

Q1) The following permeability data were measured on sandstone:

Sw	0	10	20	30	40	50	60	70	80	90	100
Kro	1	1	1	0.94	0.8	0.44	0.16	0.05	0	0	0
Krw	0	0	0	0	0.04	0.11	0.2	0.3	0.44	0.68	1

a) Estimate the:

1) Initial Water Saturation.

2) Residual Oil Saturation.

3) Connect Water and Oil Saturation.

b) Absolute Permeability 222 Md at $S_o = 40\%$ Calculate K_o .

c) Calculate the Mobility Ratio if $S_w = 45\%$, $\mu_w = 1\text{cp}$, $\mu_o = 3\text{cp}$, $k_{\text{absolute}} = 200\text{ Md}$

Q2) i) Compute the initial Water Saturation (S_{wi}) for the following field.

Bulk Volume = 15000 acres.ft

Average porosity, $\phi = 18\%$

Initial oil in place = 13.66MMBBL

and Formation Volume factor $\beta_o = 1.15$

ii) A brine is used to measure the absolute permeability of a core plug. The rock sample is 4cm long and 3cm² in cross section. The brine has a viscosity of 1.0 cp and is flowing a constant rate of 0.5cm³/sec under a 2.0 atm pressure differential. Calculate the absolute permeability.

Q3) Given the following core data,

I) Calculate the geometric average permeability.

Sample	hi, ft	ki, md
1	1.0	10
2	1.0	30
3	0.5	100
4	1.5	40
5	2.0	80
6	1.5	70
7	1.0	15
8	1.0	50
9	1.5	35
10	0.5	20

II) If the thicknesses (hi) of all core samples are the same calculate the average permeability.

Q4) i) What is the Displacement of oil?

ii) Complete Unit Darcy equation:

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

- Q5) A cylindrical core sample of a well consolidated sand is completely saturated with a synthetic brine of 50,000 ppm salinity. At 200°F the resistance of the core is 1000 ohms. The core is 3 ½ in. in diameter and the formation factor 20 .**
- i) Calculate the resistivity rock at 100% saturated with salt water.**
 - ii) Compute its porosity by both the Archie and Humble equation.**

Q6) i) Complete

- I) The secondary Porosity:.....**
- II) Residual porosity →**
- III) The permeability is:.....**
- IV) What is the assumption Darcy equation?**

- ii) A clean and dry core sample weighing 425 gm was 100% saturated with a 1.07 specific gravity (γ) brine water. The new weight is 453 gm. The core sample is 12 cm long and 4 cm in diameter. Calculate the porosity of the rock sample.**

iii) From the following data :

Capillary rise= 1800 cm $\rho_{\text{water}} = 1.0 \text{ gm/cc}$ $\rho_{\text{oil}} = 0.82 \text{ gm/cc}$

- Calculate:**
- 1) Capillary pressure. 15**
 - 2) For complete wettability compute capillary radius if oil water surface tension is 30 dynes/cm? 15**

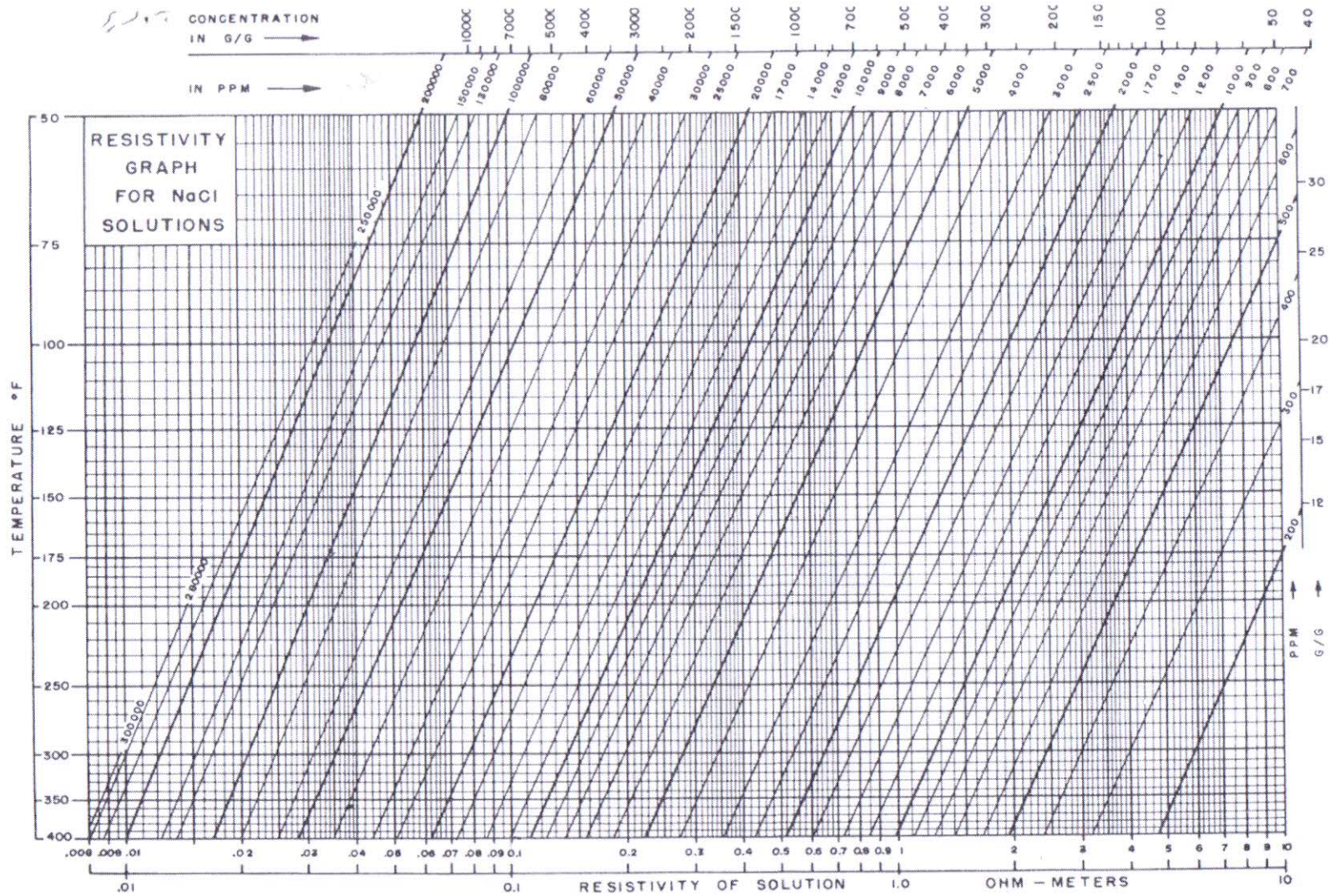


Fig. 11.3. Resistivity of water as a function of salinity and temperature. Salinities are in terms of NaCl concentration. Courtesy Schlumberger Well Surveying Corporation.