

UNIVERSITY OF SWAZILAND

RE-SIT EXAMINATIONS 2018/2019

TITLE OF PAPER: INTRODUCTORY CHEMISTRY I

COURSE NUMBER: CHE151

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS:

ANSWER ALL THE QUESTIONS IN SECTION A AND ANY TWO QUESTIONS FROM SECTION B.

SECTION A IS WORTH 50 MARKS AND EACH QUESTION IN SECTION B IS WORTH 25 MARKS. THE ANSWER SHEET FOR SECTION A IS ATTACHED TO THE QUESTION PAPER.

GIVE YOUR ANSWERS TO SECTION A QUESTIONS BY RECORDING ON THE ANSWER SHEET THE LETTER CORRESPONDING TO THE CORRECT ANSWER. DETATCH THE ANSWER SHEET FROM THE QUESTION PAPER AND FILL IN ALL THE INFORMATION REQUIRED IN THE SPACES PROVIDED.

BEFORE YOU LEAVE, PLACE THE ANSWER SHEET INSIDE THE UNISWA ANSWER BOOKLET CONTAINING YOUR ANSWERS TO SECTION B

A PERIODIC TABLE AND A TABLE OF CONSTANTS HAVE BEEN PROVIDED WITH THIS EXAMINATION PAPER.

PLEASE DO NOT OPEN THIS PAPER UNTIL AUTHORISED TO DO SO BY THE CHIEF INVIGILATOR.

SECTION A: ANSWER ALL THE QUESTIONS (50 MARKS)

- 1) Which one of the following is often easily separated into its components by simple techniques such as filtering or decanting?
 - A) heterogeneous mixture
 - B) compounds
 - C) homogeneous mixture
 - D) elements
 - E) solutions

- 2) Which states of matter are significantly compressible?
 - A) gases only
 - B) liquids only
 - C) solids only
 - D) liquids and gases
 - E) solids and liquids

- 3) For which of the following can the composition vary?
 - A) pure substance
 - B) element
 - C) both homogeneous and heterogeneous mixtures
 - D) homogeneous mixture
 - E) heterogeneous mixture

- 4) If matter is uniform throughout and cannot be separated into other substances by physical means, it is _____.
 - A) a compound
 - B) either an element or a compound
 - C) a homogeneous mixture
 - D) a heterogeneous mixture
 - E) an element

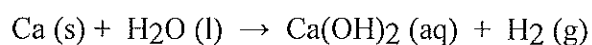
- 5) An element cannot _____.
 - A) be part of a heterogeneous mixture
 - B) be part of a homogeneous mixture
 - C) be separated into other substances by chemical means
 - D) interact with other elements to form compounds
 - E) be a pure substance

- 6) Homogeneous mixtures are also known as
 - A) solids
 - B) compounds
 - C) elements
 - D) substances
 - E) solutions

- 7) There are _____ electrons, _____ protons, and _____ neutrons in an atom of $^{132}_{54}\text{Xe}$.
- A) 132, 132, 54
 - B) 54, 54, 132
 - C) 78, 78, 54
 - D) 54, 54, 78
 - E) 78, 78, 132
- 8) An atom of the most common isotope of gold, ^{197}Au , has _____ protons, _____ neutrons, and _____ electrons.
- A) 197, 79, 118
 - B) 118, 79, 39
 - C) 79, 197, 197
 - D) 79, 118, 118
 - E) 79, 118, 79
- 9) Which combination of protons, neutrons, and electrons is correct for the isotope of copper, $^{63}_{29}\text{Cu}$?
- A) 29 p^+ , 34 n^0 , 29 e^-
 - B) 29 p^+ , 29 n^0 , 63 e^-
 - C) 63 p^+ , 29 n^0 , 63 e^-
 - D) 34 p^+ , 29 n^0 , 34 e^-
 - E) 34 p^+ , 34 n^0 , 29 e^-
- 10) Which isotope has 45 neutrons?
- A) $^{80}_{36}\text{Kr}$
 - B) $^{80}_{35}\text{Br}$
 - C) $^{78}_{34}\text{Se}$
 - D) $^{34}_{17}\text{Cl}$
 - E) $^{103}_{45}\text{Rh}$
- 11) The formula weight of a substance is _____.
- A) identical to the molar mass
 - B) the same as the percent by mass weight
 - C) determined by combustion analysis
 - D) the sum of the atomic weights of each atom in its chemical formula
 - E) the weight of a sample of the substance

