Name ...................................................... Sci Teacher .................................. Date ...............

**Gr12 Practical Investigation: Rates of Reactions**

**Aim:** to determine how the variable of concentration and temperature affect the rate of a chemical reaction

**Method**: 4 different groups in the class

* Each group is supplied with a strip of magnesium ribbon, conical flask and delivery tube, 100 ml measuring cylinder and hydrochloric acid solution.
* Each group will have slightly different conditions to control. See the results table.
* The lower and higher temperatures are controlled by having the flasks immersed in water baths, one approximately 100C below room temperature and the other 100C above room temperature. This is monitored by a thermometer.
* Reaction: Mg(s) + HCl(aq) → H2(g) + MgCl2(aq)
* The acid is placed in the 250ml conical flask. The magnesium strip is folded (all groups identical) and dropped into the acid. The stop watch (timer) is started.
* Immediately the delivery tube’s stopper is inserted tightly into the neck of the conical flask. The other end was previously placed into the submerged opening of the inverted 100ml measuring cylinder as shown in the diagram.
* Time is recorded for the volumes of gas to reach the volumes in the table. (10ml increments).
* All results are posted on the board and shared between groups

**Result**s:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Group | A | B | C | D | repeat |
| [HCl] (mol.dm-3) | 1 mol.dm-3 | 0.5 mol.dm-3 | 0.5 mol.dm-3 | 0.5 mol.dm-3 | 0.5 mol.dm-3 |
| volume acid | 50ml | 50ml | 50ml | 50ml | 50ml |
| Temperature (0C) | room 230C | room 230C | Cool 120C | warm 330C | warm 440C |
| Volumes (ml) | Time (s) | Time (s) | Time (s) | Time (s) | Time (s) |
| 10 | **5** | **4** | **29** | **13** | **58** | **24** | **20** |
| 20 | **7** | **7** | **55** | **28** | **88** | **33** | **27** |
| 30 | **9** | **10** | **77** | **43** | **121** | **48** | **36** |
| 40 | **11** | **12** | **105** | **62** | **160** | **62** | **44** |
| 50 | **14** | **15** | **133** | **79** | **204** | **76** | **53** |
| 60 | **16** | **18** | **163** | **96** | **250** | **94** | **62** |
| 70 | **19** | **21** | **203** | **110** | **306** | **110** | **85** |
| 80 | **21** | **24** | **237** | **132** | **358** | **129** | **98** |
| 90 | **24** | **27** | **287** | **159** | **413** | **147** | **114** |
| 100 | **28** | **30** | **374** | **175** | **500** | **175** | **136** |

**Analysis:**

* Plot graphs of volume versus time on the grid below. Groups A & B were duplicated. Indicate which you are plotting. Plot just one in each case. Label graph, axes, units and used the biggest scale possible to accommodate all results unless instructed otherwise. The slowest reaction may affect this.
* Draw conclusions for both aims.
* Answer the additional questions.

100

90

80

70

60

50

40

30

20

10

0

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 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

t/s

**Conclusions:**

**Questions:**

1. Which group’s reaction was the fastest?
2. How is this evident from the graphs?
3. What does the slope of the graphs represent?