Equilibrium Test – General Principles and Gas Phase Calculations!!
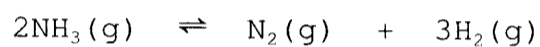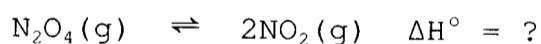
1. Provide the six criteria required in order for a system to be considered an equilibrium system.

6

2. For the equilibrium show below, what would the effect be on the equilibrium constant (Keq) if the temperature is decreased:

$$2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$$

6

3. How can the reactant concentration be maximized using the stress of change in temperature or change in volume?

$$N_2O_4(g) \rightleftharpoons 2NO_2(g) \quad \Delta H° = ?$$

Method One:	Method Two:
D:	D:
H:	H:
R:	R:
S:	S:
4	4

8

20

4. For this gas phase equilibrium in a **25.0 L** flask, the initial concentrations of nitrogen, hydrogen and ammonia were found to be 0.0044 mol/L, 0.0132 mol/L and 0.0312 mol/L. To this equilibrium, a change in temperature increases the $[NH_3(g)]$ to 0.0352 mol/L. Use this information to determine the final concentrations of the other two gases and the equilibrium constant at the final temperature.

	N_2 +	$3H_2$ ⇌	$2NH_3$
Initial [ ]			
Initial Amount			
Final Amount			
Final [ ]			

5. Phosgene gas (a particularly poisonous gas) i**s** produced through the equilibrium reaction show in the table. Equilibrium concentrations in an **8.0 L** flask are found to be:

$[CO]$ = **0.400 mol/L**

$[Cl_2]$ = **1.00 mol/L**

$[COCl_2]$ = **0.250 mol/L**

What will these concentrations become if the flask volume is doubled (i.e **16.0 L**). Please include an L.C.P. determination as a part of your answer. *Assume constant temperature*

|	CO +	Cl$_2$ ⇌	COCl$_2$
Initial [ ]			
Initial Amount			
Final Amount			
Final [ ]			

S:

R:

H:

D:

E: *(optional)*

6. For this gas phase equilibrium shown in the table, **8 mol of C** is place in a **4 L flask** and allowed to equilibriate. If the equilibrium constant for this reaction is **2.50,** what are the final concentrations for all three gases?
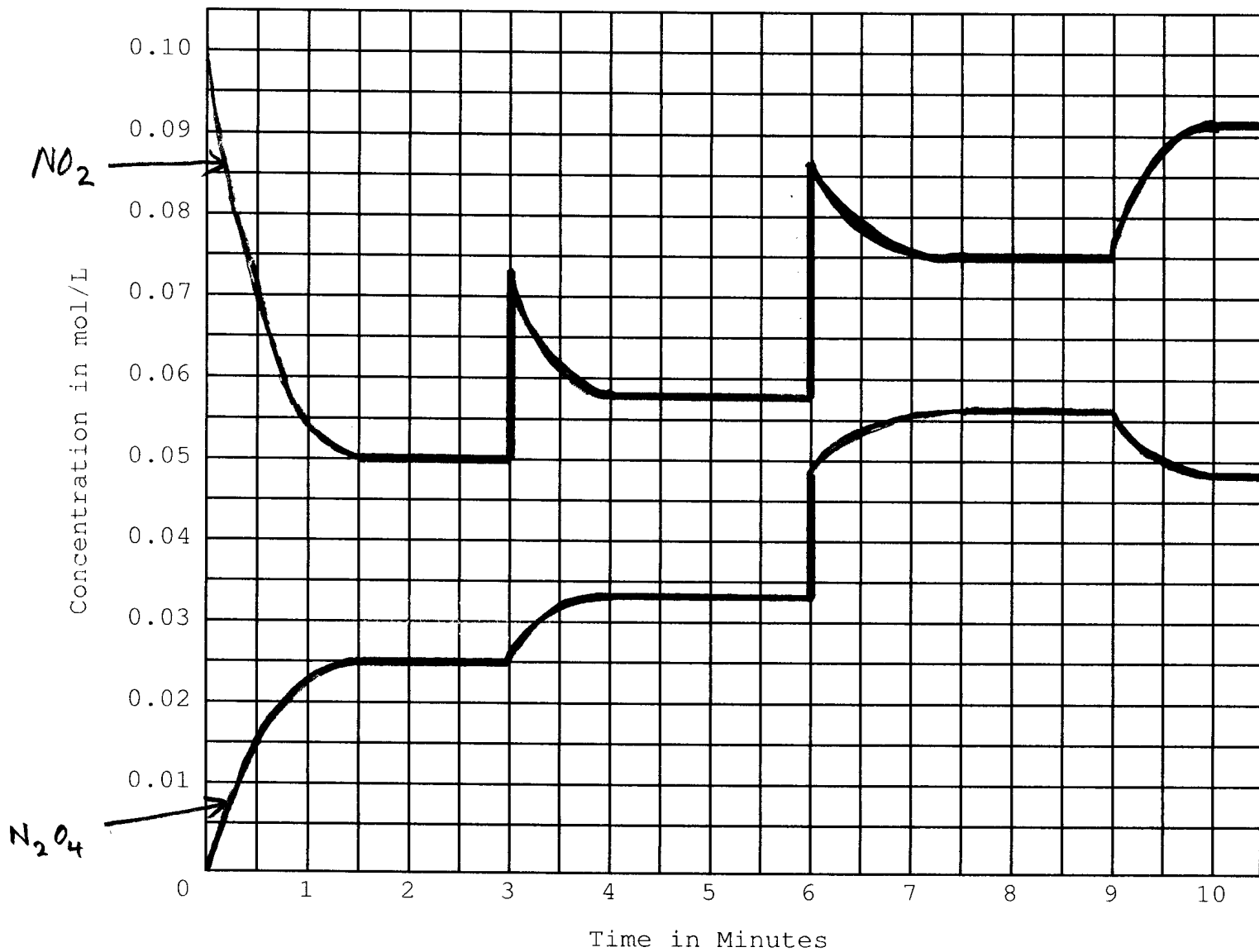
	A +	B ⇌	C
Initial [ ]			
Initial Amount			
Final Amount			
Final [ ]			

7l

7. The graph shown below is for the gas phase equilibrium:

$$2NO_2(g) \rightleftharpoons N_2O_4(g)$$
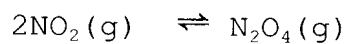
Please indicate:

a) when equilibrium is first reached? _____

b) what is happening at 3 minutes? _____

c) when equilibrium is re-established? _____

d) what is happening at 6 minutes _____

e) what is happening at 9 minutes _____

Provide clear evidence to support your answer for e) above using numerical verification. Explain briefly.