INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session	:	**AUGUST 2019**
Programme	:	Foundation in Science (CFSI)
Course	:	**CHM1203 : CHEMISTRY 1**
Date of Examination	:	11 December 2019 (Wednesday)
Time	:	8:00AM – 10:00AM Reading Time : Nil
Duration	:	2 hours
Special Instructions	:	

This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Materials permitted :

Non-Programmable Calculator

Materials provided :

Periodic Table

Examiner(s)	:	**Ms. Lim Sze Theng**
Moderator	:	**Dr. Lim Gin Keat**

This paper consists of 11 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG
FOUNDATION IN SCIENCE (CFSI)
CHM1203: CHEMISTRY 1
FINAL EXAMINATION: AUG 2019 SESSION

Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) Classify each of the following changes as physical or chemical.

(i) Crushing a piece of paper (1 mark)

(ii) Hammering a metal into a thin sheet (1 mark)

(iii) Burning off dead grass (1 mark)

(iv) Slicing a ham (1 mark)

(b) Indicate which molecule in each of the following pairs of molecules has the greatest molecular polarity.

(i) H_2S and H_2O (1 mark)

(ii) CO_2 and CO (1 mark)

(iii) HCN and SO_3 (1 mark)

(iv) SiH_4 and SiH_2Cl_2 (Si is the central atom) (1 mark)

(c) Using Lewis structures, show how ionic compounds are formed by atoms of

(i) Na and F (2 marks)

(ii) Li and S (2 marks)

(iii) Be and S (2 marks)

(iv) P and K (2 marks)

(d) Predict whether the following solutes are very soluble or slightly soluble in water.

(i) NH_3 (a polar gas)

(1 mark)

(ii) N_2 (a nonpolar gas)

(1 mark)

(iii) C_6H_6 (a nonpolar liquid)

(1 mark)

(iv) Na_3PO_4 (an ionic solid)

(1 mark)

(e) The mass of n atoms of an element X is 63.75 g. The mass of 4n atoms of another element Y with a relative atomic mass of 186.21 is 446.2 g. What is the relative atomic mass of X?

(3 marks)

(f) Determine the oxidation number of the indicated element in each of the following ions.

(i) Cl in ClO^-

(1 mark)

(ii) Cl in ClO_4^-

(1 mark)

(TOTAL: 25 MARKS)

Question 2

(a) Write chemical formulas for compounds in which the following numbers of atoms are present in a molecule of the compound.

(i) Table sugar: 12 C atoms, 22 H atoms and 11 O atoms

(1 mark)

(ii) Caffeine: 8 C atoms, 10 H atoms, 4 O atoms and 2 N atoms

(1 mark)

(b) Name each compound in the following pairs of binary ionic compounds.

(i) PbO and PbO_2

(2 marks)

(ii) Cu_2S and CuS

(2 marks)

(c) Determine the final concentration of each of the following solutions after 20.0 mL of water has been added.

(i) 30.0 mL of 5.0 M NaCl solution

(2 marks)

(ii) 30.0 mL of 7.5 M NaCl solution

(2 marks)

(d) Indicate whether the first listed reactant in each of the following Brønsted-Lowry acid-base reactions is functioning as an acid or a base.

(i) $HF + H_2O \rightarrow H_3O^+ + F^-$

(1 mark)

(ii) $CN^- + H_2O \rightarrow HCN + OH^-$

(1 mark)

(iii) $HCN + NO_2^- \rightarrow HNO_2 + CN^-$

(1 mark)

(iv) $NH_3 + HNO_3 \rightarrow NH_4^+ + NO_3^-$

(1 mark)

(e) Zinc and sulphur react according to chemical equation: $Zn + S \rightarrow ZnS$. In an experiment, 50 g of zinc and 60 g of sulphur were heated in a reaction vessel. At the end of experiment, 70 g of ZnS were obtained. The percentage yield of ZnS for this experiment was closest to

(5 marks)

(f) A gaseous mixture containing He, Ne, and Ar exerts a pressure of 3.00 atm. What is the partial pressure of each gas present in the mixture under the following conditions?

(i) There is an equal number of moles of each gas present.

(1 mark)

(ii) There is an equal number of atoms of each gas present.

(1 mark)

(iii) The partial pressures of He, Ne and Ar are in a ratio 3:2:1 ratio.

(2 marks)

(iv) The partial pressure of He is one-half that of Ne and one third that of Ar.

(2 marks)

(TOTAL: 25 MARKS)

Question 3

(a) Indicate whether each of the following samples of matter is a heterogeneous mixture, a homogeneous mixture, a compound, or an element.

(i) a colorless gas, only part of which reacts with hot iron

(1 mark)

(ii) a uniform red liquid with a boiling point of 60°C that cannot be broken down into simpler substances using chemical means.

(1 mark)

(iii) a yellow solid, all of which melts at a temperature of 45°C to produce a liquid that decomposes upon further heating.

(1 mark)

(iv) a single-phase liquid that completely evaporates without decomposition when heated to produce a gas that can be separated into simpler components using physical means.

