

# PROBLEMS

Answers to odd-numbered problems will appear at the end of the book.

- \* 1. What is the weight in newtons of an object with a mass of 32.1 kg?
- \* 2. What is the weight in pounds of an object with a mass of 12.4 slugs?

- 3. An object has a mass of 55.3 kg and a volume of  $0.33 \text{ m}^3$ 
  - f A. What is its density? (IN  $\text{kg}/\text{m}^3$ ? ; IN  $\text{g}/\text{cm}^3$ ?)
  - B. What is its specific weight?
  - C. Is the object more or less dense than water?

- 4. An object has a mass of 723 kg and a volume of  $0.56 \text{ m}^3$ 
  - \* A. What is its density? (IN  $\text{kg}/\text{m}^3$ ? ; IN  $\text{g}/\text{cm}^3$ ?)
  - B. What is its specific weight?
  - C. Is it more or less dense than water?

- 7. A constant-head permeameter has a cross-sectional area of  $156 \text{ cm}^2$ . The sample is 18 cm long. At a head of 5 cm, the permeameter discharges  $50 \text{ cm}^3$  in 193 s.

- \* A. What is the hydraulic conductivity in centimeters per second and feet per day?
- B. What is the intrinsic permeability if the hydraulic conductivity was measured at  $15^\circ\text{C}$ ?

- 8. A constant-head permeameter has a cross-sectional area of  $225 \text{ cm}^2$ . The sample is 25 cm long. At a head of 15 cm, the permeameter discharges  $50 \text{ cm}^3$  in 456 s.

- \* A. What is the hydraulic conductivity in centimeters per second and feet per day?
- B. What is the intrinsic permeability if the hydraulic conductivity was measured at  $20^\circ\text{C}$ ?

- 9. An aquifer has a specific yield of 0.19. During a drought period the following declines in the water table were noted:

Area	Size	Decline
A	14 $\text{mi}^2$	2.75 ft
B	7 $\text{mi}^2$	3.56 ft
C	28 $\text{mi}^2$	5.42 ft
D	33 $\text{mi}^2$	7.78 ft

What was the total volume of water represented by the decline in the water table? (IN  $\text{FT}^3$ ? IN GALLONS??)

- \* 11. A confined aquifer has a specific storage of  $7.5 \times 10^{-6} \text{ m}^{-1}$  and a porosity of 0.3. The compressibility of water is  $4.6 \times 10^{-10} \text{ m}^2/\text{N}$ . What is the compressibility of the aquifer skeleton?
- \* 12. A confined aquifer has a specific storage of  $8.8 \times 10^{-6} \text{ m}^{-1}$  and a porosity of 0.25. The compressibility of water is  $4.6 \times 10^{-10} \text{ m}^2/\text{N}$ . What is the compressibility of the aquifer skeleton?
- 13. An aquifer has three different formations. Formation A has a thickness of 30 ft and a hydraulic conductivity of 7.0 ft/day. Formation B has a thickness of 15 ft and a conductivity of 78 ft/day. Formation C has a thickness of 22 ft and a conductivity of 17 ft/day. Assume that each individual formation is isotropic and homogeneous. Compute both the overall horizontal and vertical conductivity.

16. Figure 4.31 is a map showing the ground-water elevations in wells screened in an unconfined aquifer at Milwaukee, Wisconsin. The aquifer is in good hydraulic connection with Lake Michigan, which has a surface elevation of 580 ft above sea level. Lakes and streams are also shown on the map.
- A. Make a water-table map with a contour interval of 50 ft, starting at 550 ft.
- B. Why do you suppose that ground-water levels are below the Lake Michigan surface elevation in part of the area?

