Answer

FORM 4
CHAPTER 4

Paper 1

1	B	**2**	B	**3**	D	**4**	C	**5**	B
6	B	**7**	D	**8**	B	**9**	D	**10**	A

Paper 2

Structured Question

1 (a) Thermal equilibrium is a state in which there is no net heat flow between two objects that are in thermal contact and both reach the same temperature.

(b) At first, heat is transferred from the boy's forehead to the wet towel at a greater rate.
When heat balance is reached, the rate of heat flow between the boy's forehead and the wet towel is the same, so both reach the same temperature.

(c) Total heat released, $Q = mc(\theta_2 - \theta_1)$
$Q = (0.300)(4200)(38 - 30)$
$= 10\,080$ J or 1.01×10^4 J

2 (a) Bourdon gauge

(b) (i) Increase

(ii) The air pressure inside the flask increases as the temperature increases.

(c) • Air molecules that receive heat move faster with higher kinetic energy.
• The collision rate of air molecules on the walls of the flask increases and this causes the air pressure to increase.

(d) Pressure law // Gay-Lussac law.

Essay Questions

3 (a) Specific latent heat of vaporisation, ℓ_v is the quantity of heat required to convert 1 kg of a substance from a liquid state to a gas without a change in temperature.

(b) (i) Total heat absorbed, $Q = Pt$, with $t = 4.0$ min
$Q = (800\text{ J s}^{-1})(4 \times 60\text{ s})$
$= 192\,000$ J or 1.92×10 J

(ii) $m\ell_v = 192\,000$ J
$\ell_v = \dfrac{192\,000\text{ J}}{0.140\text{ kg}}$
$= 1.37 \times 10^6\text{ J kg}^{-1}$

(c) Liquid K changes phase from liquid to vapor in the QR phase. The heat energy supplied is only used to break the bonds between the molecules of the liquid so that it becomes a vapor. The average kinetic energy of the molecules does not change so the temperature of the liquid K does not change.

(d) • Has a low density so it flows easily // the rate of circulation through the pipe is faster.
• Has a low boiling point so it easily turns into vapor // more volatile.
• Has a low specific heat load so it cools down faster.
• Has a high specific latent heat of vaporization so that it can absorb more heat during evaporation // increase the cooling effect // reduce the volume of refrigerant required.
• Refrigerant Y was chosen because it has a low density, boiling point and specific heat load but a high specific latent heat of vaporization.

(e) During the day, the air over warmer land is warmer. The air expands, rises and leaves the low pressure area. Cold air above sea level has higher pressure. Therefore, the air moves towards the land as the wind blows from the sea to the land to form the sea breeze.