Answer Key

Determining the Average Reaction Rate

(Honors Chemistry)

At 40º C, hydrogen chloride gas will form from the reaction of gaseous hydrogen and chlorine, according to the following balanced chemical equation: H_2 (g) + Cl_2 (g) → 2HCl (g)

Time (s)	Molarity of H_2 (g)	Molarity of Cl_2 (g)	Molarity of HCl (g)
0	1.000	1.000	0.000
2.16	0.500	0.500	1.000
4.32	0.250	0.250	1.500
6.48	0.125	0.125	1.750

Using the data table above, answer questions 1 – 4 and show all work. *(3 decimal places)*

1. Calculate the average reaction rate for the disappearance of hydrogen gas in the first 2.16 s.

   (0.231 mol/L·s)

2. Calculate the average reaction rate for the appearance of hydrogen chloride gas in the first 4.32 s

   (0.347 mol/L·s)

3. Calculate the average reaction rate for the disappearance of chlorine gas between 2.16 s and 4.32 s

   (0.116 mol/L·s)

4. Calculate the average reaction rate for the disappearance of hydrogen gas in the first 4.32 s

   (0.174 mol/L·s)

5. Calculate the average reaction rate for the appearance of hydrogen chloride gas in the first 2.16 s.

   (0..463 mol/L·s)

6. Calculate the average reaction rate for the appearance of HCl gas between 4.32 s and 6.48 s

   (0.116 mol/L·s)

7. Using your answers from questions 5 and 6, explain why the reaction rates during the first 2.16 seconds and the last 2.16 seconds are different?

At standard conditions, Hydrogen peroxide in aqueous solution will decompose to produce oxygen gas and water, according to the following balanced chemical equation: $2H_2O_2\ (aq) \rightarrow 2H_2O\ (l) + O_2\ (g)$

Time (s)	**Molarity of H_2O_2 (aq)**	**Molarity of O_2 (g)**
0	0.300	0.000
2	0.250	0.050
4	0.180	0.105
6	0.141	0.138
8	0.125	0.141
10	0.118	0.150

Using the data table above, answer questions 8 – 14 and show all work. *(3 decimal places)*

8. Calculate the average reaction rate for the disappearance of H_2O_2 in the first 4 s.

   (0.030 mol/L·s)

9. Calculate the average reaction rate for the appearance of oxygen gas in the first 4 s

   (0.026 mol/L·s)

10. Calculate the average reaction rate for the disappearance of H_2O_2 between 2 s and 6 s.

    (0.027 mol/L·s)

11. Calculate the average reaction rate for the appearance of oxygen gas between 2 s and 6 s.

    (0.022 mol/L·s)

12. Calculate the average reaction rate for the disappearance of H_2O_2 between 6 s and 10 s.

    (0.006 mol/L·s)

13. Calculate the average reaction rate for the appearance of oxygen gas between 6 s and 10 s.

    (0.003 mol/L·s)

14. Calculate the average reaction rate for the disappearance of H_2O_2 during the entire 10 s reaction.

    (0.018 mol/L·s)

15. Calculate the average reaction rate for the appearance of oxygen gas during the entire 10 s reaction.

    (0.015 mol/L·s)

16. For both H_2O_2 and O_2, compare the average reaction rates during the first 4 seconds of the reaction and the last 4 seconds of the reaction. Explain the data.