

# Explaining how to Speed Up Diffusion

1. Put a ring around the diagram where the light grey particles diffuse fastest.



Explain why the one you have chosen will be quicker.

2. Circle the temperature at which diffusion is fastest and put a triangle around the slowest.

23°C

62°C

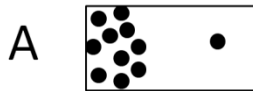
-10°C

-23°C

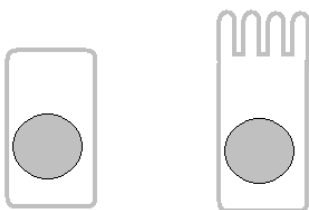
57°C

Explain your choices.

3. Why would diffusion be quicker in A than in B?



4. In which cell would diffusion happen quickest? Why?

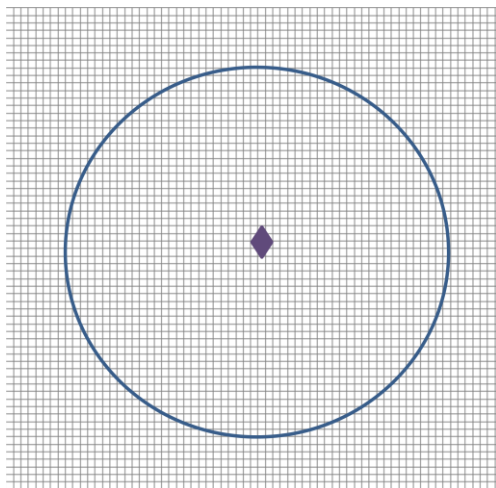


## Assignment

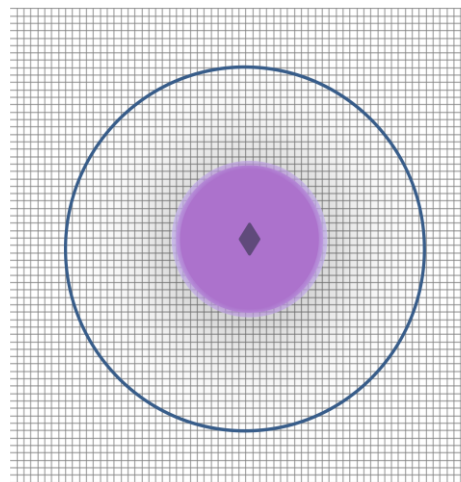
Skill D – Scientific Enquiry

Skill E – Processing Data

If a crystal of potassium permanganate is placed in a Petri dish containing water, the crystal dissolves and diffuses through water.



START



LATER

Design an experiment that investigates the effect of temperature on diffusion. Include:

- Predictions/hypothesis
- information about the amount of substances used
- how you will measure things
- your independent and dependent variables
- how many trials
- how you will ensure that it is a fair test
- design a results table
- indicate how you will process and present your data
- all safety precautions

You will have the opportunity to do a trial run at room temperature on Thursday. You will then be able to make any necessary revisions to your method before carrying out your experimental design.

The assessment criteria are on the following pages.

## Criterion D: scientific inquiry

Achievement level	Level descriptor
0	The student does not reach a standard described by any of the descriptors below.
1-2	The student <b>attempts to state</b> a focused problem or research question. The method suggested is <b>incomplete</b> . The student <b>attempts to evaluate</b> the method and respond to the focused problem or research question.
3-4	The student <b>states</b> a focused problem or research question and <b>makes a hypothesis</b> but <b>does not explain it</b> using scientific reasoning. The student selects <b>appropriate</b> materials and equipment and writes a <b>mostly complete</b> method, mentioning <b>some of the variables</b> involved and how to manipulate them. The student <b>partially evaluates</b> the method. The student <b>comments</b> on the validity of the hypothesis based on the outcome of the investigation. The student <b>suggests some</b> improvements to the method or makes suggestions for further inquiry when relevant.

