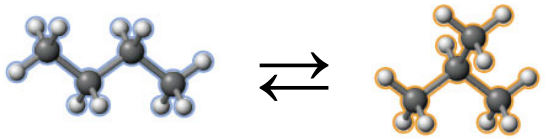
Equilibrium Concepts Practice



$K = 2.5$

How do you know which direction? Check Q. Q > K here so reaction

This system is at equilibrium (in a.), then 7 isobutane are added (in b.). What are the new equilibrium conditions?

New **I**nitial:	2	12
Change:	+x	-x
New **E**quilibrium:	2+x *2+2=4*	12-x *12-2 = 10*

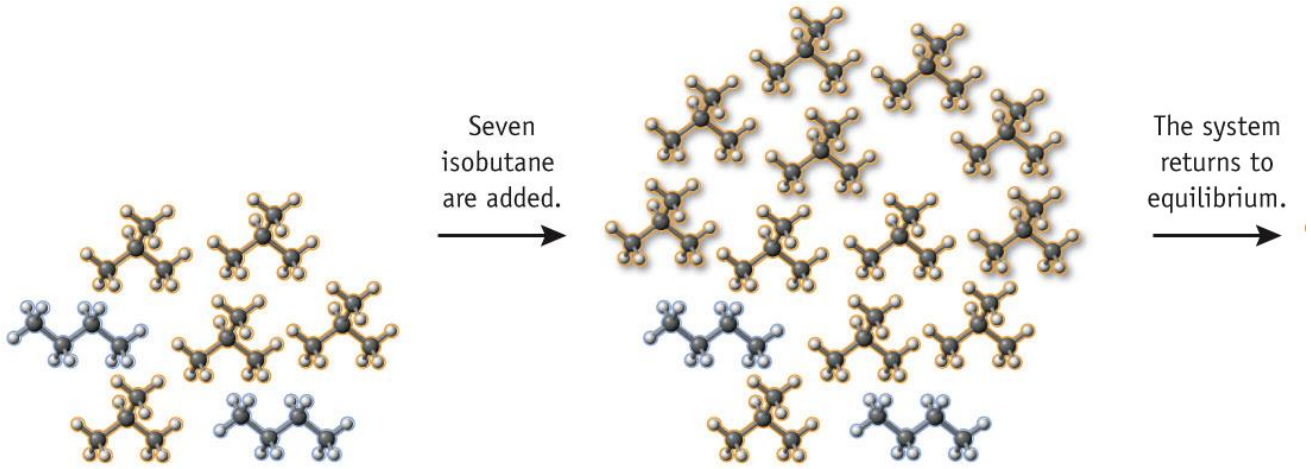
$$K = \frac{[yellow]}{[blue]}$$

$$2.5 = \frac{[12 - x]}{[2 + x]}$$

$$5 + 2.5x = 12 - x$$

$$7 = 3.5x$$

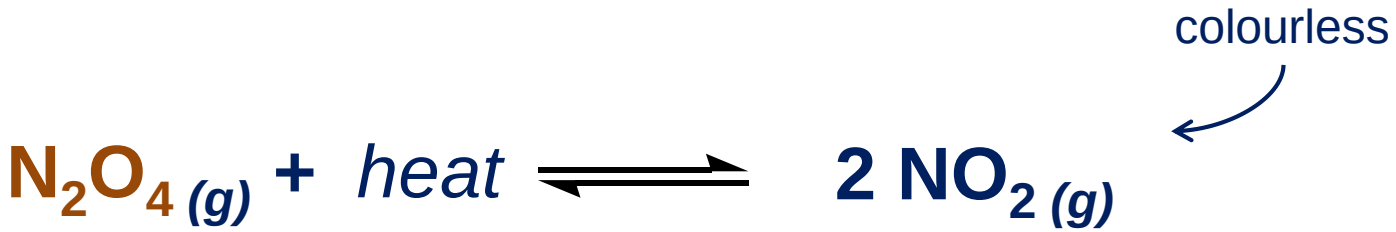
$$x = 2$$



a. b.

There will be 10 butane and 4 isobutane at equilibrium.

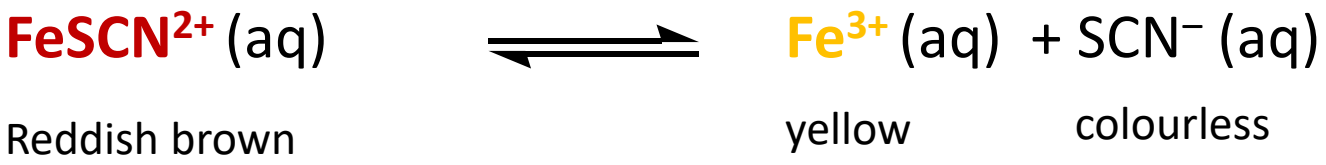
This was still right somehow...



What happens to this system if ...

