3.1 – Kinetic Theory

Kinetic theory can be used to explain the different states of matter.

You should be able to recognise simple diagrams to model the difference between solids, liquids and gases.

The particles of solids, liquids and gases have different amounts of energy.

The specific heat capacity of a substance is the amount of energy required to change the temperature of one kilogram of the substance by one degree Celsius.

The relationship between energy **E**, mass **m**, specific heat capacity **c** and temperature change θ is:
$\mathbf{E = m \times c \times \theta}$

The specific latent heat of vaporisation of a substance is the amount of energy required to change the state of one kilogram of the substance from a liquid to a vapour with no change in temperature.

The relationship between energy **E**, mass **m** and specific latent heat of vaporisation $\mathbf{L_V}$ is: $\mathbf{E = m \times L_V}$

The specific latent heat of fusion of a substance is the amount of energy required to change the state of one kilogram of the substance from a solid to a liquid with no change in temperature.

The relationship between energy **E**, mass **m** and specific latent heat of fusion $\mathbf{L_F}$ is: $\mathbf{E = m \times L_F}$

The melting point of a solid and the boiling point of a liquid are affected by impurities.

You should be able to explain the shape of the temperature-time graph for a substance that is either cooled or heated through changes in state.

3.2 – Energy transfer by heating

Energy may be transferred by conduction and convection.

You should be able to explain, in terms of particles, how these energy transfers take place.

You should understand in simple terms how the arrangement and movement of particles determine whether a material is a conductor or an insulator and understand the role of free electrons in conduction through a metal.

You should be able to use the idea of particles moving apart to make a fluid less dense, to explain simple applications of convection.

Energy may be transferred by evaporation and condensation.

You should be able to explain evaporation, and the cooling effect this causes, using the kinetic theory.

You should be able to discuss the factors that affect the rate of evaporation.

The rate at which an object transfers energy by heating depends on:

- its surface area and volume
- the material from which the object is made
- the nature of the surface with which the object is in contact.

You should be able to explain the design of devices in terms of energy transfer, for example cooling fins.

You should be able to explain animal adaptations in terms of energy transfer, for example relative ear size of animals in cold and warm climates.

The bigger the temperature difference between an object and its surroundings, the faster the rate at which energy is transferred by heating.

Most substances expand when heated.

You should understand that the expansion of substances on heating may be a hazard (for example, the expansion of roofs and bridges) or useful (for example, the bi-metallic strip thermostat).

Topic 3.3 – Infrared Radiation

All objects emit and absorb infrared radiation.

The hotter an object is the more infrared radiation it radiates in a given time.

Dark, matt surfaces are good absorbers and good emitters of infrared radiation.

Light, shiny surfaces are poor absorbers and poor emitters of infrared radiation.

Light, shiny surfaces are good reflectors of infrared radiation.