

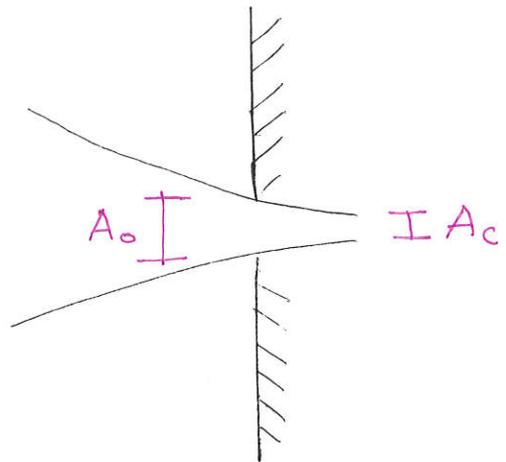
\* Exp. # 6 :- Determination of Coefficient of Discharge ( $C_d$ ) from Jet.

\* Calculations :-

$$\bullet Q_t = A_c v$$

$$\bullet v = C_v v_i = C_v \sqrt{2gh}$$

$$\bullet A_c = C_c A_o$$



$$\Rightarrow Q_t = C_c A_o C_v \sqrt{2gh}$$

$$\bullet C_c C_v = C_d$$

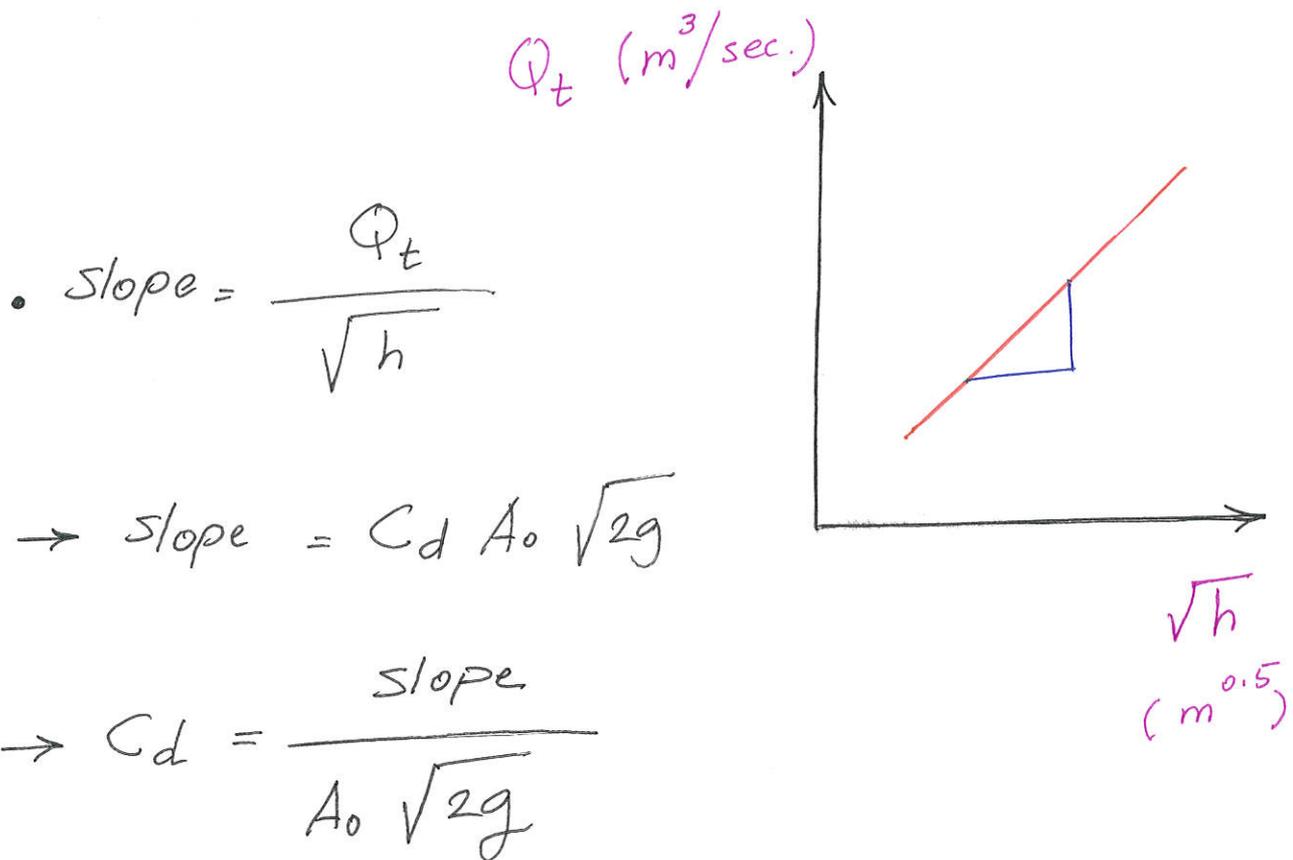
$$\Rightarrow Q_t = C_d A_o \sqrt{2gh}$$

