

INTI
International College Penang

LAUREATE INTERNATIONAL UNIVERSITIES*

FINAL
Examination Paper

(COVER PAGE)

Session : April 2017

Programme : Foundation In Science (CFSI)

Course : CHM1203 : Chemistry 1

Date of Examination : 31 July 2017 (Monday)

Time : 11:00am – 1:00pm 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 Scientific Calculator

Materials provided :

Periodic Table

Examiner(s) :

Lim Sze Theng

Moderator :

Dr. Lim Gin Keat

This paper consists of 6 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

FOUNDATION IN SCIENCE (CFSI)

CHM1203: CHEMISTRY 1

FINAL EXAMINATION: APR2017 SESSION

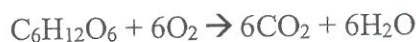
Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

- (a) Few trends that can be discovered from a periodic table. Explain the trend of;
- (i) the electronegativity as you go down a group. (3 marks)
 - (ii) the ionization energy as you go across a period. (3 marks)
 - (iii) the atomic radii as you go down a group. (3 marks)

(b) Answer the following questions.

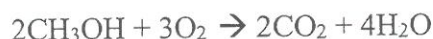
- (i) The food we eat is degraded, or broken down, in our bodies to provide energy for growth and function. A general overall equation for this very complex process represents the degradation of glucose ($C_6H_{12}O_6$) to carbon dioxide (CO_2) and water (H_2O):



If 856 g of $C_6H_{12}O_6$ is consumed by a person over a certain period, what is the mass of CO_2 produced?

(3 marks)

- (ii) Methanol (CH_3OH) burns in air according to the equation



If 209 g of methanol are used up in a combustion process, what is the mass of H_2O produced?

(3 marks)

- (c) Draw a Lewis structure for ammonium ion and identify any coordinate covalent bonds (if any). (4 marks)

- (d) Find the $[H^+]$ and the pH for the following solutions:

(i) 0.65 M KOH

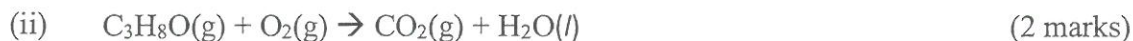
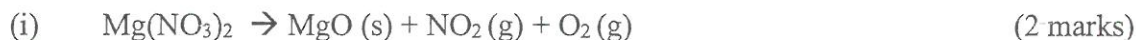
(3 marks)

(ii) 2.5×10^{-4} M H_2SO_4

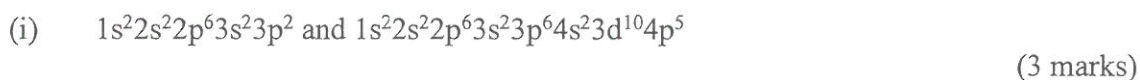
(3 marks)

Question 2

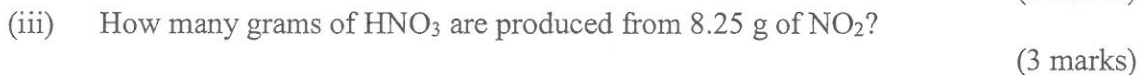
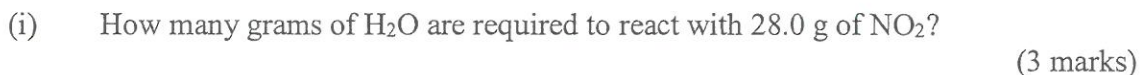
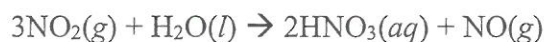
(a) Balance each of the following equations and identify the type of reaction :



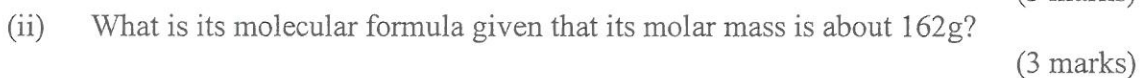
(b) Indicate whether the elements of the given pairs of electron configurations have similar chemical properties. Explain your answer.



(c) Nitrogen dioxide and water react to produce nitric acid, HNO_3 , and nitrogen monoxide:



(d) Allicin is the compound responsible for the characteristic smell of garlic. An analysis of the compound gives the following percent composition by mass: C: 44.4 percent; H: 6.21 percent; S: 39.5 percent; O: 9.86 percent.



