



FACULTY OF SCIENCE

DEPARTMENT OF CHEMICAL SCIENCES
BACHELOR OF ENVIRONMENTAL HEALTH
MODULE CODE: CETH1Y1
CAMPUS: DFC
NOVEMBER EXAMINATION 2019

DATE: 23 NOVEMBER 2019

SESSION: 12:30 – 15:30

ASSESSOR

DR P.F MSOMI

INTERNAL MODERATOR

DR N.W MAXAKATO-DINGILIZWE

DURATION 3 HOURS

TOTAL MARKS 150

NUMBER OF PAGES: 6 PAGES, INCLUDING 1 ANNEXURE

INSTRUCTIONS: ANSWER BOTH SECTION A AND SECTION B IN THE ANSWER SCRIPT PROVIDED.

FOR SECTION B, GIVE ALL NUMERICAL ANSWERS TO THE CORRECT NUMBER OF SIGNIFICANT FIGURES AND WITH APPROPRIATE UNITS.

CONSULT THE DATA SHEET AND THE PERIODIC TABLE FOR ALL SUPPLEMENTARY INFORMATION.

CALCULATORS ARE PERMITTED (ONLY ONE PER STUDENT).

REQUIREMENTS: ANSWER SCRIPT

SECTION A

QUESTION 1: ANSWER THIS SECTION ON YOUR ANSWER SCRIPT BY WRITING THE QUESTION NUMBER AND THE LETTER OF YOUR CHOICE. FOR EXAMPLE: **2. D**

1. Barium is an example of a _____
 - A. Metalloids
 - B. Metal
 - C. Non-metal
 - D. Halogen
2. A tertiary alcohol has its hydroxyl group (-OH) bonded to a carbon with _____ other carbon atoms bonded to it.
 - A. 1
 - B. 2
 - C. 3
 - D. 4
3. Class B fire can originate from
 - A. Plastic
 - B. Caused by metals in the laboratory
 - C. Oil
 - D. Faulty electrical equipment
4. An example of a homogenous mixture is:
 - A. Sugar dissolved in water
 - B. Lemon Juice
 - C. Sand in water
 - D. all of the above
5. Which compound lose their water of hydration on exposure to air?
 - A. Anhydrous
 - B. Hygroscopic
 - C. Hydrates
 - D. Efflorescent
6. Which of the compounds below will have the highest boiling point?
 - A. Nonane
 - B. Pentene
 - C. Cyclobutane
 - D. Propane

7. Phenol is the name commonly assigned to:
- A. methlybenzene
 - B. hydroxybenzene
 - C. methoxybenzene
 - D. aminobenzene
8. The oxidation number of manganese (Mn) in manganese chromate (MnCrO_4) is:
- A. + 6
 - B. - 2
 - C. +2
 - D. - 6
9. Which of the following substances represents an ionic bond?
- A. O_2
 - B. Cl_2
 - C. NaCl
 - D. CH_4
10. If an atom has 26 protons, 30 neutrons, 24 electrons, its atomic number is:
- A. 30
 - B. 24
 - C. 26
 - D. 56

[10 x 2 = 20]

SECTION B

QUESTION 1

- 1.1 Give an example of physical and chemical properties and differentiate between the two. (6)
- 1.2 Define the term *isotope*. Give one example of an isotope. (4)
- 1.3 Give condensed electron configuration of the following atoms/ions.
- 1.3.1 Magnesium (3)
 - 1.3.2 Ca^{2+} (3)
- 1.4 Distinguish between covalent and ionic bonding and give an example in each case. (6)
- 1.5 Draw Lewis structures of the following compounds.
- 1.5.1 O_2 (3)
 - 1.5.2 CCl_4 (3)

QUESTION 1 (Continues)

- 1.6. Lead nitrate, $\text{Pb}(\text{NO}_3)_2$ is a toxic oxidising agent which is carcinogenic to humans.
- 1.6.1 Calculate the molar mass of $\text{Pb}(\text{NO}_3)_2$. (2)
- 1.6.2 How many lead nitrate molecules are in 3.2 g of $\text{Pb}(\text{NO}_3)_2$? (4)
- 1.6.3 How many oxygen atoms are in 3.2 g of lead nitrate? (3)
- 1.6.4 Calculate the percentage composition of each element in lead nitrate. (6)
- [43]**