Achievement level	Level descriptor
5-6	The student states a <b>clear</b> focused problem or research question, <b>formulates a testable hypothesis</b> and <b>explains</b> the hypothesis using scientific reasoning. The student selects appropriate materials and equipment and writes a <b>clear, logical</b> method, mentioning <b>all of the relevant variables</b> involved and how to control and manipulate them, and describing how the data will be collected and processed. The student <b>evaluates</b> the method, commenting on its <b>reliability</b> and <b>validity</b> . The student comments on the validity of the hypothesis based on the outcome of the investigation. The student suggests <b>realistic</b> improvements to the method and makes suggestions for further inquiry when relevant.

**Reliability:** Refers to measurement of the data. This depends upon for example on the selection of the measuring instrument, size of the sample.

**Validity:** Refers to the success of the method, it includes how fair the testing was (control and manipulation of variables)

## Criterion E: processing data

Achievement level	Level descriptor
0	The student does not reach a standard described by any of the descriptors below.
1-2	<p>The student <b>collects some</b> data and <b>attempts to record</b> it in a suitable format.</p> <p>The student <b>organizes and presents</b> data using <b>simple</b> numerical or visual forms.</p> <p>The student <b>attempts to identify</b> a trend, pattern or relationship in the data.</p> <p>The student attempts to draw a conclusion but this is <b>not consistent with</b> the interpretation of the data.</p>
3-4	<p>The student collects <b>sufficient</b> relevant data and <b>records</b> it in a suitable format.</p> <p>The student organizes, <b>transforms</b> and presents data in numerical and/or visual forms, <b>with a few errors or omissions</b>.</p> <p>The student <b>states</b> a trend, pattern or relationship shown in the data.</p> <p>The student draws a <b>conclusion consistent with</b> the interpretation of the data.</p>
5-6	<p>The student collects sufficient relevant data and records it in a suitable format.</p> <p>The student organizes, transforms and presents data in numerical and/or visual forms <b>logically and correctly</b>.</p> <p>The student <b>describes</b> a trend, pattern or relationship in the data and comments on the reliability of the data.</p> <p>The student draws a <b>clear</b> conclusion <b>based on the correct interpretation</b> of the data and <b>explains it</b> using scientific reasoning.</p>

The next page has a checklist for you to see if you have addressed the aspects required for a successful practical report.

### **Criterion D:**

Research Question (the purpose):

- Is my research question focused/specific/detailed?

Hypothesis:

- Did I formulate a hypothesis (what do you predict will happen?)
- How will I know that it has happened? (How do I determine this?)
- Did I explain my prediction using scientific information?  
*if (I test and compare this) → then (this will be the outcome) → because (use scientific reasoning)*

Variables:

Did I make a complete/correct list and addressed

- independent variable (IV) (manipulated) ?
- dependent variable (DV) (measured) ?
- controlled variables (CV) (kept constant/monitored to make a fair test) ?

Materials:

Did I list all equipment (including sizes) and material (including amounts)?

Method:

- Did I describe clearly what was done?
- Did I describe how I monitored and controlled variables?
- Did I describe how I took measurements (collected the data)?
- Did I describe how I will process the data?

### **Criterion E:**

Data Collection (Raw Data):

- Did I present my data (quantitative and/or qualitative)
- Do my tables have a focused title, correct column headings, units, do they really show what I wanted to measure?
- Is my work neatly presented and easy to read?

Data Processing:

- Did I manipulate my raw data by mathematical calculations?
- Can I present my data in graphical form?
- Do my graphs have headings? Are axes labeled? Are there units?
- Is my graphical display actually meaningful and does it help to interpret the data better?

Conclusion:

- Do I have a final conclusion = what do my findings tell me in terms of trends, patterns and relationships? (must refer back to the Research Question!)?
- Do I use my actual data in my analysis?
- Do I show adequate depth in my conclusion?

### **Criterion D:**

Evaluation:

- What limitations did I experience?
- How reliable are my data? How valid is my method?
- How could I improve the experiment, make better if I did this again?
- Should there be any changes in the experimental design?
- Did I really keep all my variables under control? If not, how can I improve next time?