

Uva Wellassa University of Sri Lanka  
Faculty of Science and Technology  
Department of Science and Technology  
1<sup>st</sup> year 2<sup>nd</sup> Semester Examination – Dec./Jan. 2017  
SCT 132-1, Chemistry II



**Instructions to candidates**

Duration: One (01) hour

Number of questions: Two (02)

Answer all questions

Total mark allocation: 100 marks

1. a. Calculate the lattice energy of NaCl from following data

Atomization energy of Sodium =  $107 \text{ kJ mol}^{-1}$

First ionization energy of Sodium =  $496 \text{ kJ mol}^{-1}$

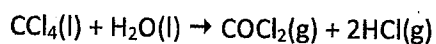
Bond dissociations energy of  $\text{Cl}_2$  =  $242 \text{ kJ mol}^{-1}$

Electron affinity of Chlorine =  $-364 \text{ kJ mol}^{-1}$

Formation energy of NaCl =  $-411 \text{ kJ mol}^{-1}$

(20 Marks)

b. Calculate the free energy for the following reaction by using given data



Heat of formation of  $\text{CCl}_4$  =  $-135.4 \text{ kJ mol}^{-1}$

Heat of formation of  $\text{H}_2\text{O}$  =  $-285.8 \text{ kJ mol}^{-1}$

Heat of formation of  $\text{COCl}_2$  =  $-218.8 \text{ kJ mol}^{-1}$

Heat of formation of HCl =  $-92.3 \text{ kJ mol}^{-1}$

(30 Marks)



2. In aqueous medium  $\text{HgCl}_2$  reacts with  $\text{K}_2\text{C}_2\text{O}_4$  yielding  $\text{KCl}$ ,  $\text{CO}_2$  and  $\text{Hg}_2\text{Cl}_2$

a. Write the balanced equation for the above reaction. (5 marks)

b. Following data are obtained for three different sets of experiments.

Experiment No	Initial Concentration / mol L <sup>-1</sup>		Initial Rate of Reaction / mol L <sup>-1</sup> min <sup>-1</sup>
	$\text{HgCl}_2$	$\text{K}_2\text{C}_2\text{O}_4$	
1	0.105	0.15	$1.775 \times 10^{-5}$
2	0.105	0.30	$7.100 \times 10^{-5}$
3	0.052	0.30	$3.500 \times 10^{-5}$

i. Write the equation for the rate (R) of total reaction using initial concentration of  $\text{HgCl}_2$  ( $[\text{HgCl}_2]$ ) and initial concentration of  $\text{K}_2\text{C}_2\text{O}_4$  ( $[\text{K}_2\text{C}_2\text{O}_4]$ ). Define all the constants.

(5 marks)

ii. Calculate the order of the reaction with respect to  $\text{HgCl}_2$ .

(10 marks)

iii. Calculate the order of the reaction with respect to  $\text{K}_2\text{C}_2\text{O}_4$ .

(10 marks)

iv. Calculate the total order of the reaction.

(10 marks)

v. Calculate the rate constant of the reaction.

(10 marks)