

CHAPTER 16 The Urinary System

Living produces wastes. Wherever people live or work or play, wastes accumulate. To keep these areas healthy, there must be a method of disposing of these wastes such as a sanitation department.

Wastes accumulate in your body also. The conversion of food and gases into substances and energy necessary for survival results in waste products. A large percentage of these wastes is removed by the urinary system.

Two vital organs, the kidneys, cleanse the blood of the many waste products that are continually produced as a result of the metabolism of food in the body cells. They eliminate these wastes in the form of urine.

Urine formation is the result of three processes: filtration, reabsorption, and secretion. These processes occur in successive portions of the microscopic units of the kidneys known as nephrons. The amount of urine produced by the nephrons is controlled primarily by the hormones ADH and aldosterone.

After urine is produced it is drained from the renal pelvis by the ureters to flow into the bladder. The bladder then stores the urine until it is voided through the urethra.

If waste products are allowed to accumulate in the body they soon become poisonous, a condition called uremia. A knowledge of the urinary system is necessary to understand how the body rids itself of waste and avoids toxicity.

TOPICS FOR REVIEW

Before progressing to Chapter 17, you should have an understanding of the structure and function of the organs of the urinary system. Your review should include knowledge of the nephron and its role in urine production. Your study should conclude with a review of the three main processes involved in urine production and the mechanisms that control urine volume.

KIDNEYS

Circle the correct answer.

1. The outermost portion of the kidney is known as the:
 - A. Medulla
 - B. Papilla
 - C. Pelvis
 - D. Pyramid
 - E. Cortex
2. The sac-like structure that surrounds the glomerulus is the:
 - A. Renal pelvis
 - B. Calyx
 - C. Bowman's capsule
 - D. Cortex
 - E. None of the above
3. The renal corpuscle is made up of the:
 - A. Bowman's capsule and proximal convoluted tubule
 - B. Glomerulus and proximal convoluted tubule
 - C. Bowman's capsule and the distal convoluted tubule
 - D. Glomerulus and the distal convoluted tubule
 - E. Bowman's capsule and the glomerulus
4. Which of the following functions is *not* performed by the kidneys?
 - A. Maintenance of homeostasis
 - B. Removal of wastes from the blood
 - C. Production of ADH
 - D. Removal of electrolytes from the blood
5. _____ percent of the glomerular filtrate is reabsorbed.
 - A. Twenty
 - B. Forty
 - C. Seventy-five
 - D. Eighty-five
 - E. Ninety-nine
6. The glomerular filtration rate is _____ ml per minute.
 - A. 1.25
 - B. 12.5
 - C. 125.0
 - D. 1250.0
 - E. None of the above
7. Glucose is reabsorbed in the:
 - A. Loop of Henle
 - B. Proximal convoluted tubule
 - C. Distal convoluted tubule
 - D. Glomerulus
 - E. None of the above

8. Reabsorption does *not* occur in the:
 - A. Loop of Henle
 - B. Proximal convoluted tubule
 - C. Distal convoluted tubule
 - D. Collecting tubules
 - E. Calyx
9. The greater the amount of salt intake, the:
 - A. Less salt excreted in the urine
 - B. More salt is reabsorbed
 - C. More salt excreted in the urine
 - D. None of the above
10. Which one of the following substances is secreted by diffusion?
 - A. Sodium ions
 - B. Certain drugs
 - C. Ammonia
 - D. Hydrogen ions
 - E. Potassium ions
11. Which of the following statements about ADH is *not* true?
 - A. It is stored by the pituitary gland.
 - B. It makes the collecting tubules less permeable to water.
 - C. It makes the distal convoluted tubules more permeable.
 - D. It is produced by the hypothalamus.
12. Which of the following statements about aldosterone is *not* true?
 - A. It is secreted by the adrenal cortex.
 - B. It is a water-retaining hormone.
 - C. It is a salt-retaining hormone.
 - D. All of the above are correct

Choose the correct term and write the letter in the space next to the appropriate definition below.

- | | |
|-------------|---------------------|
| A. Medulla | H. Uremia |
| B. Cortex | I. Proteinuria |
| C. Pyramids | J. Bowman's capsule |
| D. Papilla | K. Glomerulus |
| E. Pelvis | L. Loop of Henle |
| F. Calyx | M. CAPD |
| G. Nephrons | N. Glycosuria |

- _____ 13. Functioning unit of the urinary system
- _____ 14. Abnormally large amounts of plasma proteins in the urine
- _____ 15. Uremic poisoning
- _____ 16. Outer part of kidney
- _____ 17. Together with Bowman's capsule forms renal corpuscle
- _____ 18. Division of the renal pelvis
- _____ 19. Cup-shaped top of a nephron
- _____ 20. Innermost end of a pyramid
- _____ 21. Extension of proximal tubule
- _____ 22. Triangular-shaped divisions of the medulla of the kidney
- _____ 23. Used in the treatment of renal failure
- _____ 24. Inner portion of kidney



If you have had difficulty with this section, review pages 403-413.

