TEMPERATURE DEPENDENCE OF THE EQUILIBRIUM CONSTANT

NAME _____ SECTION _____

1. For the reaction

$$2NO_2(g) \rightleftharpoons N_2O_4(g)$$

the following data was collected for the magnitude of the equilibrium constant at different temperatures. Complete the columns 1/T (K) and ln (K).

Temperature (K)	1/T (K)	K	ln (K)
273.0		72.9	
280.0		38.8	
290.0		16.6	
298.0		8.8	
305.0		5.2	
315.0		2.5	
325.0		1.3	

a. How does the equilibrium constant for this reaction change with temperature?

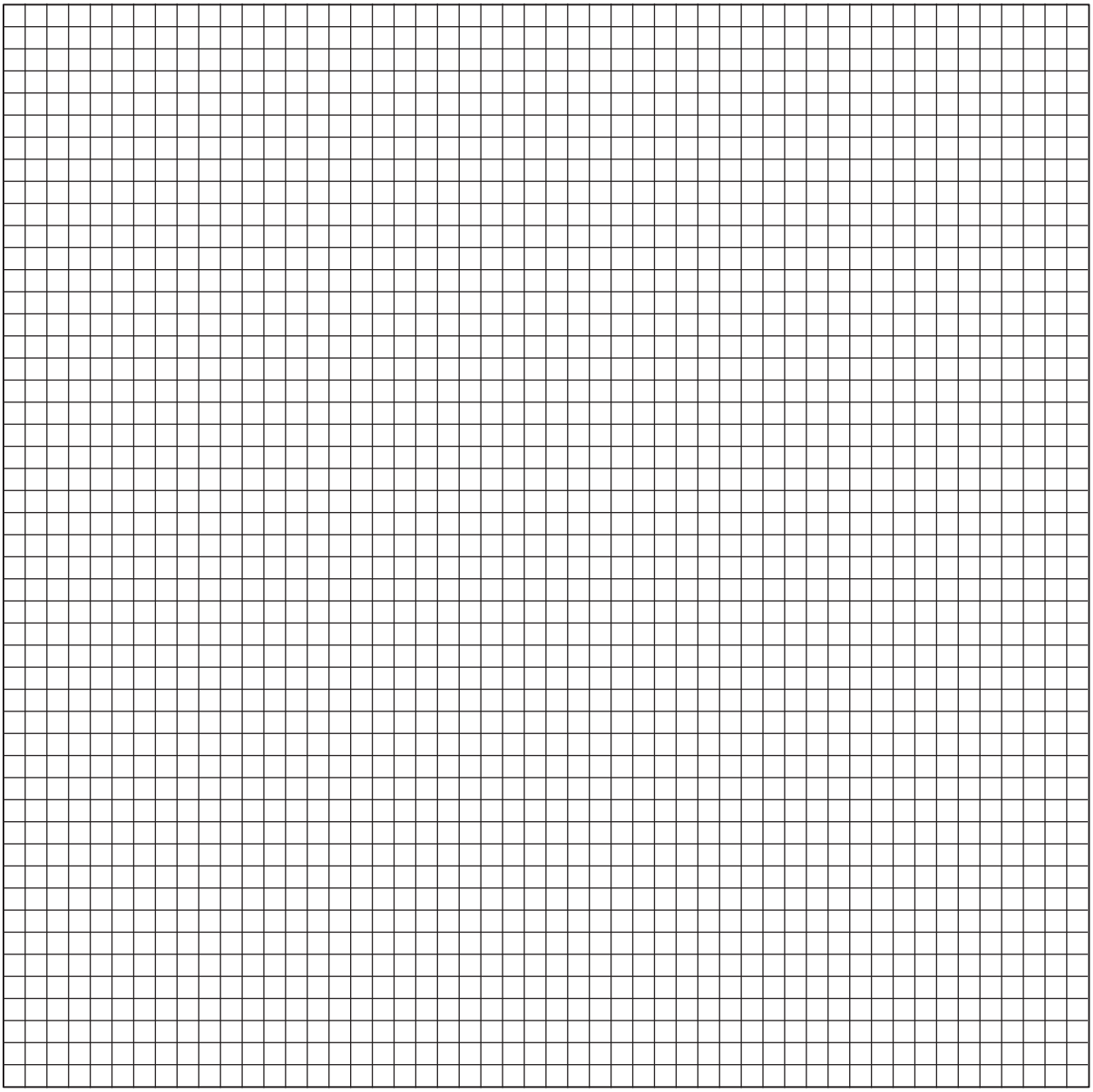
b. Is the reaction exothermic or endothermic? Explain.

c. What does a plot of ln (K) (y-axis) versus 1/T (x-axis) look like? (Use the graph paper that follows.)

d. If the slope of the line in the plot above is equal to $-\Delta H^\circ/R$ (where R is 8.314 J mol^{-1} K^{-1}.), what is ΔH° for the reaction?

e. Estimate the value of K at 278 K.

f. Estimate the temperature (K) when the equilibrium constant is 100.



2. In the reaction

$$2NO_2(g) \rightleftharpoons N_2O_4(g)$$

$\Delta H = {}^{-}57.2$ kJ mol^{-1} at 25 °C. The equilibrium constant, K_p, at this temperature is 8.8. Calculate K_p at 0 °C.

3. In the reaction

$$2ICl(g) \rightleftharpoons I_2(g) + Cl_2(g)$$

$\Delta H = 26.9$ kJ mol^{-1} at 25 °C. The equilibrium constant, K_c, at this temperature is 4.9×10^{-6}. Calculate K_c at 100 °C.