



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

**FACULTY NAME:
NATURAL RESOURCES AND SPATIAL SCIENCES**

**DEPARTMENT NAME:
AGRICULTURE AND NATURAL RESOURCES SCIENCES**

QUALIFICATION : BACHELOR OF AGRICULTURE	
QUALIFICATION CODE: 07BAGR	LEVEL: 5
COURSE: Introduction to Chemistry	COURSE CODE: ICA511S
DATE: July 2019	SESSION:
DURATION: 3 Hours	MARKS: 100

SUPPLEMENTARY / SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
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MODERATOR:	Mrs. Lucia Tuyeni—Kelao KAFIDI

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

PERMISSIBLE MATERIALS

1. Examination paper.
2. Examination script.
3. Calculator

THIS QUESTION PAPER CONSISTS OF 8 PAGES (*Excluding This Front Page*)

Section A: MULTIPLE CHOICE QUESTIONS

[40]

- There are 20 multiple choice questions in this section. Each question carries 2 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. Which of the following is a measurement of mass in the metric system?
 - A. celsius
 - B. centimeter
 - C. milliliter
 - D. kilogram
 - E. meter
 2. Which of the following numbers contains the designated CORRECT number of significant figures?

A. 0.04300	5 significant figures
B. 0.00302	2 significant figures
C. 3.0650	4 significant figures
D. 156000	3 significant figures
E. 1.04	2 significant figures
 3. Convert 0.00010 to standard scientific notation with correct number of significant figures.
 - A. 1×10^{-3}
 - B. 1.0×10^{-3}
 - C. 1×10^{-4}
 - D. 1.0×10^{-4}
 - E. 10×10^{-5}
 4. The temperature of liquid nitrogen is -196°C . What is the corresponding reading on the Kelvin scale?
 - A. 146 K
 - B. 77 K
 - C. -127 K
 - D. -91 K
 - E. 48 K
 5. The molecular formula for acetylene is C_2H_2 . The molecular formula for benzene is C_6H_6 . The empirical formula for both is
 - A. CH
 - B. C_2H_2
 - C. C_6H_6
 - D. $(\text{CH})_2$
 - E. Insufficient Information

6. What mass of NaCl (Molar mass = 58.45 g/mol) can be produced by the reaction of 0.75 mol Cl_2 ?
- 0.75 g
 - 1.5 g
 - 44 g
 - 88 g
 - 132 g
7. What is the maximum number of moles AlCl_3 that can be produced from 5.0 mol Al and 6.0 mol Cl_2 ?
- 2.0 mol
 - 4.0 mol
 - 5.0 mol
 - 6.0 mol
 - 8.0 mol
8. A certain element has 2 isotopes, one having a mass of 84.9118 amu and % abundance of 72.15 and the other having a mass of 86.9092 amu and % abundance of 27.85. The average atomic weight of this element is
- 85.9105 amu
 - 86.0025 amu
 - 85.4681 amu
 - 85.7253 amu
 - Insufficient Information
9. What is the electron configuration for the most stable ion of the element Sulfur, ${}_{16}\text{S}$.
- $1s^2 2s^2 2p^6 3s^2 3p^6$
 - $1s^2 2s^2 2p^6 3s^2 3p^5$
 - $1s^2 2s^2 2p^6 3s^2 3p^4$
 - $1s^2 2s^2 2p^6 3s^2 3d^6$
 - $1s^2 2s^2 2p^6 3s^2$
10. Which of the following is incorrect?
- $1\text{L} = 1000\text{cm}^3$
 - $1\text{m} = 100\text{cm}$
 - $1\text{ml} = 1\text{cm}^3$
 - $1\text{L} = 1\text{m}^3$
 - $1\text{ml} = 10^{-6}\text{m}^3$
11. Use the following information to identify the atom or ion: 8 protons, 8 neutrons, and 10 electrons.
- S^{2+}
 - O^{2-}
 - O^{2+}
 - S^{2-}
 - Ne

