Friday Worksheet **Name: …….**

Chemical equilibrium worksheet 7

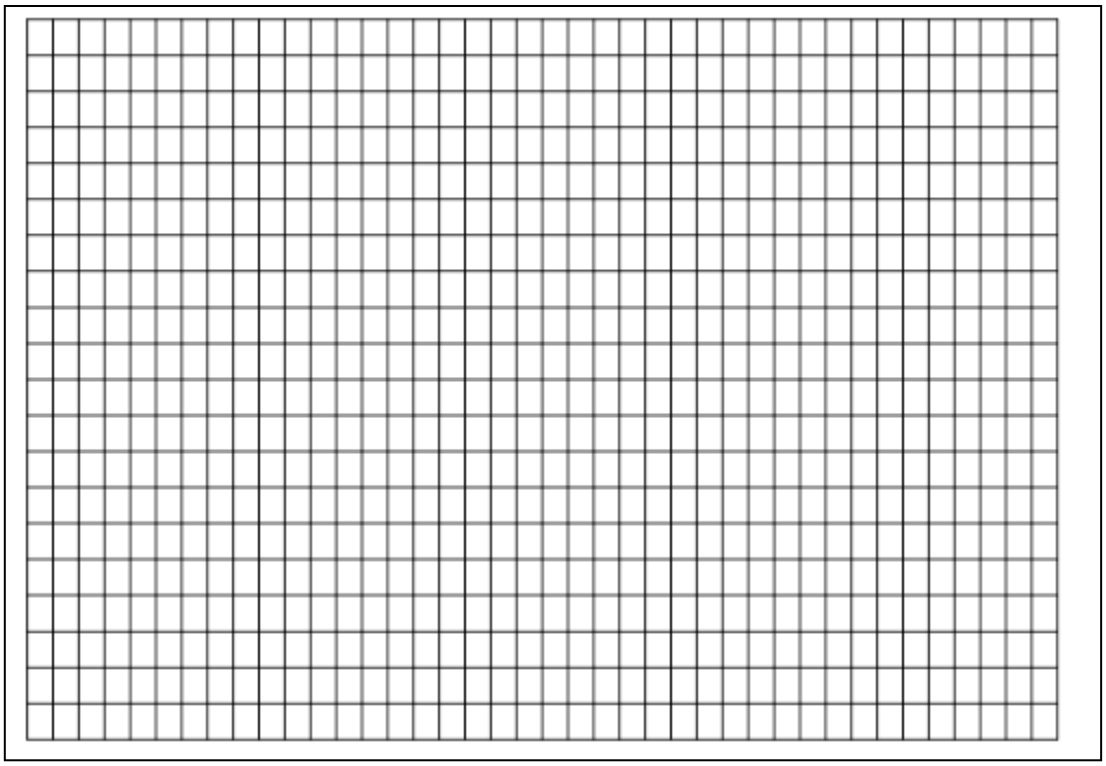
1) Consider an investigation to measure the rate of reaction between copper sulphide (CuS) and excess hydrochloric acid (HCl) . Both of these reactants react according to the equation below.

   $CuS(s) + HCl(aq) \Rightarrow H_2S(g) + CuCl_2(aq)$

   A student measured the mass loss of the open reaction vessel and collected the data tabulated in the table below.

Time(min)	*Reaction mixture total mass loss (grams)*	
	CuS powder In 2M HCl	Large CuS crystals In 2M HCl
0.00	0.00	0.00
0.50	0.80	0.60
1.00	1.70	1.30
1.50	2.30	1.90
2.00	2.80	2.40
2.50	3.20	2.75
3.00	3.40	3.10
3.50	3.40	3.40
4.00	3.40	3.40

a) Plot the above data on one set of axes on the graphing grid below.



b) What can you say about the amount of CuS used in both investigations

c) What was the purpose of the experiment?

d) Identify the dependent and independent variables in this experiment

e) Outline an experimental technique, in point form, to investigate how concentration influences the rate of a chemical reaction.
(Use the space on the back of this sheet)

2) Hydrogen gas and nitrogen gas react to form ammonia gas in a sealed vessel according to the equation below.

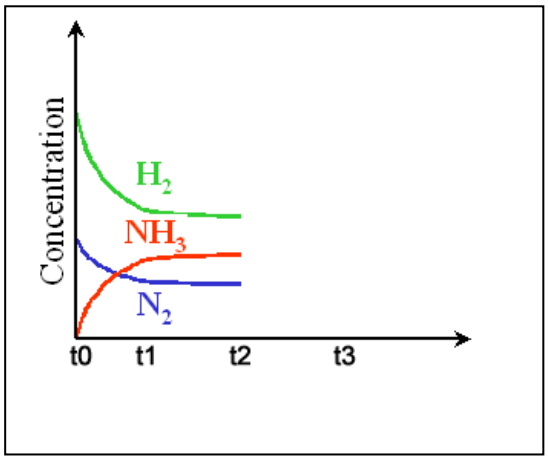
$$3H_2(g) + N_2(g) \rightleftharpoons 2NH_3(g) \quad \Delta H = -93 \text{ kJ/mol}$$

a) Consider the concentration vs time graph on the right.

i. What happened at t1?

ii. At t2 H_2 gas was added to the system. Indicate on the graph how the system responds.

iii. At t3 the system reaches equilibrium once more at which point a catalyst is added. Indicate on the graph how the system responds.



b) Draw, on the set of axes on the right, how the rates of the forward and reverse reactions change as the changes mentioned in a) above take place.