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262a. For the reaction,

$A(g) + B(g) \rightarrow C(g) + D(g)$, ΔH° and ΔS° are, respectively, -29.8 kJ mol^{-1} and -0.100 kJ K^{-1} mol^{-1} at 298 K. The equilibrium constant for the reaction at 298 K is

(1) 1.0×10^{-10}

(2) 1.0×10^{10}

(3) 10

(4) 1

Sol. $A(g) + B(g) \longrightarrow C(g) + D(g)$.

$\Delta H^\circ = -29.8 \text{ kJ/mol}$

$\Delta S^\circ = -0.100 \text{ kJ/mol}$

We know, $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$

$\therefore \Delta G^\circ = -29.8 + 298 \times 0.1$

$\Delta G^\circ = 0$

Also, $\Delta G^\circ = -RT \ln K_{eq}$

$\therefore \ln K_{eq} = 0$

$\Rightarrow \boxed{K_{eq} = 1}$