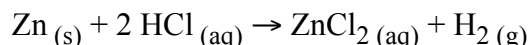


CHEMISTRY 12 – FACTORS AFFECTING THE RATES OF REACTION WORKSHEET

- 1) List four ways in which the rate of the following reaction can be increased. (4 marks)

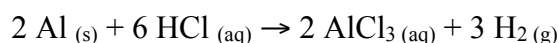


(1) Adding a catalyst, (2) increasing the [HCl], (3) increasing the surface area of the Zn by crushing it into a powder, or (4) increasing the temperature can increase the rate of the above reaction.

- 2) Which factor explains why potassium generally reacts faster than sodium? (1 mark)

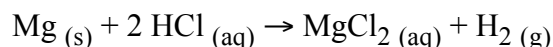
The nature of the reactants explains why potassium will react faster than sodium. Since potassium's outer electron is farther away from its nucleus, it is farther away from the attractive forces pulling the electron closer, and is therefore easier to be removed.

- 3) List four ways in which the rate of the following reaction can be decreased. (4 marks)



(1) Adding an inhibitor, (2) decreasing the [HCl], (3) decreasing the surface area of the Al by keeping it as a larger piece rather than a powder, or (4) decreasing the temperature can decrease the rate of the above reaction.

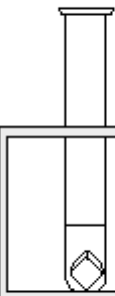


- 4) A student placed 3.0 g of Mg into some HCl in two different experiments. In each case, it reacted according to the following equation:



In the first experiment, it took 3.2 minutes for all of the Mg to react. In the second experiment, it took 5.4 minutes for all of the Mg to react. Give one reason that would account for the change in rate of the second experiment? (1 mark)

Since the second experiment took longer to complete, the second experiment could have been conducted at a colder temperature, had a lower [HCl], had a smaller surface area of the Mg or had an inhibitor added. Likewise, the first experiment could have been conducted at a warmer temperature, had a higher [HCl], had a larger surface area of the Mg or had a catalyst added.

- 5) Consider the following experiments, each involving equal masses of zinc and 10.0 mL of acid. List the order of rates of reaction from fastest to slowest. (1 mark)

Experiment I	Experiment II	Experiment III
		
Zn cube 1.0 M HCl	Zn cube 0.5 M HCl	Zn powder 1.0 M HCl

Fastest:

III

I

Slowest:

II

6) Explain why coal dust is so explosive. (1 mark)

Coal dust is explosive since it has an extremely large surface area and therefore a faster reaction rate.

7) Define and give an example of a *homogeneous* reaction. (2 marks)

A homogeneous reaction is a reaction in which all of the reactants are in the same phase. An example of a homogeneous reaction would be: $H_{2(g)} + I_{2(g)} \rightarrow 2 HI_{(g)}$

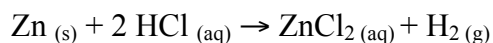
8) Which factor affects the rate of heterogeneous reactions, but does not affect the rate of homogeneous reactions? (1 mark)

The surface area of the reactants will affect the rate of a heterogeneous reaction but not a homogeneous reaction.

9) Which of the following reactions would occur slowest? (1 mark)

A.	$Cu_{(s)} + S_{(s)} \rightarrow CuS_{(s)}$	C.	$Pb^{2+}_{(aq)} + 2 Cl^{-}_{(aq)} \rightarrow PbCl_{2(s)}$
B.	$H^{+}_{(aq)} + OH^{-}_{(aq)} \rightarrow H_2O_{(l)}$	D.	$2 NaOCl_{(aq)} \rightarrow 2 NaCl_{(aq)} + O_{2(g)}$

10) Consider the following reaction:



In two different experiments, equal moles of Zn and equal volumes of HCl are reacted. After 2 minutes, the volume of H₂ produced is recorded as follows:

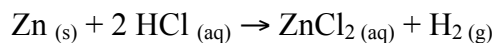
	Zn	Temp	[HCl]	Volume H ₂ (mL)
Experiment 1	strip	10°C	10.0 M	10.6
Experiment 2	powdered	15°C	3.0 M	7.3

What factor would explain why the rate in Experiment 1 is different than the rate in Experiment 2? (1 mark)

The first thing that you have to do to solve this question is use the "Volume H₂" column to determine which experiment is faster. The "Volume H₂" is not a variable that is changed; rather it is a product that is being produced. Since more H₂ is produced in experiment 1, experiment 1 is faster. The only factor that would explain this is the [HCl]. The 10.0 M [HCl] in experiment 1 would have a faster reaction rate than the 3.0 M [HCl] in experiment 2. The surface area and the temperature would both have experiment 2 being faster, which is not true in this experiment.

11) Consider the following reaction involving 1.0 g of powdered zinc:

Trial	Temperature (°C)	Concentration of HCl
1	40	3.0
2	20	3.0
3	40	6.0



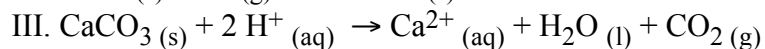
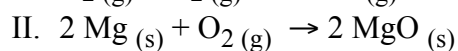
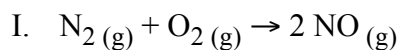
List the order of rates of reaction from fastest to slowest. **(1 mark)**

3 > 1 > 2

12) Which of the following reactions would occur fastest? **(1 mark)**

A.	$\text{H}_{2(g)} + \text{I}_{2(g)} \rightarrow 2 \text{HI}_{(g)}$
B.	$\text{C}_6\text{H}_{12}\text{O}_6(s) + 6 \text{O}_{2(g)} \rightarrow 6 \text{CO}_{2(g)} + 6 \text{H}_2\text{O}_{(g)}$
C.	$5 \text{C}_2\text{O}_4^{2-}(aq) + 2 \text{MnO}_4^-(aq) + 16 \text{H}^+(aq) \rightarrow 10 \text{CO}_{2(g)} + 2 \text{Mn}^{2+}(aq) + 8 \text{H}_2\text{O}_{(l)}$
D.	$\text{Ag}^+(aq) + \text{I}^-(aq) \rightarrow \text{AgI}_{(s)}$

13) Consider the following reactions:



Increasing the surface area will increase the reaction rate in

A.	II only	C.	II and III only
B.	I and III only	D.	I, II and III