Reaction Quotient Answers

① $K_c = 27.5$ $\quad O_{2(g)} + 2NO_{2(g)} \rightleftharpoons 2NO_{3(g)}$

	$2NO_{2(g)}$	+ $O_{2(g)}$	$\rightleftharpoons$ $2NO_{3(g)}$
I	0.15	0.25	0.42

$$Q = \frac{[NO_3]^2}{[NO_2]^2[O_2]}$$

$$= \frac{(0.42)^2}{(0.15)^2(0.25)}$$

$$= 31.36$$

$Q > K_c$

∴ shift left to achieve eqm

2. $CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$

$K_c = 0.0060$

$Q = [CO_2]$

$= 0.00040$

$Q < K_c$

∴ shift right to achieve eq'm

3. $CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}$

	$CO_{(g)}$	+ $H_2O_{(g)}$	$\rightleftharpoons$ $CO_{2(g)}$	+ $H_{2(g)}$
I	0.15	0.25	0.37	0.42

$K_c = 5.10$

$$Q = \frac{[CO_2][H_2]}{[CO][H_2O]}$$

$$= \frac{(0.37)(0.42)}{(0.15)(0.25)}$$

$$= 4.14$$

$Q < K_c$

4.14 5.10

∴ shift left to achieve eq'm

4. $Fe_2O_{3(s)} + 3H_{2(g)} \rightleftharpoons 2Fe_{(s)} + 3H_2O_{(g)}$

I — 0.45 — 0.37

$K_c = 0.064$

$$Q = \frac{[H_2O]^3}{[H_2]^3}$$

$$= \frac{(0.37)^3}{(0.45)^3}$$

$$= 0.556$$

$Q > K_c$

∴ shift left to achieve eq'm

5. $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$

I — 0.600 — 0.420 — 0.0596

$K_c = 0.080$

$$Q = \frac{[NH_3]^2}{[N_2][H_2]^3}$$

$$= \frac{(0.0596)^2}{(0.6)(0.4)^3}$$

$$= 0.0925$$

$Q > K_c$

∴ shift left to achieve eq'm

5. $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$

I — 0.81 — 0.75 — 0.030

$K_c = 0.025$

$$Q = \frac{[NO]^2}{[N_2][O_2]}$$

$$= \frac{(0.03)^2}{(0.81)(0.75)}$$

$$= 0.00148$$

$Q < K_c$

∴ shift right to achieve eq'm

7. $SbCl_{5(g)} \rightleftharpoons SbCl_{3(g)} + Cl_{2(g)}$

I 0.095 0.020 0.050

$K_c = 0.0251$

$Q = \frac{[Cl_2][SbCl_3]}{[SbCl_5]}$

$= \frac{(0.02)(0.05)}{(0.095)}$

$= 0.0105$

$Q < K_c$

∴ shift right to achieve eq'm

8. $2HF_{(g)} \rightleftharpoons H_{2(g)} + F_{2(s)}$

I 23.0 0.540 0.380

$K_c = 1.0 \times 10^{-13}$

$Q = \frac{[H_2][F_2]}{[HF]^2}$

$= \frac{(0.54)(0.38)}{(23)}$

$= 8.92 \times 10^{-3}$.

$Q > K_c$

∴ shift left to achieve eq'm

9. $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$

I 0.344 0.172 0.056

$K_c = 0.15$

$Q = \frac{[SO_3]^2}{[SO_2]^2[O_2]}$

$= \frac{(0.056)^2}{(0.344)^2(0.172)}$

$= 0.154$

$Q > K_c$

∴ shift left to achieve eq'm