**PGE381L – CHEAT SHEET MIDTERM FALL 2023**

**Units**

|  |  |  |  |
| --- | --- | --- | --- |
|  | SI | Darcy | oilfield |
| Time | s | s | day |
| Length | m | cm | ft |
| Pressure | Pa | atm | psia |
| Flow rate | m³/s | cm³/s | stb/day |
| Viscosity | Pa.s | cp | cp |
| Permeability | m² | Darcy (d) | Millidarcy (md) |
| Compressibility | Pa-1 | atm-1 | psi-1 |
|  |  |  |  |
| Gravity [] |  |  | - |
| \* 1 darcy = 9.869E-9 cm² = 9.869E-13 m²=1.062E-11 ft² | | | |

**Porosity**

Total, Effective *(contribution to flow)*, Interconnected.

Cubic packing: maximum porosity. Best sorting, higher

: weight of saturated , : weight immersed

Gas expansion - calibration : volume of solid

**In situ:**

(1)

, : % of the mineral

(2)

Density and Neutron log – calibrated to

🡪 wrong lithology

🡪

🡪 direct reading,

Resistivity log – ILD(deep) > ILM > SFLU(shallow) ;;; AT90 > AT30 > AT10

Workflow: and with Archie with (1) with (2)

Low GR: clay free ; resistivities overlap: no invasion

Shaly sands

Volumetric concentration of shale

: corrected porosity;

: measurement in shale

**Conductivity**

Clay free

Shaly

for clay free rocks

**Impact of stress, compressibility**

**Saturation**

Clay free! Log always read !

**Formation Factor** , : Sw=100% : resistivity of the water

**Resistivity Index**

**Archie:**

**Picker Plot:** vs.

is the resistance of the resistor ; is the resistivity

**Shallow resistivity:**

**Deep resistivity:**

Electrical double layers around clay crystals

is the unknown

Lamination

Oil wet

Wat wet

**Darcy** *(§107)*

Linear

Cylindrical

Inclined, anisotropic

**Permeability average**

|  |  |
| --- | --- |
|  |  |
|  |  |

**Carman-Kozeny** *§104*

Tortuosity

: radius of the capillar

: wetted surface area of the pores per unit pore volume

: wetted surface area per unit grain volume

: wetted surface área per unit bulk volume ()

Granular media: : diameter of grains

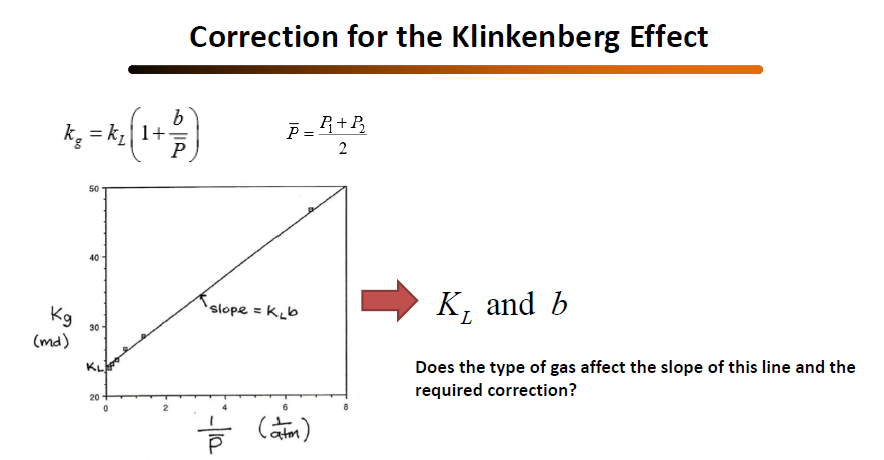
*(§107)*

Pore circular in cross section 🡪

Cylindrical pores:

Flow through a cilinder(Hagen-Poiseuille):

Flow through fractures (Hagen-Poiseuille):

Permeability given pore distribution: ,

**Laboratory assessment (steady state)**

**Darcy and Boile:** (líq) (gás)

**Klinkenberg:** ,

**Workflow:** measure ; Calc ; Extrapolate

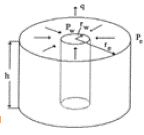
**Anisotropy**

Principal axes of anisotropy

Permeability ellipse

Eigen values analysis to find the principal axes:

**Pressure transient analysis (PTA) *🡪 Field units***

**Drawdown:**

,

Slope:

At , ( , (initial pressure)

**Buildup**

(Horner time)

(infinite res)

**Radius of investigation**