OBSERVATIONS AND CALCULATIONS

Table 1. Results of flow through orifice experiment (Constant head)

S.No.	Head (m)	Time for H cm rise (T) - sec	Discharge (Q) m^3 / s		Coefficient of discharge, C_d
			Q_a	Q_{th}	

Diameter of orifice, d =

Dimensions of collecting tank, A =

Experiment No: Roll No:
Date :

1. DETERMINE THE DISCAHRGE FROM A GIVEN TANK PRESENET IN TATA CHEMICAL LABORATORY (using ORIFICE)

AIM

To determine the coefficient of discharge of orifice by constant head method

BASIC CONCEPT

An orifice is an opening having a closed perimeter, made in the walls or in the bottom of the tank containing fluid, through which fluid may be discharged. The discharging fluid from the tank through the orifice comes out in the form of a free jet. In the process, the total energy of the fluid in the tank is converted to kinetic energy as the jet issues out into the atmosphere. The shape of the jet is function of the geometry of the orifice. The jet cross-section contracts to minimal and then expands partly due to viscous resistance offered by the surrounding atmosphere and partly due to inertia of the fluid particles. The jet cross-sectional area at which it is having minimum area is known as “Vena Contracta”.

The following formulae are employed to fine the coefficient of discharge of an orifice.

Theoretical discharge, $Q_{th} = a\sqrt{2gh}$

a = area of cross section of the orifice = $\frac{\pi}{4} \times d^2$

h = head of the liquid above the centre of the orifice in the tank

g = acceleration due to gravity

Actual discharge, Q_a = AH/T

A = Internal plan area of collecting tank

H = Rise of liquid in collecting tank

T = Time taken to collect liquid in the collecting tank

Coefficient of discharge, $C_d = Q_{at}/Q_{th}$

MODEL CALCULATIONS

APPARATUS

1 Orifice fitted to a tank
2 Piezometers
3 Meter scale
4 Calipers
5 Stop watch
6 Collecting tank fitted with a valve

PROCEDURE

1. The diameter of the orifice and the internal plan dimensions of the collecting tank are measured.
2. The supply valve of the orifice tank is regulated and water is allowed to fill the orifice tank to a constant head (h)
3. The out let valve of the collecting tank is closed tightly and the time taken for "H " rise of water in the collecting tank is noted.
4. The above procedure is repeated for different heads and the readings are tabulated.

GRAPHS

The following graph is drawn by taking Q_a on y – axis and $\sqrt{h}$ on x - axis.

Q_a vs $\sqrt{h}$

RESULT

The coefficient of discharge of orifice, C_d = ----------

(From experiment)

The coefficient of discharge of orifice, C_d = ----------

(From Q_a vs $\sqrt{h}$ graph)

INFERENCE