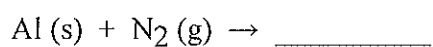
- 12) The formula weight of calcium nitrate ($\text{Ca}(\text{NO}_3)_2$), rounded to one decimal place, is _____ amu.
A) 102.1
B) 164.0
C) 204.2
D) 150.1
E) 116.1
- 13) The formula weight of magnesium fluoride (MgF_2), rounded to one decimal place, is _____ g/mol.
A) 86.6
B) 43.3
C) 62.3
D) 67.6
E) 92.9
- 14) The formula weight of lead nitrate ($\text{Pb}(\text{NO}_3)_2$) is _____ g/mol.
A) 269.2
B) 285.2
C) 317.2
D) 331.2
E) 538.4
- 15) The mass % of C in methane (CH_4) is _____.
A) 25.13 B) 133.6 C) 74.87 D) 92.26 E) 7.743
- 16) The compound responsible for the characteristic smell of garlic is allicin, $\text{C}_6\text{H}_{10}\text{OS}_2$. The mass of 1.00 mol of allicin, rounded to the nearest integer, is _____ g.
A) 34 B) 162 C) 86 D) 61 E) 19
- 17) Sulfur and oxygen react to produce sulfur trioxide. In a particular experiment, 7.9 grams of SO_3 are produced by the reaction of 5.0 grams of O_2 with 6.0 grams of S. What is the % yield of SO_3 in this experiment?
- $$2\text{S}(\text{s}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$$
- A) 32
B) 63
C) 75
D) 95
E) 99

18) When the following equation is balanced, the coefficient of H₂O is _____.



- A) 1
- B) 2
- C) 3
- D) 5
- E) 4

19) Predict the product in the combination reaction below.

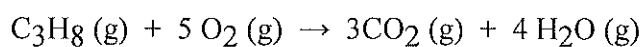


- A) AlN
- B) Al₃N
- C) AlN₂
- D) Al₃N₂
- E) AlN₃

20) What is the empirical formula of a compound that contains 27.0% S, 13.4% O, and 59.6% Cl by mass?

- A) SOCl
- B) SOCl₂
- C) S₂OCl
- D) SO₂Cl
- E) ClSO₄

21) The combustion of propane (C₃H₈) in the presence of excess oxygen yields CO₂ and H₂O:



When 2.5 mol of O₂ are consumed in their reaction, _____ mol of CO₂ are produced.

- A) 1.5
- B) 3.0
- C) 5.0
- D) 6.0
- E) 2.5

- 22) Which one of the following is a triprotic acid?
A) nitric acid
B) chloric acid
C) phosphoric acid
D) hydrofluoric acid
E) sulfuric acid
- 23) Which one of the following solutions will have the greatest concentration of hydroxide ions?
A) 0.100 M rubidium hydroxide
B) 0.100 M sodium hydroxide
C) 0.100 M ammonia
D) 0.100 M barium hydroxide
E) 0.100 M hydrochloric acid
- 24) Which one of the following is a weak acid?
A) HNO_3
B) HCl
C) HI
D) HF
E) HClO_4
- 25) Which of the following are weak acids?
A) HCl , HBr
B) HI , HBr
C) HI , H_2SO_4
D) HNO_3 , HClO_4
E) none of the above
- 26) A compound was found to be soluble in water. It was also found that addition of acid to an aqueous solution of this compound resulted in the formation of carbon dioxide. Which one of the following cations would form a precipitate when added to an aqueous solution of this compound?
A) NH_4^+ B) K^+ C) Ba^{2+} D) Rb^+ E) Na^+
- 27) Which hydroxides are weak bases?
A) KOH , $\text{Ba}(\text{OH})_2$
B) $\text{Sr}(\text{OH})_2$, KOH , NaOH , $\text{Ba}(\text{OH})_2$
C) KOH , NaOH
D) KOH , NaOH , $\text{Ba}(\text{OH})_2$
E) None of these is a weak base.

