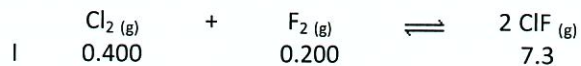


Reaction Quotient Answers

1.



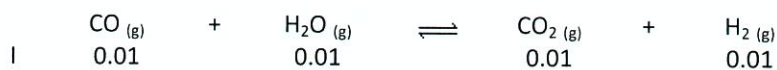
$$Q = \frac{[\text{ClF}]^2}{[\text{Cl}_2][\text{F}_2]} = \frac{(7.3)^2}{(0.4)(0.2)} = 666$$

Q > K, therefore shifts left

2. Q = 0.2 Q > K, shifts left

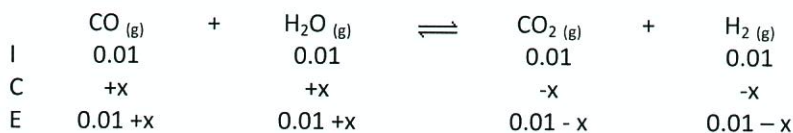
3.

(a)



$$Q = \frac{[\text{CO}_2][\text{H}_2]}{[\text{CO}][\text{H}_2\text{O}]} = \frac{(0.01)(0.01)}{(0.01)(0.01)} = 1 \quad Q > K, \text{ shifts left}$$

(b)



$$K = \frac{[\text{CO}_2][\text{H}_2]}{[\text{CO}][\text{H}_2\text{O}]} = \frac{(0.01 - x)(0.01 - x)}{(0.01 + x)(0.01 + x)} = 0.4$$

$$[\text{CO}_2]_{\text{eq'm}} = [\text{H}_2]_{\text{eq'm}} = 7.75 \times 10^{-3} \text{ mol/L}$$

$$[\text{CO}]_{\text{eq'm}} = [\text{H}_2\text{O}]_{\text{eq'm}} = 1.25 \times 10^{-2} \text{ mol/L}$$

$$\frac{(0.01 - x)}{(0.01 + x)} = 0.632$$

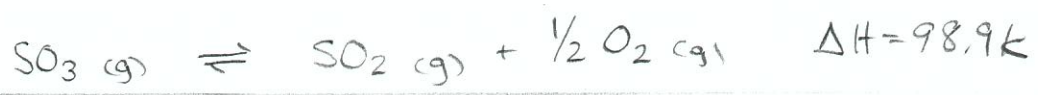
$$x = 2.25 \times 10^{-3}$$

4. Q < K, shifts right

$$[\text{F}_2]_{\text{eq'm}} = [\text{Br}_2]_{\text{eq'm}} = 0.22 \text{ mol/L}$$

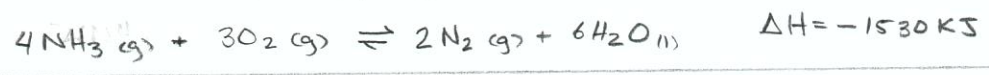
$$[\text{BrF}]_{\text{eq'm}} = 1.64 \text{ mol/L}$$

(B)



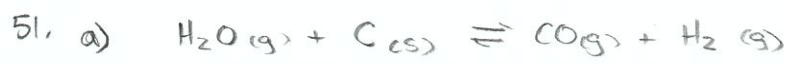
a)

add O_2	↑	↓	↓	shifts left	rvs rxn will consume the added O_2 and ↓ $[O_2]$
↓V/↑P Constant T	↑	↓	↓	shifts left	fewer moles on the reactant side, result in fewer collisions w side of the container ↓P
add Ar	—	—	—	no change	noble gas does not affect position of eqm
remove SO_2	↓	↑	↑	shift right	fvd rxn will produce SO_2 and replace some of the lost SO_2
↓T	↑	↓	↓	shift left	rvs rxn is exothermic and will produce some E



remove O_2	↑	↑	↓	—	shift left	- rvs rxn will produce O_2 and replace the removed O_2
add N_2	↑	↑	↓	—	shift left	- rvs rxn will consume the added N_2 and decrease $[N_2]$
add H_2O	—	—	—	—	—	no affect; not $[]$
↑V at constant P	—	—	—	—	—	no change in P results in neither side having a preference
↑T	↑	↑	↓	↓	shift left	- rvs rxn is endothermic and will consume the added energy

→ only a temp change will change K_{Eq}



$\uparrow P/\downarrow V \rightarrow$ shift left bcz fewer reactant particles
 \rightarrow result in fewer collisions w side of container
 $\rightarrow P \downarrow$



$\uparrow P/\downarrow V \rightarrow$ shift left



$\uparrow P/\downarrow V \rightarrow$ no shift
 \rightarrow same # of gas particles on both sides
so neither side is preferred



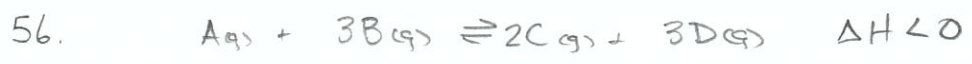
$\downarrow P/\uparrow V \rightarrow$ shift left; more moles of gas particles, increasing the collisions w side of the container; $\uparrow P$



$\downarrow P/\uparrow V \rightarrow$ shift right



$\downarrow P/\uparrow V \rightarrow$ no affect



K_{eq}

a) $\uparrow T$ at constant V

decrease

(rxn endothermic; consume add E creating more reactants & fewer products)

b) add A

no affect

c) add C

no affect

d) remove D

no affect

e) $\uparrow P/\downarrow V$

no affect

} only change in temp affects K_{eq}