12. The element with atomic number 32 describes a _____.
- A. Metal
 - B. Non-metal
 - C. Metalloid
 - D. Halogen
 - E. Noble gas
13. Member of a common horizontal row(period) of the Periodic Table should have the same _____?
- A. Atomic number
 - B. Atomic mass
 - C. Number of energy shells
 - D. Electrons in the outer shell
 - E. Valence
14. What is the mass of 3.00moles of Aluminum
- A. 80.9 g
 - B. 12.84 g
 - C. 8.99 g
 - D. 12.4 g
 - E. 8.99 g
15. The number of significant figures in 0.010 is
- A. 4
 - B. 3
 - C. 2
 - D. 1
 - E. Cannot be specified
16. When you heat a sample of gas, what happens to the particles that make up the gas?
- A. The particles gain kinetic energy
 - B. The particles break apart
 - C. The particles get smaller
 - D. The particles move slowly
 - E. The particles become more dense
17. Which element is a metal?
- A. Se (atomic number =34)
 - B. Co (atomic number =27)
 - C. C (atomic number =6)
 - D. Br (atomic number =35)
 - E. None of the above

18. What is the volume of 1.5M NaOH needed to provide 0.75mol of NaOH?
- A. 500L
 - B. 5.0L
 - C. 500ml
 - D. 0.75L
19. Which element has the noble gas configuration $[\text{Kr}]5s^24d^2$
- A. Se
 - B. Sr
 - C. Zr
 - D. Mo
 - E. Mn
20. Any sample of matter has mass and takes up space. The main reason for this is because:
- A. All matter is heavy
 - B. Matter can be a gas
 - C. Matter is made up of tiny particles that have mass and takes up space
 - D. The Earth is made up of matter
 - E. All the above

Section B: STRUCTURED QUESTIONS**[60]**

- There are SEVEN questions in this section. Answer all Questions.
- Show clearly, where necessary, how you arrive at the answer as the working will carry marks too.

QUESTION 1**[11]**

1.1 What is the maximum number of electrons that can be contained within the region (shell, subshell, orbital) specified by the following quantum numbers?

1.1.1 $n = 3$ [1]

1.1.2 $n = 4 ; l = 2$ [2]

1.1.3 $n = 2 ; l = 0 ; m_l = 0$ [2]

1.2 Give the n and l values for the following orbitals

1.2.1 1s [1]

1.2.2 3s [1]

1.2.3 2p [1]

1.2.4 4d [1]

1.2.5 5f [1]

1.2.6 6g [1]

QUESTION 2**[8]**

Evaluate each of the following and round off the answer to the correct number of significant figures.

2.1 $235.05 + 19.6 + 2.1$ [2]

2.2 $58.925 - 18.2$ [2]

2.3 $\frac{4.311}{0.07}$ [2]

2.4 $\frac{(2.54 \times 0.0028)}{(0.0105 \times 0.060)}$ [2]

QUESTION 3**[5]**

Element Q has only 2 naturally occurring isotopes: ^{94}Q with an abundance of 76.62% and ^{97}Q . The mass of ^{94}Q is 7.883 times greater than that of ^{12}C , while ^{97}Q is 8.082 times greater than that of ^{12}C . What is the atomic weight of element Q? (Reminder: the mass of ^{12}C is exactly 12).

QUESTION 4**[9]**

The fizz produced when Alka-Seltzer tablet is dissolved in water is due to the reaction between sodium bicarbonate (NaHCO_3) and citric acid ($\text{H}_3\text{C}_6\text{H}_5\text{O}_7$):



In a certain experiment 1.00 g of sodium bicarbonate and 1.00 g of citric acid are allowed to react.

- 4.1 Which is the limiting reactant? [3]
4.2 How many grams of carbon dioxide form? [3]
4.3 How many grams of excess reactant remain after the limiting reactant is completely consumed? [3]

QUESTION 5**[5]**

The element ^{29}Cu , which has an average atomic mass of 63.546 amu, consists of two isotopes: Isotope A with an isotopic mass of 62.930 amu, and isotope B with an isotopic mass of 64.928 amu. The relative abundance of the heavier isotope B is?