- 28) The balanced reaction between aqueous potassium hydroxide and aqueous acetic acid is _____.
- A) $\text{KOH (aq)} + \text{HC}_2\text{H}_3\text{O}_2 \text{ (aq)} \rightarrow \text{OH}^- \text{ (l)} + \text{HC}_2\text{H}_3\text{O}_2^+ \text{ (aq)} + \text{K (s)}$
 B) $\text{KOH (aq)} + \text{HC}_2\text{H}_3\text{O}_2 \text{ (aq)} \rightarrow \text{H}_2\text{O (l)} + \text{KC}_2\text{H}_3\text{O}_2 \text{ (aq)}$
 C) $\text{KOH (aq)} + \text{HC}_2\text{H}_3\text{O}_2 \text{ (aq)} \rightarrow \text{H}_2\text{C}_2\text{H}_3\text{O}_3 \text{ (aq)} + \text{K (s)}$
 D) $\text{KOH (aq)} + \text{HC}_2\text{H}_3\text{O}_2 \text{ (aq)} \rightarrow \text{KC}_2\text{H}_3\text{O}_3 \text{ (aq)} + \text{H}_2 \text{ (g)}$
 E) $\text{KOH (aq)} + \text{HC}_2\text{H}_3\text{O}_2 \text{ (aq)} \rightarrow \text{H}_2\text{KC}_2\text{H}_3\text{O (aq)} + \text{O}_2 \text{ (g)}$
- 29) The balanced reaction between aqueous nitric acid and aqueous strontium hydroxide is _____.
- A) $\text{HNO}_3 \text{ (aq)} + \text{Sr(OH)}_2 \text{ (aq)} \rightarrow \text{Sr(NO}_3)_2 \text{ (aq)} + \text{H}_2 \text{ (g)}$
 B) $\text{HNO}_3 \text{ (aq)} + \text{Sr(OH)}_2 \text{ (aq)} \rightarrow \text{H}_2\text{O (l)} + \text{Sr(NO}_3)_2 \text{ (aq)}$
 C) $\text{HNO}_3 \text{ (aq)} + \text{SrOH (aq)} \rightarrow \text{H}_2\text{O (l)} + \text{SrNO}_3 \text{ (aq)}$
 D) $2\text{HNO}_3 \text{ (aq)} + \text{Sr(OH)}_2 \text{ (aq)} \rightarrow 2 \text{H}_2\text{O (l)} + \text{Sr(NO}_3)_2 \text{ (aq)}$
 E) $2\text{HNO}_3 \text{ (aq)} + \text{Sr(OH)}_2 \text{ (aq)} \rightarrow \text{Sr(NO}_3)_2 \text{ (aq)} + 2 \text{H}_2 \text{ (g)}$
- 30) In which reaction does the oxidation number of oxygen increase?
- A) $\text{Ba(NO}_3)_2 \text{ (aq)} + \text{K}_2\text{SO}_4 \text{ (aq)} \rightarrow \text{BaSO}_4 \text{ (s)} + 2 \text{KNO}_3 \text{ (aq)}$
 B) $\text{HCl (aq)} + \text{NaOH (aq)} \rightarrow \text{NaCl (aq)} + \text{H}_2\text{O (l)}$
 C) $\text{MgO (s)} + \text{H}_2\text{O (l)} \rightarrow \text{Mg(OH)}_2 \text{ (s)}$
 D) $2 \text{SO}_2 \text{ (g)} + \text{O}_2 \text{ (g)} \rightarrow 2 \text{SO}_3 \text{ (g)}$
 E) $2 \text{H}_2\text{O (l)} \rightarrow 2 \text{H}_2 \text{ (g)} + \text{O}_2 \text{ (g)}$
- 31) In which reaction does the oxidation number of hydrogen change?
- A) $\text{HCl (aq)} + \text{NaOH (aq)} \rightarrow \text{NaCl (aq)} + \text{H}_2\text{O (l)}$
 B) $2 \text{Na (s)} + 2 \text{H}_2\text{O (l)} \rightarrow 2 \text{NaOH (aq)} + \text{H}_2 \text{ (g)}$
 C) $\text{CaO (s)} + \text{H}_2\text{O (l)} \rightarrow \text{Ca(OH)}_2 \text{ (s)}$
 D) $2 \text{HClO}_4 \text{ (aq)} + \text{CaCO}_3 \text{ (s)} \rightarrow \text{Ca(ClO}_4)_2 \text{ (aq)} + \text{H}_2\text{O (l)} + \text{CO}_2 \text{ (g)}$
 E) $\text{SO}_2 \text{ (g)} + \text{H}_2\text{O (l)} \rightarrow \text{H}_2\text{SO}_3 \text{ (aq)}$
- 32) Which one of the following is not a valid value for the magnetic quantum number of an electron in a 5d subshell?
- A) 2
 B) -3
 C) 0
 D) 1
 E) -1