	JAZAN UNIVERSITY COLLEGE OF ENGINEERING CHEMICAL ENGINEERING DEPARTMENT	FINAL EVALUATION	
		Semester: 2020 2	Date: 7/5/2020
		Subject Code: 111CHE-2	Time: 8 AM to 8 AM
		Subject Title: Physical Chemistry	Max Marks: 20
		Instructor: Dr. Isam Y. Qudsieh	Number of pages: 2

Student Name:		
Student ID:		
Section:	663	Serial Number:

Question #	CLOs	Question Mark	Student Mark
1	CLO (#1): Apply the adequate equations to determine the energy related to the reaction enthalpy, entropy, Gibbs energy as well as gas behaviour.	5	
2	CLO (#2): Explain thermodynamic equilibrium for spontaneous physical and chemical changes	4	
3	CLO (#3): Appraise the rate of reaction, (for engineering design purpose)	5	
4	CLO (#5): Recognize the physical chemistry principles introduced in introductory Chemistry courses	6	
5	CLO (#):		
Total		20	

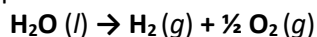
Advice to Candidates

1. Write Student Name, Student ID & Serial No. on the question paper.
 2. You should write your answers clearly.
 3. Pencils are not allowed. Use Pens!
 4. Allocate your time wisely. Use the number of marks assigned to each problem as pointed.
 5. In order to get full marks on a question, you must show ALL your work!
 6. You are not allowed to use programmable CALCULATORS or smart WATCHES.
 7. During an exam session, your mobile must be completely switched off. Otherwise, a default cheating case will be reported.
 8. You are not allowed to use any kind of paper materials during an exam session.
 9. It is a student's responsibility to ensure that there is no written texts on his desk, body or clothes, otherwise, he has to inform the invigilators.
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QUESTION 1: (CLO (# 1)) Apply the adequate equations to determine the energy related to the reaction enthalpy, entropy, Gibbs energy as well as gas behaviour.

5 marks

Calculate standard entropy change kJ/K.mol for the reaction below and prove that the reaction is endothermic and not occurs spontaneously at standard conditions.



Necessary data and information are provided in the tables which are illustrated in the course notes.

QUESTION 2: (CLO (# 2)) Explain thermodynamic equilibrium for spontaneous physical and chemical changes

4 marks

Show that the change in Gibbs free energy is related to the spontaneity of the process by using the definition of Gibbs free energy.

QUESTION 3: (CLO (# 3)) Appraise the rate of reaction, (for engineering design purpose)

5 marks

In the following 1st order chemical reaction



- 1- What is the rate of disappearance of reactant? (0.5 mark)
- 2- What is the rate of formation of product? (0.5 mark)
- 3- What is the rate law of the above reaction? (0.5 mark)
- 4- According to the definition of half-life time, write an equation showing the relation between initial concentrations and concentrations after certain period of time based on the chemical equation above. (1 mark)
- 5- What is the general unit of 2nd order reaction? (0.5 mark)
- 6- Prove the relation between the relaxation time and rate constant? (2 marks)

QUESTION 4: (CLO (# 5)) Recognize the physical chemistry principles introduced in introductory Chemistry courses

6 marks

- a) How much heat is given off when a 2 kg iron bar cools from 105°C to 5°C? (1 mark)
- b) What is the Gibbs free energy change in J/mol for Haber process of nitrogen fixation, relative to that under standard conditions, of forming 1 mole of NH₃ at 298k if 1 atm of N₂ and 1 atm of H₂ are reacted to give 0.0100 atm of NH₃. **Hint:** $\Delta G^\circ_{298} = -32.90$ kJ/mol, (5 marks)