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**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2017/2018**

**COURSE NAME : CHEMISTRY**  
**COURSE CODE : DAS 12203**  
**PROGRAMME : DAM**  
**EXAMINATION DATE : DECEMBER 2017 / JANUARY 2018**  
**DURATION : 3 HOURS**  
**INSTRUCTION : SECTION A: ANSWER ALL  
QUESTIONS.**  
**SECTION B: ANSWER TWO (2)  
QUESTIONS ONLY.**

**THIS QUESTION PAPER CONSISTS OF EIGHT (8) PAGES**

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Universiti Tun Hussein Onn Malaysia  
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## SECTION B

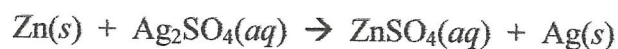
Q4 (a) Consider the reaction



56.0 mol of  $\text{FeCl}_2$  and 27.0 mol of  $\text{KMnO}_4$  are mixed with excess  $\text{HCl}$ . Calculate how many moles of  $\text{MnCl}_2$  can be formed.

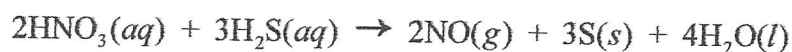
(5 marks)

(b) (i) Write the balanced equation for:

(ii) Calculate the number of mole of  $\text{Ag}$  that can be prepared by treating 12.5 g  $\text{Zn}$  with 30.5 g  $\text{Ag}_2\text{SO}_4$ .[Relative atomic mass:  $\text{Ag} = 108$ ,  $\text{O} = 16$ ,  $\text{S} = 32$ ,  $\text{Zn} = 65$ ]

(10 marks)

(c) Given a balanced reaction



Calculate the volume of 0.350 M  $\text{HNO}_3$  that will completely react with 275 mL of 0.100 M  $\text{H}_2\text{S}$ .

(5 marks)

- Q5 (a)** Quantum numbers are used to describe the position of an electron in an atom.
- (i) Describe in details the four (4) quantum numbers that addressed the electron in the atom. (8 marks)
- (ii) List the values of  $\ell$  for  $n = 1$  until  $n = 4$ . (2 marks)
- (b)** The elements in the periodic table are arranged in order of increasing atomic number. All these elements display several trends that can be used to predict their chemical, physical and atomic properties.
- (i) Define ionization energy. (2 marks)
- (ii) Describe the relationship between electron shielding and  $Z_{\text{eff}}$  on the outermost electrons of an atom. (2 marks)
- (iii) Arrange Ag, Pt, Mg, C, Cu, and Si in order of increasing atomic radius. (2 marks)
- (iv) Explain why anion radius is larger than its neutral atom. (2 marks)
- (v) Electron affinities of two elements A and B are 3.79eV and 3.56eV respectively. State which of them will ionize more easily and why. (2 marks)

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- Q6** (a) Dinitrogen oxide ( $N_2O$ ) formed the resonance structures as follows.



Determine which of the resonance structures is more stable.

(7 marks)

- (b) Arrange the following substances in the order of increasing boiling point.  
 $MgCl_2$ ,  $CO$ ,  $HF$ ,  $H_2$ ,  $Ne$   
 Explain your answer.

(3 marks)

- (c) The temperature of 2.5 L of a gas initially at STP is raised to  $210^\circ\text{C}$  at constant volume. Calculate the final pressure of the gas in atmosphere.

(4 marks)

- (d) When ammonium nitrite ( $NH_4NO_2$ ) is heated, it decomposes to give nitrogen gas and water. This property is used to inflate some tennis balls.

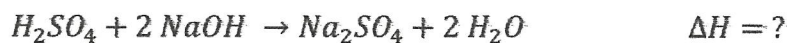
(i) Write a balanced equation for the reaction,

(ii) Calculate the quantity (in grams) of  $NH_4NO_2$  needed to inflate a tennis ball to a volume of 86.2 mL at 1.20 atm and  $22^\circ\text{C}$ .

[Atomic Mass :  $N = 14$ ,  $H = 1$ ,  $O = 16$ ] and  $R = 0.0821 \text{ L.atm/mol.K}$

(6 marks)

- Q7 (a)** Find the enthalpy of the reaction for the equation and determine if it is an exothermic or endothermic reaction



Given the following

$H_2 + S + 2O_2 \rightarrow H_2SO_4$	$\Delta H = -907.5 \text{ kJ}$
$Na + \frac{1}{2}H_2 + \frac{1}{2}O_2 \rightarrow NaOH$	$\Delta H = -469.6 \text{ kJ}$
$2Na + S + 2O_2 \rightarrow Na_2SO_4$	$\Delta H = -1387.1 \text{ kJ}$
$H_2 + \frac{1}{2}O_2 \rightarrow H_2O$	$\Delta H = -285.8 \text{ kJ}$

(10 marks)

- (b) (i)** The decomposition of dimethylether at 504 °C is a first order with a half-life of 1570 s. Determine the concentration of dimethylether remains in the reaction after 4710 s. (3 marks)
- (ii)** For the reaction of  $2 NO + Cl_2 \rightarrow 2 NOCl$  at 300 K, the following data are obtained.

Experiment	[NO] (molL <sup>-1</sup> )	[Cl <sub>2</sub> ] (molL <sup>-1</sup> )	Rates (molL <sup>-1</sup> s <sup>-1</sup> )
1	0.010	0.010	1.2 X 10 <sup>-4</sup>
2	0.010	0.020	2.4 X 10 <sup>-4</sup>
3	0.020	0.020	9.6 X 10 <sup>-4</sup>

Determine the most probable equation for the rate of the reaction and the rate constant.

(7 marks)

**- END OF QUESTIONS -**

**FINAL EXAMINATION**SEMESTER / SESSION : I 2017/2018  
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1.  $n = \frac{MV}{1000}$
2.  $M_1V_1 = M_2V_2$
3.  $\frac{M_aV_a}{a} = \frac{M_bV_b}{b}$
4.  $\text{pH} = -\log [\text{H}^+]$
5.  $\text{pH} + \text{pOH} = 14$
6.  $P_1V_1 = P_2V_2$
7.  $\frac{V_1}{T_1} = \frac{V_2}{T_2}$
8.  $PV = nRT$
9.  $K_p = K_c(RT)^{\Delta n}$
10.  $Q = ms\Delta T$

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