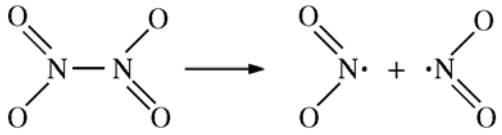
6. Use principles of thermodynamics to answer the following questions.

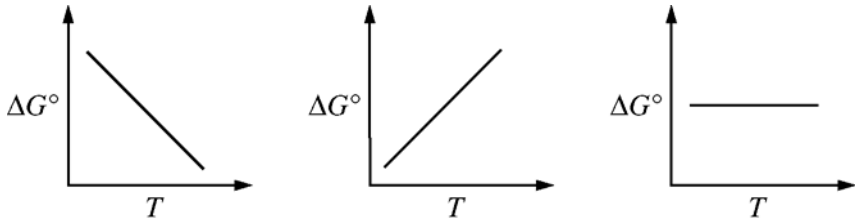
(a) The gas N_2O_4 decomposes to form the gas NO_2 according to the equation below.



(i) Predict the sign of $\Delta H°$ for the reaction. Justify your answer.

(ii) Predict the sign of $\Delta S°$ for the reaction. Justify your answer.

(b) One of the diagrams below best represents the relationship between $\Delta G°$ and temperature for the reaction given in part (a). Assume that $\Delta H°$ and $\Delta S°$ are independent of temperature.



Draw a circle around the correct graph. Explain why you chose that graph in terms of the relationship $\Delta G° = \Delta H° - T\Delta S°$.

(c) A reaction mixture of N_2O_4 and NO_2 is at equilibrium. Heat is added to the mixture while the mixture is maintained at constant pressure.

(i) Explain why the concentration of N_2O_4 decreases.

(ii) The value of K_{eq} at 25°C is 5.0×10^{-3}. Will the value of K_{eq} at 100°C be greater than, less than, or equal to this value?

(d) Using the value of K_{eq} at 25°C given in part (c)(ii), predict whether the value of $\Delta H°$ is expected to be greater than, less than, or equal to the value of $T\Delta S°$. Explain.

STOP

END OF EXAM