(d) Maximum entropy favours REACTANTS (gas is the most random phase). Since the reaction DOES NOT OCCUR, then the tendency to minimum enthalpy must also favour REACTANTS ($\Delta H > 0$).

(e) Maximum entropy favours PRODUCTS: $\underline{1}\ N_2O_4(g) \longrightarrow \underline{2}\ NO_2(g)$. Since equilibrium occurs ("**some** of it decomposes") one tendency must oppose the tendency to products by maximum entropy, so that minimum enthalpy favours REACTANTS ($\Delta H > 0$).

(f) Maximum entropy favours REACTANTS: smoke + $CO_2(g)$ + $H_2O(g)$ $\longrightarrow$ solid wood + $O_2(g)$. Since the reaction WON'T GO, the tendency to minimum enthalpy favours REACTANTS ($\Delta H > 0$).

17. (a) shift to reactant side (b) shift to product side (c) shift to reactant side (d) no shift

18. (a) shift to product side (b) shift to reactant side (c) shift to reactant side

19. (a) shift to reactant side (b) shift to product side (c) no shift

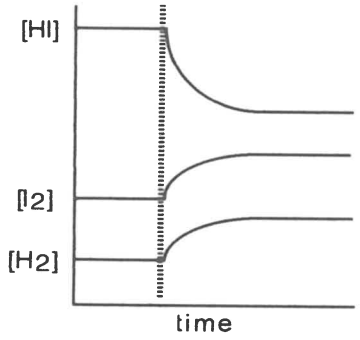
20. (a) shift to reactant side
(b) shift to reactant side
(c) no shift (same numbers of gas particles on both sides)

21. (a) DEC (b) INC (c) INC (d) NC

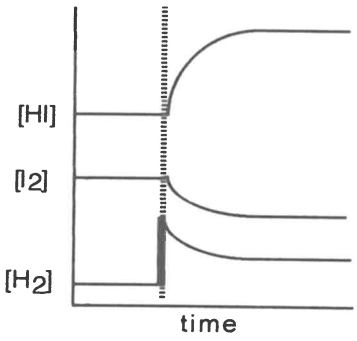
22. (a) DEC (b) INC (c) NC, after the initial increase in all concentrations

23. (a) INC (b) NC (c) INC

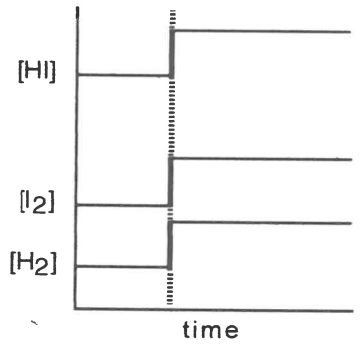
24. (a)



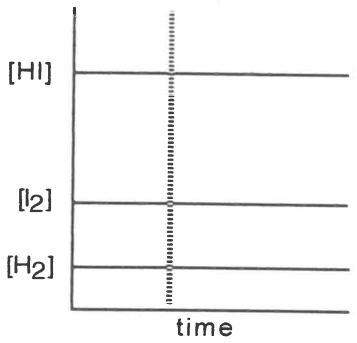
(b)



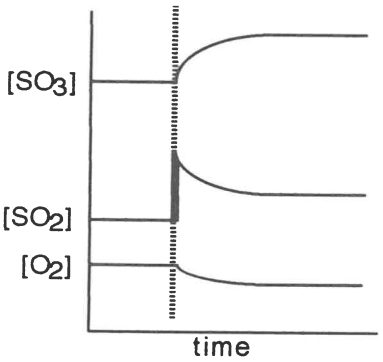
(c)



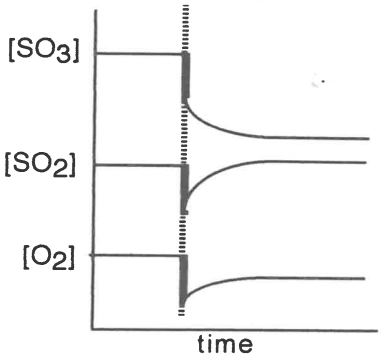
(d)



