

Seven Deadly Sins of Heat Transfer

Each of the following ideas—commonly mixed up or badly explained—would *cost you marks* in an exam. How are you going to make sure that you get it right, instead of wrong? Try underlining key words in your explanations.

Emit/Evaporate/Expand

We say that thermal radiation is *emitted* or sent out by hot objects—what are the other two words that we can use to describe the behaviour of IR (_____) waves?

Some words describe specific changes of state, like melt (solid to liquid) and _____ (liquid to gas).

Particles in a heated substance spread out because they have more energy, which means the material expands. The particles themselves... get bigger/get smaller/stay the same size.

Contract/Condense

Contract means...

Condense means...

Use the space below to draw a diagram to help you remember state changes and particle arrangements.

Heat doesn't rise!

Write four sentences describing what happens to **particles** during the process of **convection**. You may find the ideas of energy, movement and density useful.

1

2

3

4

Heat Particles Don't Exist

There is no such thing as a 'heat particle'. Explain how heated particles and IR waves can each transfer energy from one place to another.

Extension: Explain what is actually moving in each of conduction, convection and radiation.

Shiny Conductors?

A student believes that a foil blanket would be a bad idea for a mountain climber. They say the foil is a good conductor. Explain how the blanket actually keeps them warm in a snow storm.

Extension: what does this tell you about the comparative rates of conduction and radiation?

Cold Can't Get In...

...but heat (between touching particles, carried by particles, or as waves) can get out. Explain this using the ideas of light and darkness.

Extension: We might say that we close a window or door to 'keep the cold out' - what do we mean?

Particles stop conduction but a vacuum is even better.

Conduction only happens when particles touch. Use this idea to explain why a Thermos flask reduces heat transfer because of (1) the vacuum (2) the plastic foam in the cap.

Extension: Foam (with lots of gas bubbles) has less convection than a gas-filled space—why?