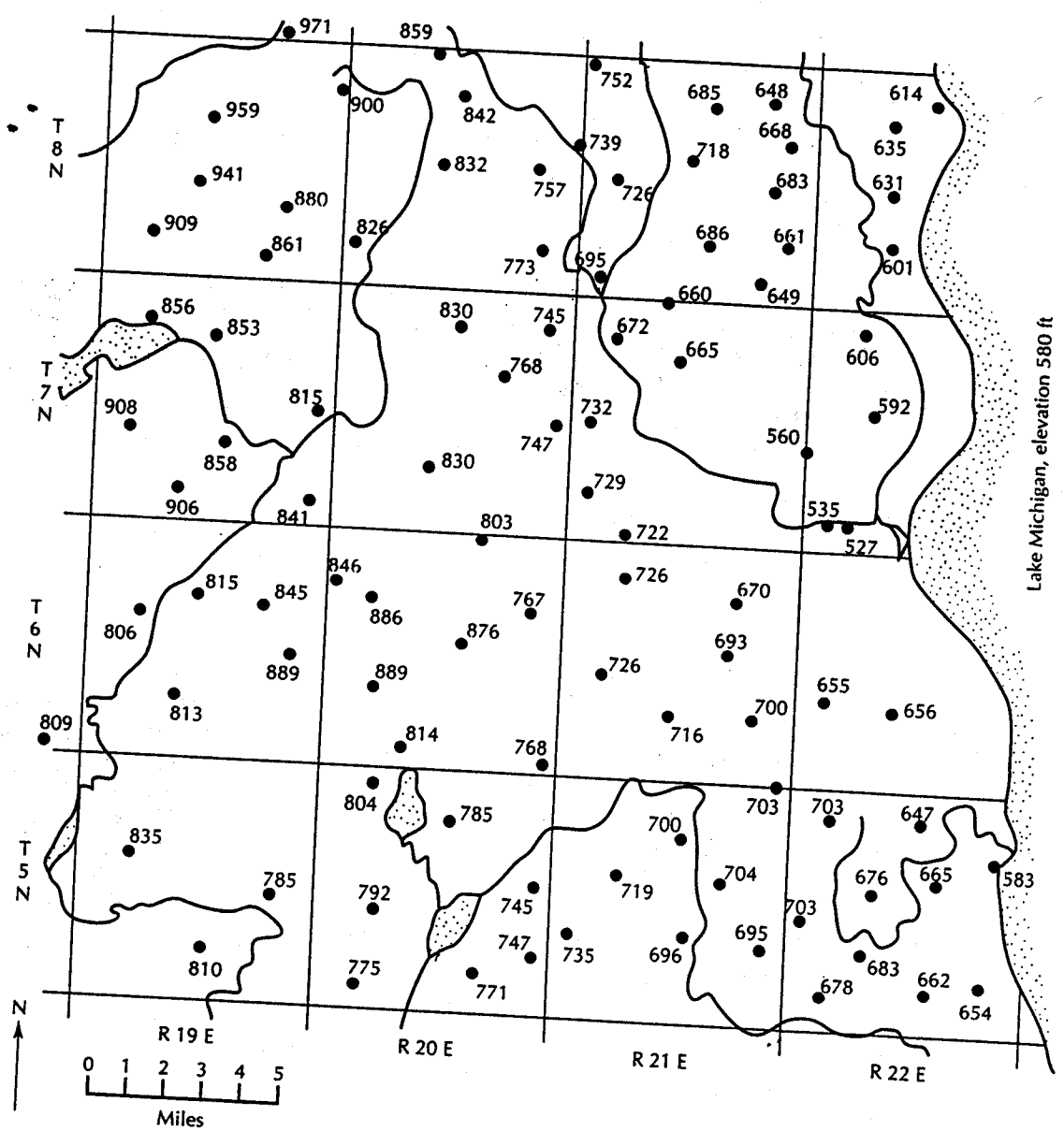


FIGURE 4.31 Base map for Problem 16.

17. A. 5 different solutions were analyzed for hydrogen activity. The following activities were determined:

Solution 1	$10^{-3.8}$
Solution 2	$10^{-6}$
Solution 3	$10^{-4.5}$
Solution 4	$10^{-13}$
Solution 5	$10^{-12.3}$

Determine the pH for each solution.

17. B. 5 different solutions were analyzed for pH with the following results:

Solution 1	pH = 3.6
Solution 2	pH = 13.7
Solution 3	pH = 9
Solution 4	pH = 4.5
Solution 5	pH = 6.3

Determine the hydrogen activity for each.