- Temperature is increased? **Since heat is listed as a "reactant" this is endothermic. Reaction will shift towards the products as temp. is increased.**
- Temperature is decreased? **Reaction will shift towards the reactants as temp. is decreased.**

- The container volume is increased? **2 mol gas in products, 1 mol gas in reactants – reaction will shift towards the products if volume is increased (inc. V will cause P to decrease)**
- N_2 (g) is added to the container? **N_2 is not part of the equilibrium – reaction is not affected.**



What color will the solution become (i.e. more red / more yellow) if:

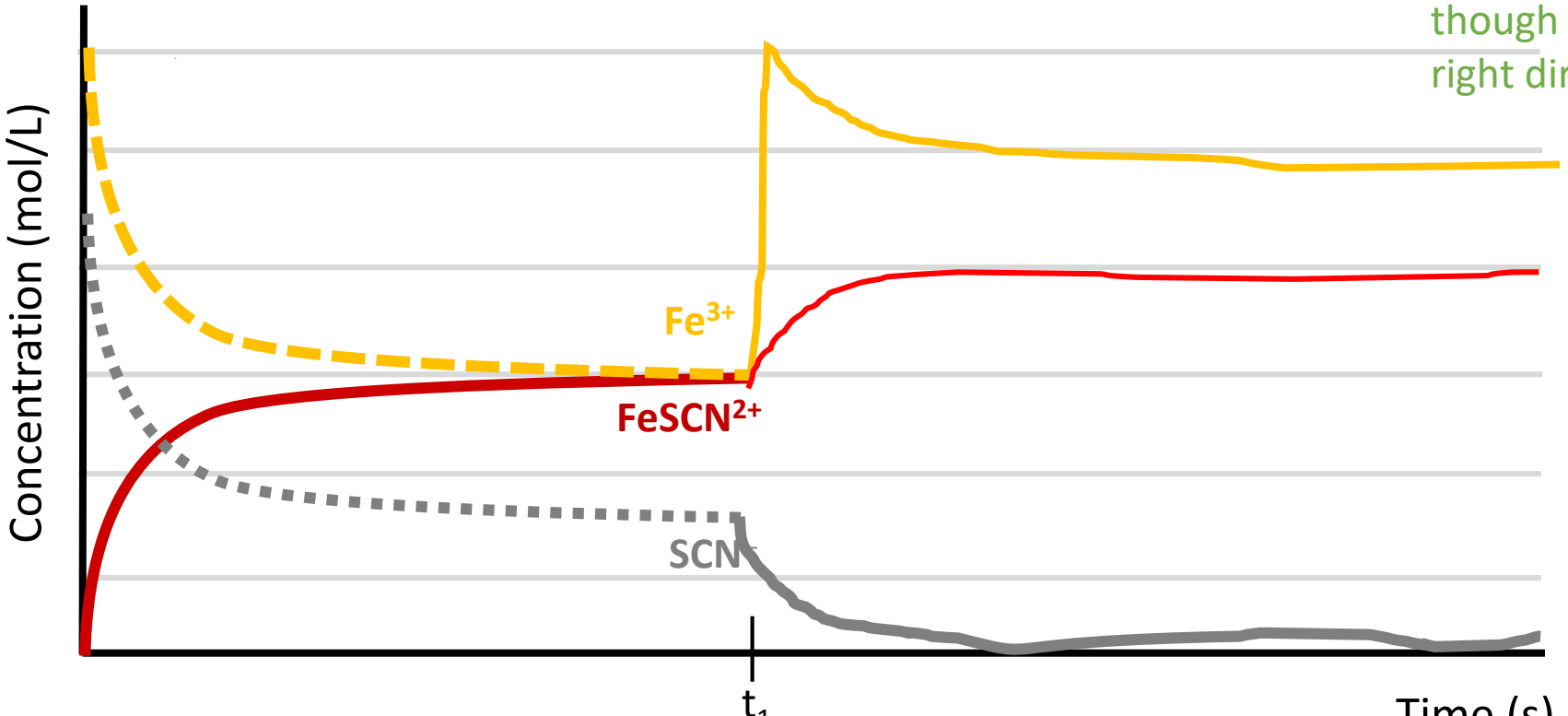
- NaSCN is added? **This is adding SCN^- so reaction will shift towards reactants (more RED)**
- Fe^{3+} is removed? **This is removing a product; reaction shifts towards products (more YELLOW)**
- Water is added? **This will dilute all aqueous solutions. More mol (aq) on the products side: reaction will shift towards the products (more YELLOW)** ***Alternately, imagine diluting to ½ [initial] for everything and find Q: "new Q" is 2x smaller: reaction will shift towards products.***
- Pressure is increased in the reaction container?