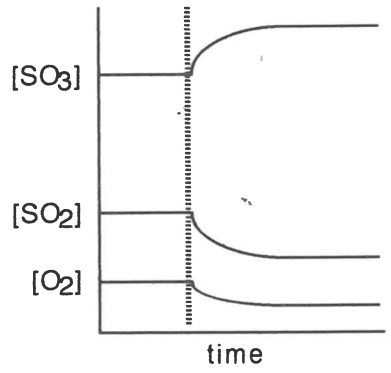
25. (a)



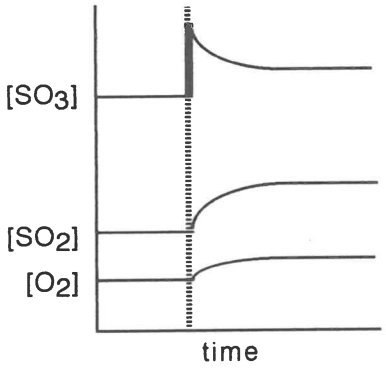
(b)



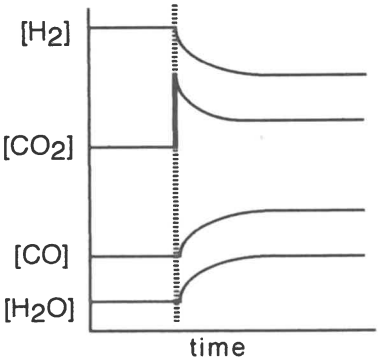
(c)



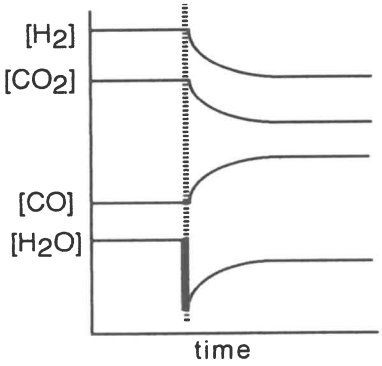
(d)



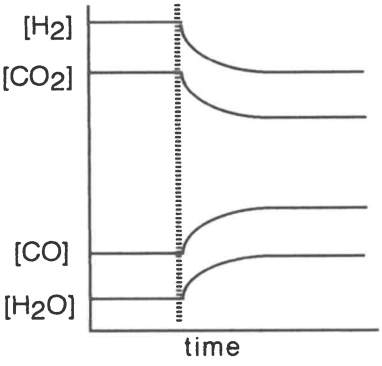
26. (a)



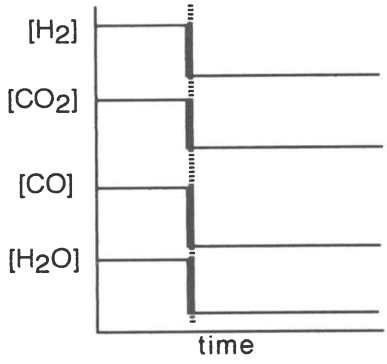
(b)



(c)



(d)



27. (a) temperature is decreased (b) some PCl_5 is injected

28. (a) pressure is decreased by increasing the volume (b) temperature is increased

29. (a) high pressure
(b) low temperature
(c) high temperature
(d) High temperature is needed to get a fast reaction (get to equilibrium quickly) but at high temperature the reaction gives little products at equilibrium. Choose an intermediate temperature: a somewhat slower reaction occurs but it gives an acceptable amount of product in return.
(e) add a catalyst

30. (a) high temperature
(b) low pressure. Let the $CO_2(g)$ produced escape to the atmosphere.
(c) high temperature (which agrees with the requirements for a large yield of CaO)