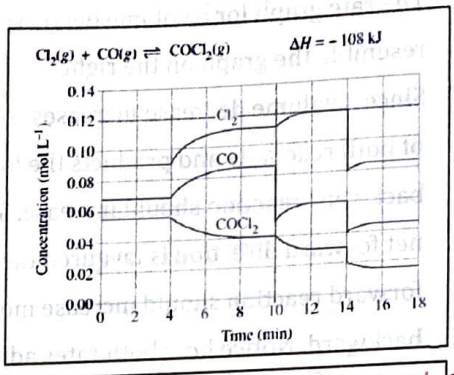
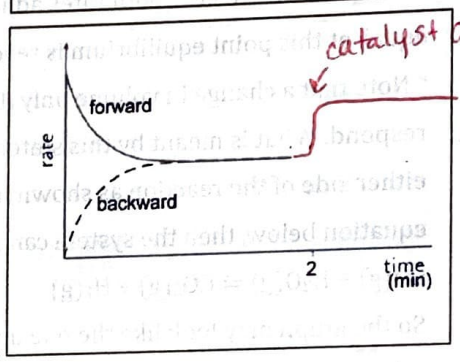
1) Consider the changes made to the system represented by the reaction $Cl_2(g) + CO(g) \rightleftharpoons COCl_2(g)$. The graph on the right shows how the system responded to certain changes.



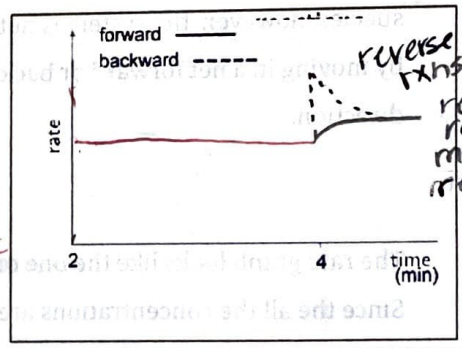

a) A change was made at the 2 minute mark. If no gas was added to the system what could this change have been? Explain.




A catalyst was added. Addition of a catalyst does not affect equilibrium concentrations. ~~not the~~ It increases the rate of the forward and reverse rxns proportionately

b) Indicate how the rates of the forward and backward changed at the 2 minute mark on the set of the right.

c) What happened at the 4 minute mark? Explain.

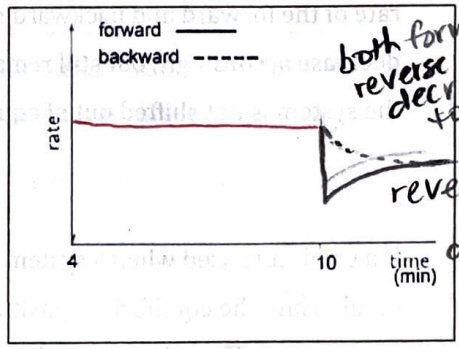



reverse and forward rxns both increase

reverse rxn rate increases more since reaction shifts to the left

↑ temp. An ↑ in temp would shift the rxn to the left for an exothermic rxn.

d) Indicate how the rates of the forward and backward reactions changed at the 4 minute mark on the set of axes shown on the right.




both forward and reverse rxn rates decrease due to decrease in concentration

reverse rxn rate decreases less because rxn shifts to the left

e) Suggest what happened at the 10 minute mark.

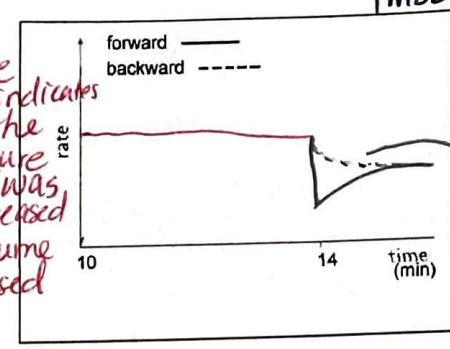
At 10 mm, CO is removed

f) Indicate how the rates of the forward and backward reactions changed at the 10 minute mark on the set of axes shown on the right.

g) Suggest what happened at the 14 minute mark.

All reactants & products decreased. Since system is gaseous, this indicates the Pressure was decreased or volume increased

h) Indicate how the rates of the forward and backward reactions changed at the 14 minute mark on the set of axes shown on the right.

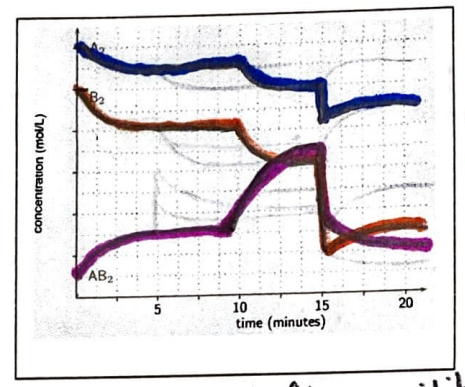



2 moles gas on left, 1 mole on right
↓ pressure shifts to left
reverse rxn rate decreases less than forward rxn rate

2) The graph on the right shows the system

$A_2(g) + 2B_2(g) \rightleftharpoons 2AB_2(g)$ $\Delta H$ = *negative*

A mixture of gases $A_2$ and $B_2$ is placed in a sealed vessel and allowed to react according to the equation above. Draw on the graph on the right how the system responds if:




$-A_2$
$-AB_2$
$-B_2$

2 mol B × 1 mol A / 2 mol B

mol B = 1/2 mol A

a) The system reached equilibrium within 5 minutes.

b) At the 10 minute mark the temperature was reduced in the reaction vessel. exothermic, reducing temp shifts equilibrium to right

c) At the 15 minute mark the system had reached equilibrium.

d) Just after 15 minutes the volume of the reaction vessel was doubled the system responded and reached equilibrium again in 5 minutes

volume doubled = pressure decrease
rxn shifts to left (more moles)