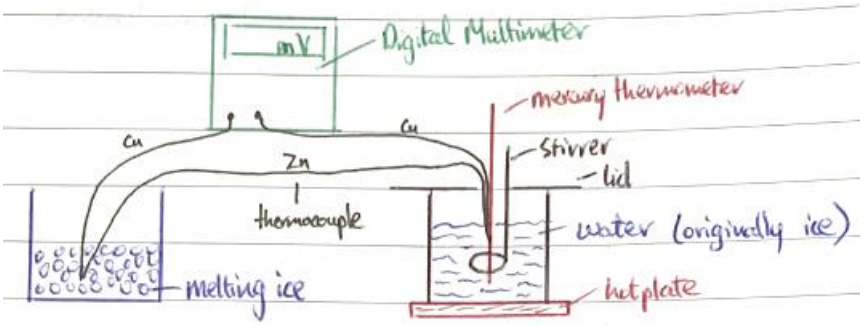
Heat Experiments #1

Calibrate a thermometer using a mercury thermometer as standard

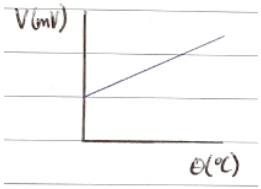
Diagram



Method: - thermocouple connected to multimeter in millivolts (read 0)

- one junction left in beaker of melting ice = fixed temperature
- other junction in ice, heat with hot plate
- form calibration curve - measure any body's temperature

Graph



Callibration curve

Theory: thermocouple - two different metal wives each and

- EMF generated when junctions at different temperatures
- voltage generated depends on temperature difference

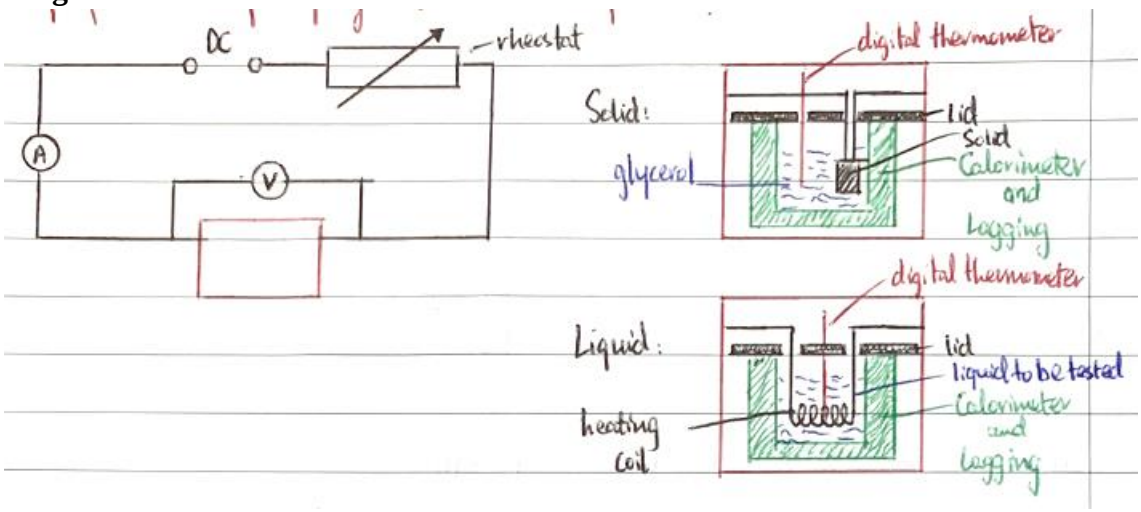
Errors + Precautions: - one junction at fixed temperature (0°C)

- stir for thermal equilibrium
- measure temp. of any body place junction B in contact with body, read voltage, read calibration curve
- Subtract zero error

Heat Experiments #2

Measure specific heat capacity of a solid and a liquid

Diagram



Method: - adjust rheostat for a current ≈ 3A on ammeter
- record highest temperature and time t

} solid

- cover heating coil with liquid to be tested
- precool liquid in fridge
- record highest temperature and time t

} liquid

Calculations: $E = VIt = mc\theta$; $c = \frac{E}{m\theta}$ or $\frac{VIt}{m\theta}$ (solid)

