*This is the **Higher Combined** version — includes Higher Tier content. Some Separate-only details are omitted.*

The body maintains a core temperature of around 37°C to ensure enzymes work at their optimum rate. This is controlled by the hypothalamus.

- The hypothalamus (in the brain) is the thermoregulatory centre — it detects blood temperature and sends signals to effectors.
- If TOO HOT: sweating (evaporation removes heat), vasodilation (blood vessels near skin widen → more heat radiated), hairs lie flat (reduces insulating air layer).
- If TOO COLD: shivering (muscle contractions generate heat), vasoconstriction (blood vessels near skin narrow → less heat lost), hairs stand up (trap warm air layer → better insulation).
- Vasodilation: arterioles near the skin surface widen → more blood flows near surface → more heat lost by radiation.
- Vasoconstriction: arterioles near the skin surface narrow → less blood flows near surface → less heat radiated.
- Sweating: water evaporates from skin → requires energy from skin → cools the body.
- ★ **HT** Hypothermia: body temperature falls below 35°C — enzyme activity slows → metabolic processes fail. Can be fatal.
- ★ **HT** Hyperthermia/heatstroke: body temperature above 40°C — enzymes begin to denature → organ failure.

Key Terms

Thermoregulation	The process of maintaining a stable body temperature
Vasodilation	Widening of blood vessels near the skin — increases heat loss by radiation
Vasoconstriction	Narrowing of blood vessels near the skin — reduces heat loss by radiation
Hypothalamus	Region of the brain that detects blood temperature and coordinates thermoregulatory responses
Shivering	Rapid involuntary muscle contractions that generate heat

■ **Exam Tip:** For thermoregulation questions: ALWAYS give both the response AND explain HOW it reduces/increases heat loss. E.g. "vasodilation causes blood vessels to widen → more blood flows near skin surface → more heat is lost by radiation." The explanation earns the mark, not just naming the response.