# Factors Affecting Rates

**T-Level Science · Chemistry · A12.1.1–A12.1.3**

Name: _____ Date: _____

## 1. Retrieval

1.1 State the two requirements for a successful collision. Then explain what collision frequency means.

## 2. Surface area — two source datasets

The teacher PowerPoint and the student workbook do not use the same times. Keep them separate.

| Source | Large chips / s | Small chips / s | Powder / s |
|---|---|---|---|
| Teacher PowerPoint (2.0 g) | 95 | 48 | not given |
| Student workbook (2.0 g) | 96 | 51 | 29 |

2.1 Using the PowerPoint pair only, which experiment is faster and why?

A12.1 Factors Affecting Rates of Chemical Reactions

## 2.2 Workbook powder trial

Using 96 s / 51 s / 29 s, explain why powder is fastest for the same 2.0 g mass.

2.3 A student says ‘smaller pieces contain more substance’. Correct the error.

## 3. Concentration

| Concentration / mol $dm^{-3}$ | Time to same endpoint / s |
|---|---|
| 0.50 | 120 |
| 1.00 | 64 |
| 1.50 | 43 |
| 2.00 | 31 |

3.1 Describe the pattern and explain it with collision theory. Temperature is unchanged.

### 3.2 Doubling concentration

Concentration is doubled at constant temperature. What happens to rate? May you assume it exactly doubles?

## 4. Pressure

4.1 At constant temperature a gas mixture is compressed. Explain why rate increases.

4.2 Why is it wrong to say higher pressure always means higher temperature?

## 5. Graph

Sketch two gas-volume vs time curves for the same limiting amount: one faster, one slower. Label the steeper start and the shared final volume.

## 6. Controls

6.1 For a surface-area investigation, name the independent variable, a suitable dependent variable, and two control variables. Explain one control.

## 7. Unfamiliar

7.1 Trial X uses 8 large pieces. Trial Y uses 80 small pieces of the same mass. Which is faster and why?

## 8. Examination-style

(a) Powder vs same mass of large pieces. [3] (b) Increasing concentration. [3]

(c) Increasing pressure of gaseous reactants. [3] (d) One surface-area control and why. [2]

A12.1 Factors Affecting Rates of Chemical Reactions

## 9. Extended response

Write a single explanation of how surface area, concentration and pressure each increase rate. Use collision frequency and successful collisions. State what does not change if temperature is constant.

## 10. Source note

A12.1 original PDF binaries were not in the upload set. This worksheet uses the markdown extracts of the teacher PowerPoint, student workbook and teacher answers. The 95 s / 48 s and 96 s / 51 s / 29 s times are both printed above and must not be merged.