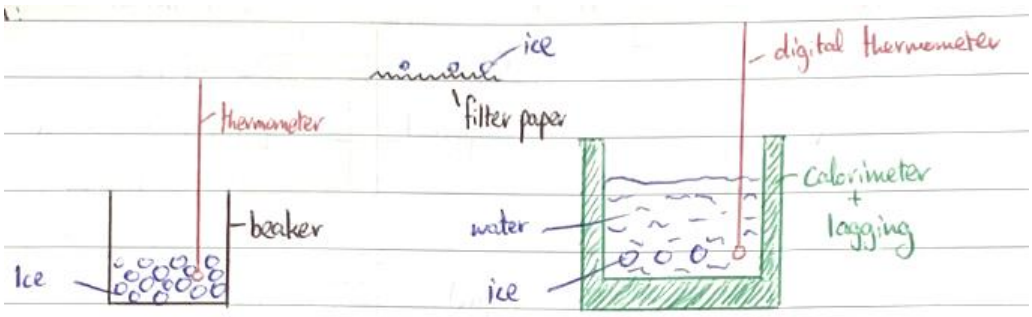
$E = VIt = (mc\theta)_l + (mc\theta)_{cal}$ (liquid)

Errors + Precautions: - reduce heat loss - lagging jacket - conduction
- polishing - radiation
- cover - convection
- constant current throughout
- stir regularly, take highest temperature
- large temperature rises = small percentage error
- sensitive thermometer, low specific heat capacity
- heating coil completely immersed in liquid
- precooling - heat flowing into calorimeter below room temperature is approximately equal to heat lost to surroundings above room temperature
- minimise error due to heat loss or gain for surroundings

Heat Experiments #3

Measure the specific latent heat of fusion of ice

Diagram



Method:
- Crush ice leave in beaker water drops appear
- dry ice on filter paper
- heat water 5°C above room temperature
- add ice to water
- record lowest temperature

Calculations:

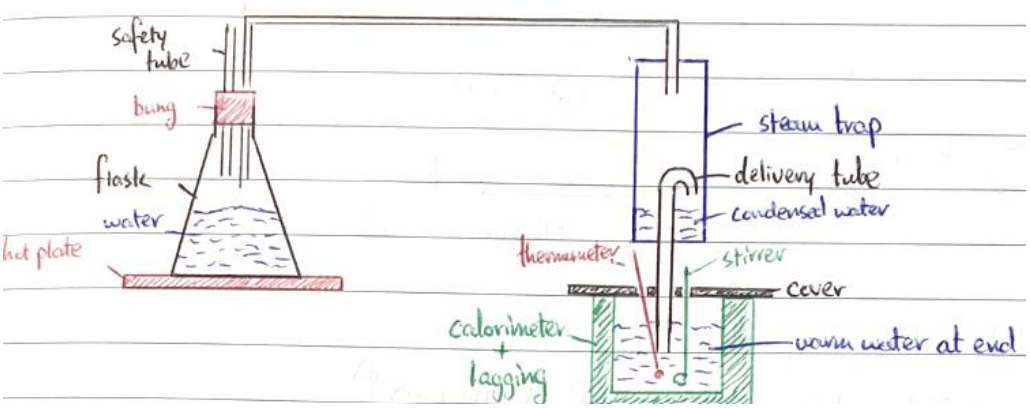
$(mc\Delta\theta)_w + (mc\Delta\theta)_{cal} = (mL)_{ice} + (m_{ice}c_w\Delta\theta)$

Errors + Precautions:
- reduce heat loss
  - lagging jacket - conduction
  - Polishing - radiation
  - cover - convection
- warm water - speeds up process - reduce heat loss
- preheat water - heat loss to surroundings = heat gained by calorimeter
- more ice → lower percentage error.
- sensitive digital thermometer
- stir continuously
- record lowest temperature
- dry ice - filter paper only ice, no water
- crush ice - melt quickly

Heat Experiments #4

Specific latent heat of vaporisation of water

Diagram



Method:
- precool calorimeter half filled with water 5ºC below room temperature
- dry delivery tube with thick cloth
- place delivery tube deep into calorimeter
- record highest temperature

Calculations: $(mc\Delta\theta)_w + (mc\Delta\theta)_{cal} = (mL)_{steam} + (m_{steam}c_w\Delta\theta)$

Errors + Precautions:
- reduce heat loss
  - lagging jacket - conduction
  - Polishing - radiation
  - cover - convection
- cool liquid condense steam foster - reduce heat loss
- greater mass of steam - lower percentage error.
- sensitive thermometer
- stir throughout thermal equilibrium
- record highest temperature
- steam trap - water formed by condensation not enter calorimeter.