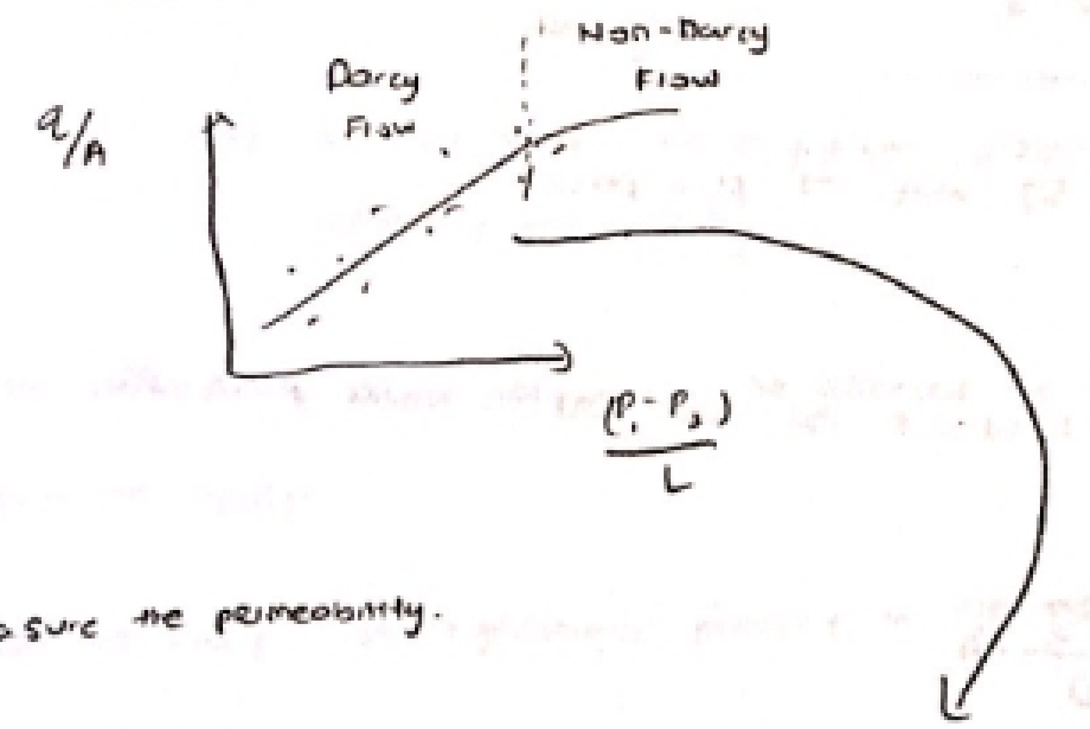
↳ cut, clean & allow a fluid to flow through the core plug

↳ record the P_{in} & P_{out}

L

measure these at different flow rates



↳ to measure the permeability.

$$\frac{q}{A} = \frac{k}{\mu} \frac{\Delta P}{L}$$

the gradient will be

$$\frac{q/A}{\left(\frac{P_1 - P_2}{L}\right)} = \boxed{\frac{k}{\mu}}$$

↳ we cannot use darcy equation for non-darcy flow.

- Issues Affecting Laboratory measurement of Permeability

↳ core handling → { core handling, cleaning, drying, storage, sampling.

①

we are remove the core from high pressure formation, the gas & oil will try to escape & causes fracture.

↳ fluid - rock interaction ⇒ clays in the core sample are very reactive to water,
(2)
It will swell when get in contact with water,
it affects the permeability

↳ that may cause fines migration, plugging pore throats and reducing permeability

↳ pressure ⇒ the permeability of the sample will be affected by the different pressure that we apply.
(3)
↳ when we apply high hydrostatic pressure in the reservoir, the formation will face compaction, so the permeability will be different when we test on the free core sample.

↳ core heterogeneities.
(4)

- Laboratory Analysis of Gas flow mean Pressure method

↓

for low pressure

$$\bar{q} = \frac{kA}{\bar{\mu}_g L}\left(\frac{1}{\bar{p}}\right)\left(\frac{P_1^2 - P_2^2}{2}\right)$$

EXAMPLE

Determine the absolute permeability

given

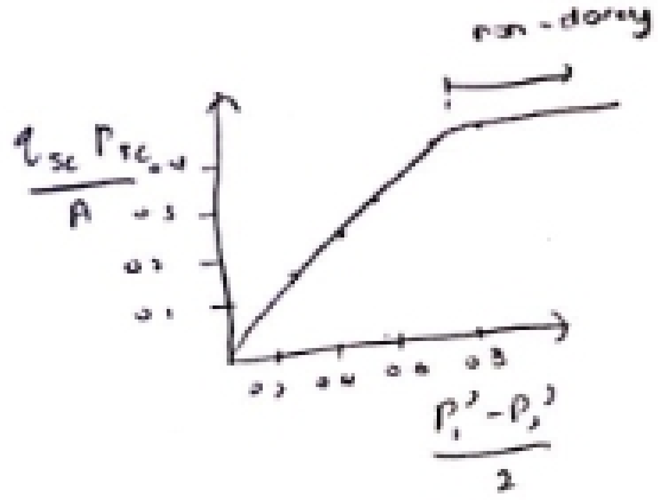
standard pressure & temperature 60 °F 14.65 psia

$L = 2.5$ in $\quad D = 1.03$ in

$P_{atm} = 14.6$ psia $\quad \mu_{nitrogen} = 0.019$ cp

solution

$$q_{g,sc} = \frac{k}{\mu}\left(\frac{A}{P_{sc}}\right)\left(\frac{P_1^2 - P_2^2}{2L}\right)$$



$\Rightarrow \frac{k}{\mu} = 0.7$ cm

$\frac{P_1^2 - P_2^2}{2L}$ $\left(\frac{atm^2}{cm}\right)$	$\frac{q_{sc} P_{sc}}{A}$ $\left(\frac{cm\ atm}{s}\right)$
0.6	0.41
0.366	0.382
0.478	0.347
0.289	0.335
0.197	0.118

– END –