

PETE 311 LAB EXAM

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GROUP: 3

83%
+5
88%

ANSWER ALL QUESTIONS

1. caliper and helium porosimeter can be used to measure the bulk volume of a core in the lab. (2points)

2. Which of the methods listed above is more accurate? porosimeter (2points)

3. The density of water in field units is? 62.4 lb/ft³ (2points)

4. The density of 20wt% KCl brine is 0.8g/cm³. True/False (2points)

$\rho = \frac{m}{V}$ depends on total volume of water & solution ρ can never be 0.8 g/cm³

5. List 2 methods to determine the porosity of a core sample in the lab (2points)

- volume method
- mass method

6. A chamber of unknown volume contains helium gas at a pressure of $30 P_1$ psia. A second chamber (2) with 20 cm³ volume is vacuumed at 0 psia. When the valve between chamber (1) and chamber (2) is opened, the pressure decreased to $20 P_2$ psia. Calculate the volume of chamber (1) (4points)

$$P_1 V_1 = P_2 V_2$$

$$P_1 V_1 = P_2 (V_{c1} + V_{c2})$$

$$30(V_{c1}) = 20(V_{c1} + 20)$$

$$\frac{30}{20} = \frac{V_{c1} + 20}{V_{c1}}$$

$$\frac{3}{2} = \frac{V_{c1} + 20}{V_{c1}}$$

$$30V_1 = 20(20)$$

$$V_1 = \frac{400}{30}$$

$$V_1 = 13.33$$

$P_1 = 30$
 $P_2 = 20$
 $V_1 = \text{cham. 1}$
 $V_2 = \text{cham. 2} = 20 \text{cc}$

7. From the list below underline what could affect porosity? (2points)

- a. Grain Shape
- b. Density
- c. Uniformity of grain packing
- d. API gravity
- e. Grain size-distribution
- f. Permeability
- g. Temperature

8. When a reservoir starts to produce fluids, the pore volume increases, decreases or remains constant? (2points)

stays constant
(assuming no compaction)

$$\phi = \frac{V_p}{V_g}$$

ϕ stays constant

9. T F If we assume that the grains are perfect spheres, all the grains have the same size, and they are in an ideal packing, the size of the grain affects the porosity. (2points)

10. It is effective porosity which measures interconnected void space. (2points)

11. Effective porosity will approach total porosity for clean, well sorted reservoirs. (2points)

12. Which of the following is not a reason for using helium gas to measure porosity? (2points)

- a. Has small molecules
- b. Is inert
- c. Is incompressible
- d. Has high diffusivity

13. A core sample was cleaned and dried. The porosity was determined by Archimedes' method, using synthetic brine as saturating fluid. The weights of the sample at different stages are given below in the table. Determine:

(5points)

- a. Bulk volume = $V_B = \frac{(W_{sat} - W_{sub})}{\rho} = \frac{84.697 - 46.9379}{.998} = 37.83 \text{ cc} = V_B$
- b. Pore volume = $V_P = \frac{(W_{sat} - W_{dry})}{\rho} = \frac{84.697 - 75.9}{.998} = 9.32 \text{ cc} = V_P$
- c. Matrix volume = $V_M = V_B - V_P = 37.83 - 9.32 = 28.51 \text{ cc} = V_M$
- d. Porosity = $\frac{V_P}{V_B} = \frac{9.32}{37.83} = 0.246 = \phi$

Dry weight	0.0754	kg	→ 75.9g
Saturated weight	84.697	g	
Weight of the core saturated & submerged in brine	46.9379	g	
Density of brine	998	kg/m ³	→ .998 g/cc

$\frac{998,000 \text{ g}}{\text{m}^3} \cdot \frac{1 \text{ m}^3}{(100 \text{ cm})^3}$

14. (Packing / Sorting) is a measure of the uniformity of the grain sizes. (2points) m → cm

15. Sand screens are used in completing wells in _____ zones? (2points)

- a. Consolidated
- b. Unconsolidated
- c. Both a & b
- d. None of the above

16. Grain size analysis can ALSO be applied to estimate permeability, a petrophysical parameter of a core. (2points)

17. An advantage of grain-size analysis is that we do not need to core the well. True False (2points)

18. The grain size distribution of a crushed rock can be determined using a sonic sifter (2points)

19. A 100cm^3 chamber contains an ideal gas at 60 F and 60 psia. It is expanded to 150cm^3 at the same temperature. What is the new pressure? Please show your work

(2points)

$$\left. \begin{array}{l} V_1 = 100 \text{ cc} \\ P_1 = 60 \text{ psia} \\ V_2 = 150 \text{ cc} \end{array} \right\} @ T = 60^\circ\text{F}$$
$$P_1 V_1 = P_2 V_2$$
$$60(100) = P_2(150)$$
$$\boxed{P_2 = 40 \text{ psia}}$$

20. What is the Darcy's equation defined for gas flow in a linear system? State each of the variables and units used. (4points)

$$q = \frac{kA(P_1^2 - P_2^2)}{\mu P_{ref} L}$$

q = flow rate, cm^3/s

k_{gas} = gas perm, md

$\frac{A}{L}$ = G = geomet. factor, cm

P_1 & P_2 = inject & output press, atm

μ = viscosity, cP

P_{ref} = ref. pressure, atm

21. In determining permeability using gas, When pressures and flow rates are low a phenomenon known as slippage occurs (2points)

22. This phenomenon is known as the Klinkenberg effect (2points)

23. In determining liquid permeability, why is a 1000psi over burden pressure applied? Can we use more? Can we use less? (3points)

Overburden pressure must be at least 3 times greater than the injection pressure for fluid to flow linearly through core and not other areas of the core. More or less of the overburden depends on the injection pressure used.