

A-Level Physics

Name: _____ Score: _____

1. Heat (thermal energy) naturally flows from:

- ☐ higher to lower temperature
- ☐ lower to higher temperature
- ☐ bigger to smaller object
- ☐ lighter to heavier object

2. Select **all** the properties that can be used to measure temperature.

- ☐ expansion of a liquid
- ☐ resistance of a metal
- ☐ e.m.f. of a thermocouple
- ☐ the colour of the glass case

Tick every correct option.

3. How much energy raises 2.0 kg of water by 10 K? (Use $c = 4200 \frac{\text{J}}{\text{kg} \cdot \text{K}}$.)

_____ J

4. At thermal equilibrium there is no net flow of energy between two bodies.

- ☐ True ☐ False

5. Absolute zero (0 K) is:

- ☐ the lowest possible temperature
- ☐ the freezing point of water
- ☐ room temperature
- ☐ the boiling point of water

6. Water has a high specific heat capacity compared with most metals.

- ☐ True ☐ False

7. Two objects in thermal equilibrium are at the same _____.

8. What is 27 °C in kelvin?

_____ K

9. While a solid is melting, its temperature:

- ☐ stays constant
- ☐ rises steadily
- ☐ falls
- ☐ doubles

10. Temperature tells you:

- ☐ which way heat will flow
- ☐ the total thermal energy stored
- ☐ the mass of the object
- ☐ the volume of the object

A-Level Physics

1. **higher to lower temperature**

Energy always flows down the temperature difference, from hot to cold, until they are equal.

2. **expansion of a liquid; resistance of a metal; e.m.f. of a thermocouple**

Any property that changes repeatably with temperature works. The fixed colour of the case does not.

3. **84000 J**

$$Q = mc\Delta T = 2.0 \times 4200 \times 10 = 84000 \text{ J.}$$

4. **True**

Equal temperatures mean no net flow — particles still exchange energy, but with no overall transfer.

5. **the lowest possible temperature**

At 0 K a system has its least possible internal energy; nothing can be made colder.

6. **True**

Water ~4200 vs aluminium ~900, copper ~385 J/(kg · K) — water needs much more energy per kelvin.

7. **temperature**

Same temperature is exactly the condition for thermal equilibrium.

8. **300 K**

$$T/\text{K} = \theta/^{\circ}\text{C} + 273 = 27 + 273 = 300 \text{ K.}$$

9. **stays constant**

During a state change the energy breaks bonds rather than raising temperature, so it stays constant.

10. **which way heat will flow**

Temperature decides the direction of heat flow; the amount of energy also depends on mass and material.