

How heat moves and how to measure temperature

Grade 7 science (Year 8 · Class 7) · Lab answers

These model answers use the sample class results from the table. Your own numbers will differ, but cotton wool should beat the bare cup in the same way. Check your calculations and your explanations against the steps below.

Level: Grade 7 science (Year 8 · Class 7) · **Curriculum:** MS-PS3-3, MS-PS3-4

Question 1 Total fall in temperature

Cup 1: $80 - 44 = 36$ °C. Cup 2: $80 - 54 = 26$ °C. Cup 3: $80 - 58 = 22$ °C. Cup 4: $80 - 51 = 29$ °C. **36, 26, 22 and 29 °C.**

Question 2 Rank the insulators

Smallest fall is best: cotton wool (22), newspaper (26), foil (29), bare (36). **Cotton wool, newspaper, foil, none.**

Question 3 Cooling rate

Cup 1: $(80 - 66) \div 5 = 2.8$ °C/min. Cup 3: $(80 - 73) \div 5 = 1.4$ °C/min. **2.8 °C/min and 1.4 °C/min.**

Question 4 Percentage improvement

$(36 - 22) \div 36 = 0.389$. **About 39 %.**

Question 5 Describe the graph

Cup 1 falls 14, 10, 7 and 5 °C in the four intervals. The fall decreases as the water gets closer to the room temperature, so there is less difference to drive heat flow. **The cooling slows down.**

Question 6 Explain the best material

Cotton wool is full of tiny pockets of trapped air. The air conducts poorly and cannot circulate, so it reduces conduction and convection. **Trapped air is the reason.**

Question 7 Foil and radiation

Shiny foil reflects some radiation back into the cup, so it loses less energy than a bare cup, but a thin foil layer traps little air and conducts well. **It reduces radiation but not conduction.**

Question 8 Improve the lab

Repeat the test three times and calculate means, use the same thickness for each material and measure the water volume exactly. **Repeat and control thickness.**