QUESTION 2

- 2.1 List and describe all stages of water purification. (12)
- 2.2 Differentiate between distilled and deionised water. (4)
- 2.3 Discuss the chemical properties of water. (5)
- 2.4 Differentiate between a colloid and suspension. (6)
- 2.5 Consider a 150 mL bottle of hair dye containing 3.35 g of hydrogen peroxide.
- 2.5.1 Calculate the concentration in (mol/L) of hydrogen peroxide in the hair dye. (5)
- 2.5.2 Calculate the % (m/v) concentration of hydrogen peroxide. (3)
- 2.6 Calculate the pH and pOH of a solution containing a hydronium ion concentration of 0.0011 M. (4)
- 2.7 Explain the terms, strong acid and strong base. Give a chemical reaction to show their dissociation in water. (6)
- 2.8 Balance the overall redox reaction in acidic medium
- 2.8.1 $\text{OCl}^- (\text{aq}) + \text{I}^- (\text{aq}) \longrightarrow \text{I}_2 (\text{aq}) + \text{Cl}^- (\text{aq}) + \text{H}_2\text{O} (\text{l})$ (5)
- 2.8.2 $\text{SO}_3^{2-} (\text{aq}) + \text{MnO}_4^- (\text{aq}) \longrightarrow \text{SO}_4^{2-} (\text{aq}) + \text{Mn}^{2+} (\text{aq})$ (8)

[58]

QUESTION 3

3.1 Give the structural formula for each of the following organic compounds:

3.1.1 6,6-dimethyl-hept 4-ene-3-one (4)

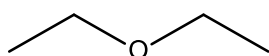
3.1.2 Trimethylamine (3)

3.1.3 Cyclohexylamine (3)

3.1.4 Ethanoic acid (3)

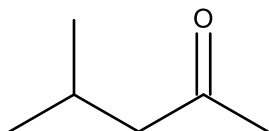
3.2 Name each of the following organic compounds:

3.2.1



(3)

3.2.2



(4)

3.3 Use reaction equation to show the following:

3.3.1 Oxidation of alkene. (4)

3.3.2 Halogenation of alkenes. (4)

3.3.3 A reaction that follows Markovnikov's rule. (4)

[32]

TOTAL: 150
FULL MARKS: 153

DATA

Avogadro's number: 6.022×10^{23}
 K_w : $1 \times 10^{-14} = [H^+][OH^-]$

UNIVERSITY OF JOHANNESBURG
Department of Applied Chemistry

1 H <i>1.0079</i>		Atomic Number																2 He <i>4.0026</i>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
3 Li <i>6.941</i>		4 Be <i>9.0122</i>		Atomic Weight																5 B <i>10.811</i>		6 C <i>12.011</i>		7 N <i>14.007</i>		8 O <i>15.999</i>		9 F <i>18.998</i>		10 Ne <i>20.179</i>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
11 Na <i>22.990</i>		12 Mg <i>24.305</i>																		13 Al <i>26.982</i>		14 Si <i>28.086</i>		15 P <i>30.974</i>		16 S <i>32.064</i>		17 Cl <i>35.453</i>		18 Ar <i>39.948</i>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
19 K <i>39.098</i>		20 Ca <i>40.078</i>		21 Sc <i>44.956</i>		22 Ti <i>47.88</i>		23 V <i>50.942</i>		24 Cr <i>51.996</i>		25 Mn <i>54.938</i>		26 Fe <i>55.847</i>		27 Co <i>58.933</i>		28 Ni <i>58.69</i>		29 Cu <i>63.546</i>		30 Zn <i>65.39</i>		31 Ga <i>69.723</i>		32 Ge <i>72.61</i>		33 As <i>74.922</i>		34 Se <i>78.96</i>		35 Br <i>79.904</i>		36 Kr <i>83.80</i>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
37 Rb <i>85.47</i>		38 Sr <i>87.62</i>		39 Y <i>88.906</i>		40 Zr <i>91.224</i>		41 Nb <i>92.906</i>		42 Mo <i>95.94</i>		43 Tc <i>(98)</i>		44 Ru <i>101.07</i>		45 Rh <i>102.91</i>		46 Pd <i>106.42</i>		47 Ag <i>107.87</i>		48 Cd <i>112.41</i>		49 In <i>114.82</i>		50 Sn <i>118.71</i>		51 Sb <i>121.75</i>		52 Te <i>127.60</i>		53 I <i>126.90</i>		54 Xe <i>131.29</i>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
55 Cs <i>132.91</i>		56 Ba <i>137.33</i>		57 La <i>138.91</i>		72 Hf <i>178.49</i>		73 Ta <i>180.95</i>		74 W <i>183.85</i>		75 Re <i>186.2</i>		76 Os <i>190.2</i>		77 Ir <i>192.22</i>		78 Pt <i>195.08</i>		79 Au <i>196.97</i>		80 Hg <i>200.59</i>		81 Tl <i>204.38</i>		82 Pb <i>207.2</i>		83 Bi <i>208.98</i>		84 Po <i>(209)</i>		85 At <i>(210)</i>		86 Rn <i>(222)</i>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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