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Through a microbiologist's eyes: optimal time to add honey to tea

Worksheet 3

Determining the optimal time to add honey to tea

How does hot water cool?

After boiling water is poured into a cup, its temperature gradually decreases. The cooling rate is usually fastest at the beginning and becomes slower as the water approaches room temperature.

By recording temperature at regular intervals, students can determine how long the water takes to reach the target temperature identified in Activity 2.

Instructions

1. Perform Activity 3 (Determining the optimal time to add honey to tea).
2. Record the cup type, water volume, room temperature and target temperature in table 1.
3. Start the timer immediately after the freshly boiled water is poured into the cup.
4. Record the water temperature every 30 seconds until it reaches the target temperature.
5. Repeat the experiment three times under the same conditions.
6. Record the results in table 2 and calculate the mean time needed to reach the target temperature.
7. Plot a graph showing the temperature over time.
8. Use the results to recommend how long to wait before adding honey.

Table 1: Experimental conditions

Variable	Details
Cup material and size	
Water volume	
Room temperature	
Target temperature from Activity 2	
Measuring device	

Table 2: Cooling measurements

Time	Trial 1 temperature (°C)	Trial 2 temperature (°C)	Trial 3 temperature (°C)	Mean temperature (°C)
0 min				
0.5 min				
1 min				
1.5 min				
2 min				
2.5 min				
3 min				
3.5 min				
4 min				
4.5 min				
5 min				
5.5 min				
6 min				
6.5 min				
7 min				

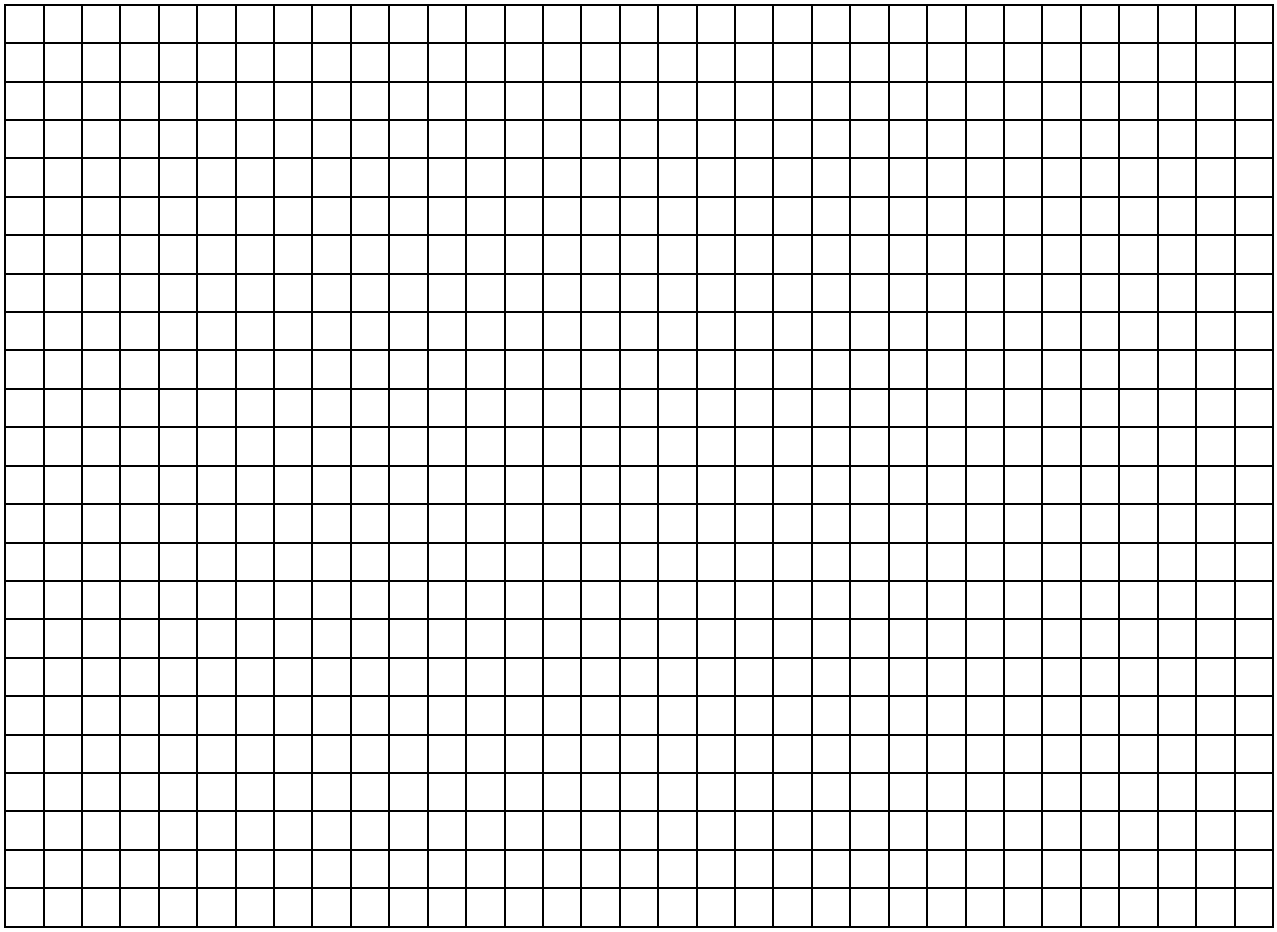
Table 3: Time taken to reach the target temperature

Trial	Time
1	
2	
3	
Mean	

Graph

Create a line graph showing the cooling of the water.

- **x-axis:** time (min)
- **y-axis:** temperature (°C)
- Mark the target temperature on the graph.



Summarise your results

a) Were the three trials similar?

b) During which part of the experiment did the water cool fastest?

c) Which factors may have affected the cooling rate?

d) How could the reliability of the results be improved?

e) Based on your results, how long should a person wait before adding honey to tea?

f) Would the same recommendation apply to every cup? Explain your answer.