NOTHING → no gases! Aqueous/liquid/solid are essentially incompressible & won't be effected

Sketch how you expect the concentrations to change over time if more Fe^{3+} is added to the mixture at time t_1:

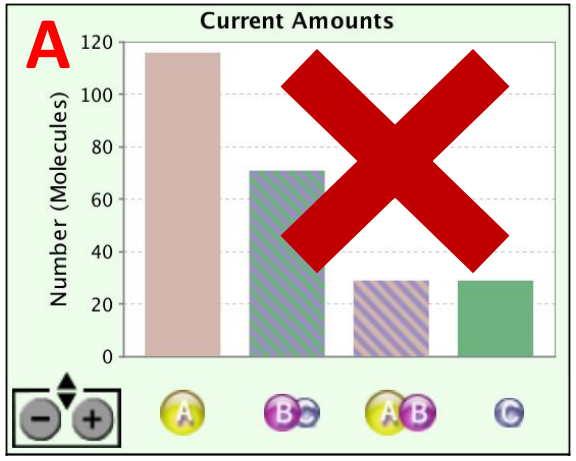
(Same reaction as on previous page)

Something like this:
(SCN^- can't go below 0, watch out)
Ratios here might not quite match K – if you want to be more accurate, you can estimate K from the original plot and figure out approximate final conc. Values for each component. Not necessary in a "sketch" though – as long as things change in the right direction with *about* the right stoich.

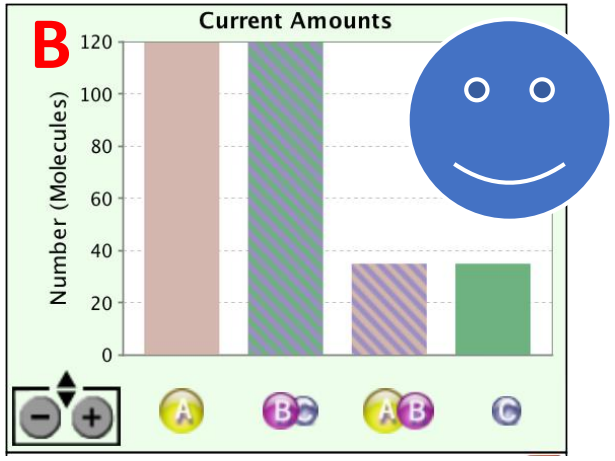


Which of A-E could result from addition of more product(s) to the initial mixture?

A and BC should change by the same amount.

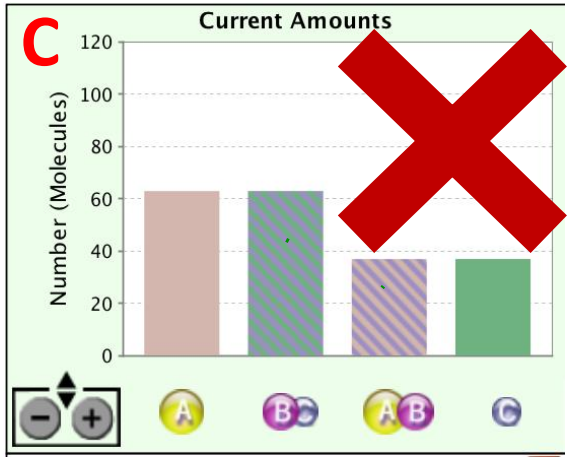


Stoich matches, and reaction has shifted to make more reactants. (Some extre products might be leftover from the addition)

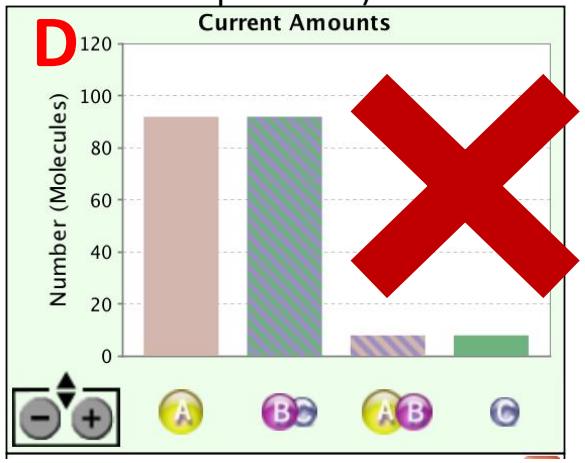


Initial mixture:

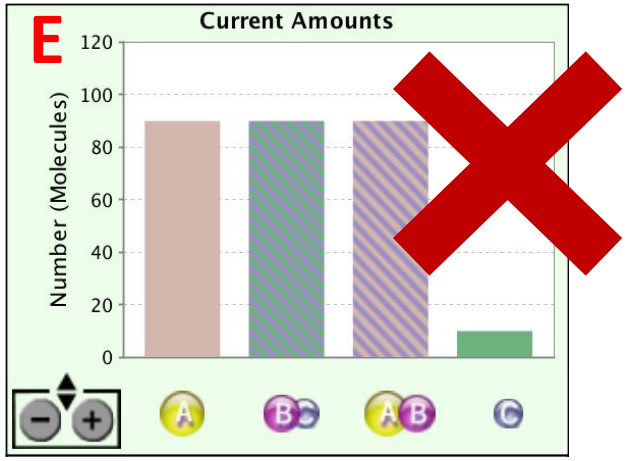
Reactants have been lost; shift is in the wrong direction.



If products were added, it's unlikely that they were consumed beyond the initial values (assuming we started at equilibrium).



How did we end up with so much AB and so little C in a reaction where they are 1:1? No thanks.



F – None of these apply