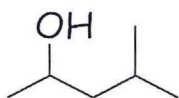
QUESTION 6**[12]**

6.1 Draw the structure of:

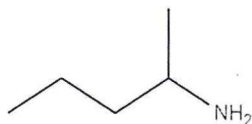
- 6.1.1 3,3-dimethylpentane [2]
6.1.2 3-ethyl-2-methylhexane [2]
6.1.3 3-chloropropyne [2]

6.2 Name the following structures:

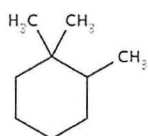
- 6.2.1 [2]



- 6.2.2 [2]



- 6.2.3 [2]



QUESTION 7**[10]**

7.1 Name the following ionic compounds:

7.1.1 FePO_4 7.1.2 K_2S 7.1.3 NaHCO_3 7.1.4 $\text{Fe}(\text{NO}_3)_2$ 7.1.5 AlMnO_4

7.2 Give the formulas for the following ionic compounds:

7.2.1 Sodium Sulphate

7.2.2 Magnesium phosphate

7.2.3 Sodium chloride

7.2.4 Silver carbonate

7.2.5 Dihydrogen monoxide

Total Marks:**100****USEFUL CONSTANTS:**Gas constant, $R = 8.3145 \text{ J mol}^{-1} \text{ K}^{-1}$ $1 \text{ atm} = 101\,325 \text{ Pa} = 760 \text{ mmHg} = 760 \text{ torr}$ Avogadro's Number, $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$ Planck's constant, $h = 6.626 \times 10^{-34} \text{ Js}$ Speed of light, $c = 2.998 \times 10^8 \text{ ms}^{-1}$

PERIODIC TABLE OF THE ELEMENTS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18														
1 H 1.00794	2 He 4.00260	3 Li 6.941	4 Be 9.01218	5 B 10.81	6 C 12.011	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.179	11 Na 22.9898	12 Mg 24.305	13 Al 26.9815	14 Si 28.0855	15 P 30.9738	16 S 32.06	17 Cl 35.453	18 Ar 39.948														
19 K 39.0983	20 Ca 40.08	21 Sc 44.9559	22 Ti 47.88	23 V 50.9415	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.69	29 Cu 63.546	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 83.8														
37 Rb 85.4678	38 Sr 87.62	39 Y 88.9059	40 Zr 91.22	41 Nb 92.9064	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.906	46 Pd 106.42	47 Ag 107.868	48 Cd 112.41	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.6	53 I 126.9	54 Xe 131.29														
55 Cs 132.905	56 Ba 137.33	57 Lu 174.967	58 Hf 178.49	59 Ta 180.948	60 W 183.85	61 Re 186.207	62 Os 190.2	63 Ir 192.22	64 Pt 195.08	65 Au 196.967	66 Hg 200.59	67 Tl 204.383	68 Pb 207.2	69 Bi 208.908	70 Po (209)	71 At (210)	72 Rn (222)														
87 Fr (223)	88 Ra 226.025	89 Ac 227.028	90 Th 232.038	91 Pa 231.036	92 U 238.029	93 Np 237.048	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (264)	108 Hs (265)	109 Mt (268)	110 Uun (269)	111 Uuu (272)	112 Uub (269)	113 Uuq 114	114 Uuh 116	115 Uuq 114	116 Uuh 116	117 Uuh 116	118 Uuo 118

Lanthanides:

57 La 138.906	58 Ce 140.12	59 Pr 140.908	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.925	66 Dy 162.50	67 Ho 161.930	68 Er 167.26	69 Tm 166.934	70 Yb 173.04
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Actinides:

89 Ac 227.028	90 Th 232.038	91 Pa 231.036	92 U 238.029	93 Np 237.048	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)
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