SUBJECT: Physics YEAR: 10 MTP TITLE: Astrophysics HALF TERM: 5 NO. OF LESSONS (approx):

Deliberate and specific retrieval of expected prior knowledge (be specific)

From KS3:

- Prior experience using a thermometer, heater, and balance
- Hotter objects will lose energy to their surroundings. This can be reduced through insulation

From earlier in year 10:

- Understanding of internal energy and the particle model
- Familiarity with temperature vs energy – temperature is a measure of average kinetic energy.
- Simple energy calculations from earlier physics topics, such as E=P×t

Academic transformation (be specific)

Students will understand:

- Application of the specific heat capacity equation: $\Delta E = mc\Delta\theta$
- Use of real experimental data (from the required practical) to derive or compare specific heat capacity values.
- Development of numerical fluency in rearranging equations and unit conversions (Joules, kg, °C).
- Appreciation of energy dissipation and experimental error – learning how heat loss affects results.
- Modelling heating in real materials – e.g. why metals heat faster than water or concrete.
- Definition of specific latent heat, and application of the equation $\Delta E = mL$ for changes of state
- Interpretation of temperature-time graphs to identify patterns in heating and cooling.

Personal transformation (2 or 3)

- **Connecting the abstract calculations to everyday applications:**
  - Why metal spoons feel colder than wood (specific heat capacity & conductivity).
  - How engineers choose materials for cooking pots or building insulation.
- Investigating how thermal storage systems (e.g. hot water tanks, lava stones, night storage heaters) use high specific heat capacity materials.
- Awareness of career links: materials science, renewable energy systems, thermal engineering

Can I Learning Questions

Can I define and calculate the specific heat capacity of a material?

Can I use practical measurements to calculate specific heat capacity?

Can I define and calculate specific latent heat?

Can I link SHC and SLH to heating curves?

Can I combine the SHC and SLH equations in complex questions?

Literacy and Oracy

Report Writing:
Required practical Methods: Measuring specific heat capacity
Extended writing: "Why do some materials heat up faster than others?"

Verbal Discussion & Debate:
Think-Pair-Share e.g. "What makes a material good at storing heat?"

Website Links for Research & Engagement:
https://theconversation.com/conservation-policies-threaten-indigenous-reindeer-herders-in-mongolia-121729

https://www.sciencedirect.com/topics/engineering/thermal-energy-storage

https://www.nationalgeographic.com/science/article/solar-water-heating

Misconceptions (5 or 6 examples)

- **Temperature and energy are the same"** – Students often confuse energy input with the temperature change it causes.
- **All materials heat up at the same rate"** – Overlooking the role of specific heat capacity and mass.
- **"Once heat is added, temperature always rises"** – Not understanding that energy can go into changing state or spreading out.
- **"A small object always heats faster than a big one"** – Misunderstanding the role of mass and specific heat capacity together.
- **"If you double the temperature, you double the energy"** – Temperature scales aren't directly proportional to energy
- **"The heater adds heat, not energy"** – Confusing the colloquial use of "heat" with the physical concept of energy transfer.