Petroleum Engineering 311
Test 6

February 21, 2002

1. Match the following names in Column 1 with the definitions in Column 3. Place answer in Column 2.

wettability	g	a. the pressure required to force non-wetting fluid into largest pores
saturation	d	b. the difference between two solid-fluid interfacial tensions
drainage	i	c. fluid flow process in which the saturation of the wetting phase increases and the non-wetting phase saturation decreases
capillary pressure	f	d. fraction of pore space occupied by a particular fluid (immiscible phases)
irreducible wetting phase saturation	h	e. the lagging of an effect behind its cause
adhesion tension	b	f. pressure difference existing across the interface separating two immiscible fluids in capillaries
displacement pressure	a	g. tendency of one fluid to spread on or adhere to a solid surface in the presence of other immiscible fluids
hysteresis	e	h. the limiting value in reduction of the wetting phase saturation
interfacial tension	j	i. fluid flow process in which the saturation of the wetting phase decreases and the non-wetting phase saturation increases
imbibition	c	j. the energy per unit area (force per unit distance) at the surface between phases

2. The height of a fluid rise in a capillary is given by, $h = \dfrac{2\sigma\cos\theta}{\rho g r}$.

a. Calculate the height, in cm, for an air-mercury system where the interfacial tension is 480 dynes/cm, the contact angle is 140°, the density of mercury is 13.6 g/cm^3, and the radius of the capillary is 0.01 cm.

$$h = \frac{(2)(\cos 140^\circ)(480\ \text{dynes})}{\text{cm}} \left| \frac{\text{cm}^3}{13.6\ \text{g}} \right| \frac{\text{s}^2}{980\ \text{cm}} \left| \frac{1}{0.01\ \text{cm}} \right| \frac{\text{g}\cdot\text{cm}}{\text{s}^2\cdot\text{dyne}}$$

$= -5.6$ cm

b. Interpret the result of your calculations.

$h<0 \Rightarrow$ fluid level in capillary is depressed or lowered.