\* where :-

- $Q_t$  : Actual Flow Rate ( $m^3/sec.$ )
- $A_c$  : Actual Area ( $m^2$ )
- $v$  : Actual velocity ( $m/sec.$ )
- $C_v$  : Coefficient of velocity ( $< 1$ )
- $A_o$  : Orifice Area ( $m^2$ )
- $C_c$  : Coefficient of contraction ( $< 1$ )
- $v_i$  : Ideal velocity ( $m/sec.$ )
- $C_d$  : Coefficient of Discharge ( $< 1$ )

$$\rightarrow C_d A_0 \sqrt{2g} = \frac{Q_t}{\sqrt{h}} = \text{slope}$$

\* Figures :-



❖ Results: (Tables)

| Point | Orifice Diameter, D (m) | Head, h (m) | Collected Volume, V (m <sup>3</sup> ) | Collection Time, t (sec.) | Flow Rate, Q <sub>t</sub> (m <sup>3</sup> /sec.) | $\sqrt{h}$ (m <sup>0.5</sup> ) |
|-------|-------------------------|-------------|---------------------------------------|---------------------------|--|--------------------------------|
|       | 0.003                   |             |                                       |                           |  |                                |
|       |                         |             |                                       |                           |  |                                |
|       |                         |             |                                       |                           |  |                                |
|       |                         |             |                                       |                           |  |                                |
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|       |                         |             |                                       |                           |  |                                |
|       |                         |             |                                       |                           |  |                                |
|       |                         |             |                                       |                           |  |                                |

| Point | Orifice Diameter, D (m) | Head, h (m) | Collected Volume, V (m <sup>3</sup> ) | Collection Time, t (sec.) | Flow Rate, Q <sub>t</sub> (m <sup>3</sup> /sec.) | $\sqrt{h}$ (m <sup>0.5</sup> ) |
|-------|-------------------------|-------------|---------------------------------------|---------------------------|--|--------------------------------|
|       | 0.006                   |             |                                       |                           |  |                                |
|       |                         |             |                                       |                           |  |                                |
|       |                         |             |                                       |                           |  |                                |
|       |                         |             |                                       |                           |  |                                |
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|       |                         |             |                                       |                           |  |                                |
|       |                         |             |                                       |                           |  |                                |

❖ Results: (Figures)

- 1- Plot (Q<sub>t</sub>) against ( $\sqrt{h}$ ) for 3 mm orifice and determine the slope of curve.
- 2- Plot (Q<sub>t</sub>) against ( $\sqrt{h}$ ) for 6 mm orifice and determine the slope of curve.
- 3- Determine the value of Coefficient of Discharge (C<sub>d</sub>) for the two orifices.
- 4- Determine the value of Coefficient of Contraction (C<sub>c</sub>) for the two situations. (take the value of C<sub>v</sub> from the previous experiment)
- 5- Compare between the all above results.