11) $H_2O + CO \rightleftharpoons H_2 + CO_2$

no, equilibrium is dynamic

C^{14} will be found in both CO_2 + CO

12) $K >> 1$ means relatively large concentrations of product as compared to reactants.

- a large value of K is a good source of products

13) $H_2O + CO \rightleftharpoons H_2 + CO_2$

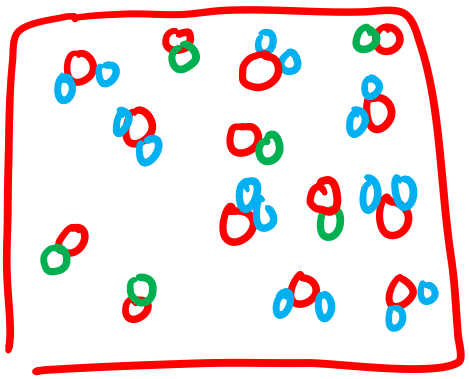
$$K = \frac{[H_2][CO_2]}{[H_2O][CO]} = 2.0$$

trial + error

lets say 4 molecules CO reacts

	H_2O	+ CO	$\rightleftharpoons$ H_2	+ CO_2
initial	8	6	0	0
change	-4	-4	+4	+4
equil.	4	2	4	4

$$K = \frac{(4)(4)}{(4)(2)} = 2.0 \checkmark$$



2) a) $K = \frac{[NO]^2}{[N_2][O_2]}$ b) $K = \frac{[NO_2]^2}{[N_2O_4]}$

c) $\frac{[SiCl_4][H_2]^2}{[SiH_4][Cl_2]^2}$ d) $K = \frac{[PH_3]^2[Br_2]^3}{[PBr_3]^2[H_2]^3}$

23) $K = 1.3 \times 10^{-2} = \frac{[NH_3]^2}{[N_2][H_2]^3}$ $N_2 + 3H_2 \rightleftharpoons 2NH_3$

$K' = \frac{1}{K}$ For reverse reaction

$K'' = K^n$

a) $\frac{1}{2} N_2 + \frac{3}{2} H_2 \rightleftharpoons NH_3$ $K' = K^{\frac{1}{2}} = (1.3 \times 10^{-2})^{\frac{1}{2}} = 0.11$

b) $2NH_3 \rightleftharpoons N_2 + 3H_2$ $K'' = \frac{1}{K} = \frac{1}{1.3 \times 10^{-2}} = 77$

c) $NH_3 \rightleftharpoons \frac{1}{2} N_2 + \frac{3}{2} H_2$ $K''' = \left(\frac{1}{K}\right)^{\frac{1}{2}} = \left(\frac{1}{1.3 \times 10^{-2}}\right)^{\frac{1}{2}} = 8.8$

d) $2N_2 + 6H_2 \rightleftharpoons 4NH_3$ $K'''' = K^2 = (1.3 \times 10^{-2})^2 = 1.7 \times 10^{-4}$

25) $2NO + 2H_2 \rightleftharpoons N_2 + 2H_2O$

$$K = \frac{[N_2][H_2O]^2}{[NO]^2[H_2]^2}$$

$$K = \frac{(5.3 \times 10^{-2})(2.9 \times 10^{-3})^2}{(8.1 \times 10^{-3})^2 (4.1 \times 10^{-5})^2} = 4.0 \times 10^6$$