



NANYANG GIRLS' HIGH SCHOOL
2021 Sec 4 Physics Practical 07
Temperature of a Bunsen Flame

Suggested Markscheme (Total = 10 marks)

Results (sample): Check units and decimal place (precision of instrument)!

- Mass of iron washer, m_{Fe} = 4.30 g [1]
- Initial temperature of water, θ_i = 30.0 °C [1]
- Final highest temperature of water, θ_f = 36.0 °C [1]

Calculations

- Specific heat capacity, $c = Q / m\Delta\theta$ where Q = thermal energy
 m = mass of body
 $\Delta\theta$ = **change in temperature**

- Law of conservation of energy: Q lost by the iron washer = Q gain by the water

$$m_{Fe} c_{Fe} \Delta\theta_{Fe} = m_w c_w \Delta\theta_w \quad \text{working} \quad [1]$$

$$m_{Fe} c_{Fe} (\theta_{flame} - \theta_f) = m_w c_w (\theta_f - \theta_i) \quad \theta_f (\text{flame}) = \theta_f (\text{water}) \quad [1]$$

$$\theta_{flame} = > 700 \text{ to } 2000 \text{ } ^\circ\text{C} \quad [1]$$

(2 or 3 s.f.)

Questions

1. State **two** assumptions you made in calculating the temperature of the Bunsen flame. [2]

Any two:

- Temperature of the flame is constant.
- All the heat lost by the iron washer is gained by the water.
- There is no heat loss to the surroundings.

2. Suggest **two** possible sources of error in this experiment.

[2]

Possible things to consider:

- **Materials:** flame/washer/tongs → transfer to water → washer/water/container and surroundings
- **Processes:** transfer of heat: conduction/convection/radiation, change of state: vaporization

Any two (indicate clearly the changes, the process and materials involved):

- Some heat is lost from the water by vaporisation when the iron washer is inserted.
- Mass of water decreases due to vaporisation of water.
- Temperature of the flame at the location of the iron washer is not constant.
- Some heat is lost to the tongs through conduction when it is transferring the iron washer to the water.
- Some heat is lost to the surroundings (specifically - bamboo container/air/etc) by (conduction, convection or radiation)
- Heat is lost to surrounding by radiation when the washer is moved from the washer to the container of water.