(1 mark)

(b) Draw the Lewis structure of the following molecules.

(i) SiH_4

(2 marks)

(ii) NCl_3

(2 marks)

(iii) H_2S

(2 marks)

(iv) Cl_2O

(2 marks)

(c) Calculate the mass-volume percent of $MgCl_2$ in each of the following solutions.

(i) 5.0 g of $MgCl_2$ in enough water to give 250 mL of solution

(2 marks)

(ii) 85.0 g of $MgCl_2$ in enough water to give 580 mL of solution

(2 marks)

(d) For the reaction
$C_6H_6\,(g) + 3\,H_2\,(g) \rightleftharpoons C_6H_{12}\,(g)$ + heat
determine in what direction the equilibrium will be shifted by each of the following changes.

(i) Increasing the concentration of C_6H_{12}

(1 mark)

(ii) Decreasing the concentration of C_6H_6

(1 mark)

(iii) Increasing the temperature

(1 mark)

(iv) Decreasing the pressure by increasing the volume of the container

(1 mark)

(e) Identify the two "active species" in each of the following buffer systems.

(i) H_3PO_4 and NaH_2PO_4

(2 marks)

(ii) H_2CO_3 and $KHCO_3$

(2 marks)

(f) Indicate whether butter is acidic, basic, or neutral.

(1 mark)

(TOTAL: 25 MARKS)

Question 4

(a) Indicate whether the number in each of the following statements is an exact or an inexact number.

(i) A classroom contains 63 students.

(1 mark)

(ii) The car is travelling at a speed of 56 miles per hour.

(1 mark)

(iii) The temperature on the back porch is -3 °F.

(1 mark)

(iv) There are 3 feet in a yard.

(1 mark)

(b) If 64.15 g of HCl were produced from 2.07 g of H_2 and an excess of Cl_2 according to the reaction

$$H_2 + Cl_2 \rightarrow 2\ HCl$$

what was the percent yield of HCl?

(3 marks)

(c) In each of the following pairs of substances, indicate which member of the pair would be expected to have the higher boiling point.

(i) Cl_2 or Br_2

(2 marks)

(ii) H_2O or H_2S

(2 marks)

(iii) O_2 or CO

(2 marks)

(iv) HCl or HF

(2 marks)

(d) Classify each of the following reactions as a redox reaction or a nonredox recation.

(i) $2\ NO + O_2 \rightarrow 2\ NO_2$

(1 mark)

(ii) $CO_2 + H_2O \rightarrow H_2CO_3$

(1 mark)

(iii) $Zn + 2\ AgNO_3 \rightarrow Zn(NO_3)_2 + 2\ Ag$

(1 mark)

(iv) $HNO_3 + NaOH \rightarrow NaNO_3 + H_2O$

(1 mark)

(e) Classify each of the following bonds as nonpolar covalent, polar covalent, or ionic on basis of electronegativity differences.

(i) C—O

(1 mark)

(ii) Na—Cl

(1 mark)

(iii) C—I

(1 mark)

(iv) Ca—S

(1 mark)

(v) P—H

(1 mark)

(vi) Cl—F

(1 mark)

(TOTAL: 25 MARKS)

Question 5

(a) Write complete electron configurations for atoms whose electron configurations end as follows.

(i) $4p^2$

(1 mark)

(ii) $3d^{10}$

(1 mark)

(iii) $5s^1$

(1 mark)

(iv) $4p^6$

(1 mark)

(b) A certain water supply was found to be polluted by 0.10 mg/L of chloroform ($CHCl_3$). How many $CHCl_3$ molecules are present in one drop (0.050 mL) of this water?

(3 marks)

(c) Indicate whether or not each of the following statements about intermolecular forces is true or false.

(i) Hydrogen bonds are extra strong London forces.

(1 mark)

(ii) A London force is a very weak permanent dipole-dipole interaction.

(1 mark)

(iii) The strength of dipole-dipole interactions increases as molecular polarity increases.

(1 mark)

(iv) All molecules with H atoms can participate in hydrogen bonding.

(1 mark)

(d) Classify each of the following reactions using one selection from the choices *redox* and *nonredox* combined with one selection from the choices *combination, decomposition, displacement, exchange,* and *combustion.*

(i) $Zn + Cu(NO_3)_2 \rightarrow Zn(NO_3)_2 + Cu$

(2 marks)

(ii) $CH_4 + O_2 \rightarrow CO_2 + 2\ H_2O$

(2 marks)

(iii) $2\ CuO \rightarrow 2\ Cu + O_2$

(2 marks)

(iv) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

(2 marks)

(e) Indicate whether each of the following ionic compounds is soluble or insoluble in water.

(i) $Cu(OH)_2$

(1 mark)

(ii) $CuCl_2$

(1 mark)

(f) Indicate whether or not the two members of each of the following pairs of compounds have similar solubility (both soluble or both insoluble).

(i) $CaCO_3$ and $Ca_3(PO_4)_2$

(2 marks)

(ii) $Ni(OH)_2$ and $Ni_3(PO_4)_2$

(2 marks)

(TOTAL: 25 MARKS)

--THE END--

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