

Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Science and Technology Degree Programme
200 Level 1st Semester Examination – May/July 2017
SCT 231-2, Physical Chemistry


Uva Wellassa
University

Number of Questions: Three (03)

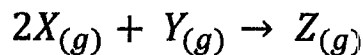
Time Allocation: Two (02) hours

Mark Allocation: 300

Scientific calculators are allowed

Symbols contain usual meaning

1. Following data are given to calculate the order of following reaction



Experiment	Initial Concentration (mol dm ⁻³)		Initial Rate (mol.dm ⁻³ S ⁻¹)
	X	Y	
01	1	1	2x10 ⁻⁶
02	2	1	8x10 ⁻⁶
03	2	2	8x10 ⁻⁶

i. Calculate the order with respect to X.

ii. Calculate the order with respect to Y.

iii. What is the total order of the reaction?

iv. Calculate the rate constant of the reaction?

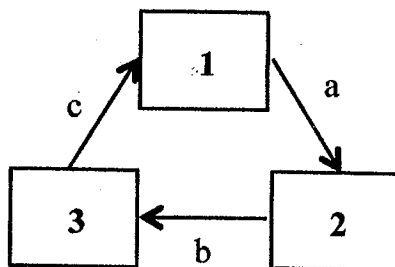
v. Calculate the elapsed time of the reaction (consider experiment set 02) at the reactant concentration of X at 0.125 mol dm⁻³ (Prove all necessary equations).

vi. Calculate the half-lifetime of the reaction (consider experiment set 01). (Prove all necessary equations).

(100 Marks)



2. Ten moles of an ideal gas is carried out through the following cycle. Each process is carried out reversibly.

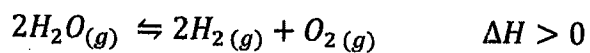


	State 1	State 2	State 3
V/ dm ³	22.4	22.4	44.8
T/ K	273	546	546

- Calculate the pressure at each state 1, 2 and 3 in Nm⁻².
- Identify the type of thermodynamic processes given by a, b and c.
- Calculate w, q and ΔU for each process and for the complete cycle.
(C_{vm}=3R/2, C_{pm}=5R/2)

(100 Marks)

3. Consider the gas-phase equilibrium system represented by the equation:



Predict the direction that equilibrium will shift if,

- O₂ gas is added to the mixture
- the volume of the container is decreased
- the temperature is increased
- He gas (inert gas) is added to the mixture
- some H₂ gas is removed from the system

(100 Marks)