. Sodium

1.14 Element X has a nucleon number of 20 and a proton number of 10. Which group in the Periodic Table does it belong to?

- A. I
- B. III
- C. VII
- D. VIII

1.15 What is the correct symbol for the lithium ion in lithium chloride?

- A. ${}^6_2\text{Li}^-$ B. ${}^6_2\text{Li}^+$ C. ${}^7_2\text{Li}^+$ D. ${}^7_2\text{Li}^-$

- A. A.
B. B.
C. C.
D. D.

1.16 Table 1.1 shows the structure of different atoms and ions.

Table 1.1

Particle	Nucleon Number	Number of electrons	Number of neutrons	Number of protons
Cl	35	17	V	17
Cl ⁻	35	W	18	X
Ca	40	20	Y	20
Ca ²⁺	40	Z	20	20

What are the values of V, W, X, Y and Z in Table 1.2?

Table 1.2

	V	W	X	Y	Z
A	18	17	18	20	20
B	18	18	17	20	18
C	17	16	16	20	22
D	18	17	17	20	16

1.17 If 50.0 mL of gasohol has a mass of 37.5 g, what is the density of the gasohol in grams per cubic centimetre?

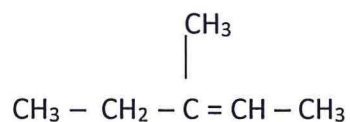
- A. 0.00750 g/cm³
- B. 0.0750 g/cm³
- C. 0.750 g/cm³
- D. 7.50 g/cm³

1.18 The alcohol shown below is a:



- A. Primary alcohol
- B. Secondary alcohol
- C. Tertiary alcohol
- D. Allylic alcohol

1.19 What is the name of the following alkene according to the IUPAC rules?



- A. 2-ethyl-3-pentene
- B. 3-methyl-2-pentene
- C. 3-methyl-3-pentene
- D. 3-pentene-2-ethyl

1.20 A hydrocarbon with the general formula C_nH_{2n-2} can be:

- A. an alkyne
- B. an alkyne or a cycloalkane
- C. an alkyne or a cycloalkene
- D. a cycloalkene

END OF SECTION A

QUESTION 2

2.1 Use your calculator to evaluate these expressions.

[3]

- a) $4585 \times 13 \div 82$
b) $[(6.37 \times 10^4) \times (8.44 \times 10^{-4})] \div (3.2209 \times 10^{15})$
c) $0.758 \text{ g} + 3.10 \text{ g}$

2.2 Osteoporosis is a condition in which bone deteriorates to cause a decreased bone mass. If a bone sample has a mass of 2.15 g and a volume of 1.40 cm^3 , what is its density in SI units of density.

[4]

QUESTION 3

3.1 An element consists of 1.40% of an isotope with mass 203.973 amu, 24.10% of an isotope with mass 205.9745 amu, 22.10% of an isotope with mass 206.9759 amu, and 52.40% of an isotope with mass 207.9766 amu. Calculate the average atomic mass and identify the element.

[4]

QUESTION 4

4.1 For each of the following species in **Table 4.1 below** determine number of protons, neutrons and electrons.

[4]

Table 4.1

	Neutrons	Electrons	Protons
$^{52}\text{Cr}^{3+}$			
^{40}Ar			
$^{39}\text{K}^+$			
$^{79}\text{Se}^{2-}$			

QUESTION 5

5.1 Succinic acid is 40.7% C, 5.12% H, and 54.2% O. If it has an experimental molar mass of 118 g, what are the:

- a) empirical formula [4]
- b) molecular formula [3]

QUESTION 6

6.1 Ammonia is produced from the reaction of nitrogen and hydrogen according to the following balanced equation: $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$.

From a mixture of 1.00 g N_2 and 0.500 g H_2 :

- a) Determine the limiting reagent. [3]
- b) What is the maximum mass of ammonia produced? [3]
- c) What is the mass of excess reactant that would remain unreacted? [3]
- d) If 0.986 g of ammonia is actually produced when an experiment is done, calculate the percentage yield. [2]

QUESTION 7

7.1 Define electronegativity. [1]

7.2 Arrange the following atoms in order of increasing electronegativity: [2]

N, Na, F, Mg, O

7.3 One of the most useful features of the periodic table of the elements is that it allows trends in the properties of the elements to be compared. Explain why

- a) the alkali metals are all reactive. [2]
- b) the reactivity of the alkali metals increases down the group. [2]

Periodic Table of the Elements

1																	18
1 H Hydrogen 1.008																	2 He Helium 4.003
3 Li Lithium 6.941	4 Be Beryllium 9.012											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
11 Na Sodium 22.990	12 Mg Magnesium 24.305											13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.066	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.88	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.933	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.722	32 Ge Germanium 72.61	33 As Arsenic 74.922	34 Se Selenium 78.09	35 Br Bromine 79.904	36 Kr Krypton 84.80
37 Rb Rubidium 84.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.94	43 Tc Technetium 98.907	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.71	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.904	54 Xe Xenon 131.29
55 Cs Cesium 132.905	56 Ba Barium 137.327	57-71 Lanthanides	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.967	80 Hg Mercury 200.59	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [209]	85 At Astatine 209.987	86 Rn Radon 222.018
87 Fr Francium 223.020	88 Ra Radium 226.025	89-103 Actinides	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [269]	109 Mt Meitnerium [268]	110 Ds Darmstadtium [269]	111 Rg Roentgenium [272]	112 Cn Copernicium [277]	113 Uut Ununtrium unknown	114 Fl Flerovium [289]	115 Uup Ununpentium unknown	116 Lv Livermorium [293]	117 Uus Ununseptium unknown	118 Uuo Ununoctium unknown

57 La Lanthanum 138.906	58 Ce Cerium 140.115	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.24	61 Pm Promethium 144.913	62 Sm Samarium 150.36	63 Eu Europium 151.966	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.50	67 Ho Holmium 164.930	68 Er Erbium 167.26	69 Tm Thulium 168.934	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967
89 Ac Actinium 227.028	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.080	99 Es Einsteinium [254]	100 Fm Fermium 257.095	101 Md Mendelevium 258.1	102 No Nobelium 259.101	103 Lr Lawrencium [262]