(TOTAL: 25 MARKS)

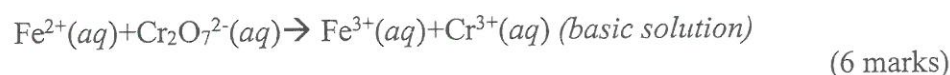
Question 3

- (a) Write the electronic configurations within the subshells of :
- (i) N^{3-} (2 marks)
- (ii) Cu^{2+} (2 marks)

(b) Lewis structure is a combination of Lewis symbols that represents either the transfer or the sharing of e^- in chemical bonds. Draw the Lewis structure for the compound below;

- (i) Mg_3P_2 (3 marks)
- (ii) NH_3 (3 marks)

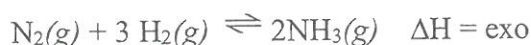
(c) Write a balanced ionic equation for redox reaction below.



- (i) Determine the reducing agent and the oxidizing agent. (2 marks)

(d) Calculate the volume to which 500mL of 0.02M sodium sulfate solution must be diluted to make a new solution of 0.005M. (2 marks)

(e) How will the gas-phase equilibrium be affected by each of the following?



- (i) The removal of $NH_3 (g)$. (1 mark)
- (ii) The addition of $NH_3 (g)$. (1 mark)
- (iii) An increase in temperature (1 mark)
- (iv) A decrease in pressure. (1 mark)
- (v) Addition of catalyst. (1 mark)

Question 4

- (a) Predict which compound in each of the following pairs that has higher melting and boiling points.

(i) $\text{CH}_3\text{CH}_2\text{OH}$ and C_3H_8 (2 marks)

(ii) NH_3 and diamond (2 marks)

- (b) Write a balanced chemical equation for the reaction of phosphoric acid with each of the following;

(i) $\text{Li}_2\text{CO}_3(\text{s})$ (2 marks)

(ii) $\text{NaOH}(\text{aq})$ (2 marks)

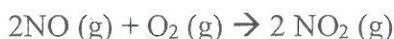
- (c) When heated, calcium carbonate decomposes to give calcium oxide and carbon dioxide gas:



If 2.00 moles of CaCO_3 react, how many liters of CO_2 gas are produced at STP? (2 marks)

- (d) Solutions can be in the types of saturated or unsaturated. Define each types of solution. (4 marks)

- (e) Nitric oxide (NO) reacts with oxygen gas to form nitrogen dioxide (NO_2), a dark-brown gas:



In one experiment 0.886 mole of NO is mixed with 0.503 mole of O_2 .

(i) Which of the two reactants is the limiting reagent. Show your calculation. (4 marks)

(ii) Calculate also the number of moles of NO_2 produced. (3 marks)

- (f) What is the oxidation number for the underlined element in each of the following? Determine whether it is an oxidation or reduction process?

(i) Mn O_4^- (aq) \rightarrow Mn^{2+} (aq) (2 marks)

(ii) N O_3^- (aq) \rightarrow NO_2 (g) (2 marks)

(TOTAL : 25 MARKS)

Question 5

- (a) During heavy exercise and workouts, lactic acid, $C_3H_6O_3$, accumulates in the muscles, where it can cause pain and soreness.
- (i) What is the molar mass of lactic acid? (2 marks)
- (ii) How many molecules are in 1.500 mole of lactic acid? (2 marks)
- (b) All of the substances listed below are fertilizers that contribute nitrogen to the soil. Which of these is the richest source of nitrogen on a mass percentage basis?
- (i) Urea, $(NH_2)_2CO$
- (ii) Ammonium nitrate, NH_4NO_3
- (iii) Guanidine, $HNC(NH_2)_2$
- (iv) Ammonia, NH_3 (9 marks)
- (c) Consider the following equilibrium.
- $$V^{2+} + H_2O \rightleftharpoons V^{3+} + \frac{1}{2} H_2 + OH^-$$
- For each of the following adjustments of conditions, indicate the effect (shifts left, shifts right or no effect) on the position of the equilibrium.
- (i) Adding an acid (1 mark)
- (ii) Adding a catalyst. (1 mark)
- (iii) Increasing the size of the reaction container. (1 mark)
- (d) Determine the molarity of NaOH solution when 75 ml of 1.00 M H_2SO_4 neutralizes 50.0 ml of the NaOH solution. (3 marks)
- (e) By using the solubility rules, predict whether each of the following ionic compounds is soluble (S) or insoluble (I) in water:
- (i) $BaCrO_4$ (2 marks)
- (ii) $Sr_3(PO_4)_2$ (2 marks)
- (iii) $RbNO_3$ (2 marks)
- (TOTAL : 25 MARKS)



--THE END--

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