URETERS URINARY BLADDER URETHRA

Indicate which organ is identified by the following descriptions by writing the appropriate letter in the answer blank.

- A. Ureters B. Bladder C. Urethra

- _____ 25. Rugae
- _____ 26. Lower-most part of urinary tract
- _____ 27. Lining membrane richly supplied with sensory nerve endings
- _____ 28. Lies behind pubic symphysis
- _____ 29. Dual function in male
- _____ 30. 11/2 inches long in female
- _____ 31. Drains renal pelvis
- _____ 32. Surrounded by prostate in male
- _____ 33. Elastic fibers and involuntary muscle fibers
- _____ 34. 10 to 12 inches long
- _____ 35. Trigone

Fill in the blanks.

- 36. _____ is the description of the pain caused by the passage of a kidney stone.
- 37. The urinary tract is lined with _____.
- 38. Another name for kidney stones is _____.
- 39. A technique that uses _____ to pulverize stones, thus avoiding surgery, is being used to treat kidney stones.
- 40. The passage of a tube through the urethra into the bladder for the removal of urine is known as _____.
- 41. The _____ is the basinlike upper end of the ureter located inside the kidney.
- 42. In the male, the urethra as a passageway for both urine and _____.
- 43. The external opening of the urethra is the _____.



If you have had difficulty with this section, review pages 412-416.

MICTURITION

Fill in the blanks.

The terms (44) _____, (45) _____, and (46) _____ all refer to the passage of urine from the body or the emptying of the bladder. The sphincters guard the bladder. The (47) _____ sphincter is located at the bladder (48) _____ and is involuntary. The external urethral sphincter circles the (49) _____ and is under (50) _____ control.

As the bladder fills, nervous impulses are transmitted to the spinal cord and an (51) _____ is initiated. Urine then enters the (52) _____ to be eliminated.

Urinary (53) _____ is a condition in which no urine is voided. Urinary (54) _____ is when the kidneys do not produce any urine, but the bladder retains its ability to empty itself. Complete destruction or transection of the sacral cord produces an (55) _____.



If you have had difficulty with this section, review pages 415-416.

UNSCRAMBLE THE WORDS

56. AYXLC

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57. GVNODI

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58. ALPALIP

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59. SGULLOUMRE

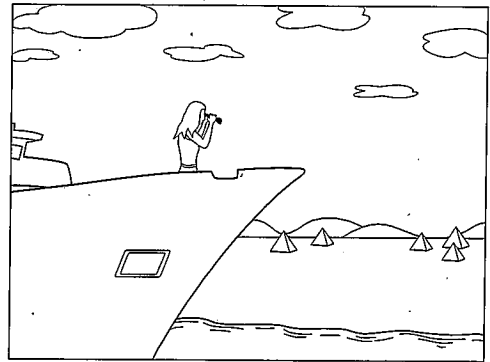
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Take the circled letters, unscramble them, and fill in the statement.

What Betty saw while cruising down the Nile.

60.

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APPLYING WHAT YOU KNOW

61. John suffered from low levels of ADH. What primary urinary symptom would he notice?
-
62. Bud was in a diving accident and his spinal cord was severed. He was paralyzed from the waist down and as a result was incontinent. His physician was concerned about the continuous residual urine buildup. What was the reason for concern?
-
63. Mrs. Peace had a prolonged surgical procedure and experienced problems with urinary retention postoperatively. A urinary catheter was inserted into her bladder for the elimination of urine. Several days later, Mrs. Peace developed cystitis. What might be a possible cause?
-

64. WORD FIND

Can you find 18 terms from this chapter? Words may be spelled top to bottom, bottom to top, right to left, left to right, or diagonally.

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C C C B W E F F L J V G G S
A T N L W E U O Z I E L I B
R K K P Z F R I T P O Y K L
B Q M I N E R A L S J C C P
O S S N C X M I D B D O W P
H S I Y O I T X H I N L S N
Y E L N N I K W W D S Y N S
D G O S O W T I U E H S C N
R M B Y T I W C Z N N I A A
A R A Q W A T B E I G S J M
T E T F N I F A E V E W T Y
E V A P O R A T I O N D T E
S I C N E S O P I D A O F E
H L Y K I R E B V P A H C J
I W E E P A D F T E A R G G
    
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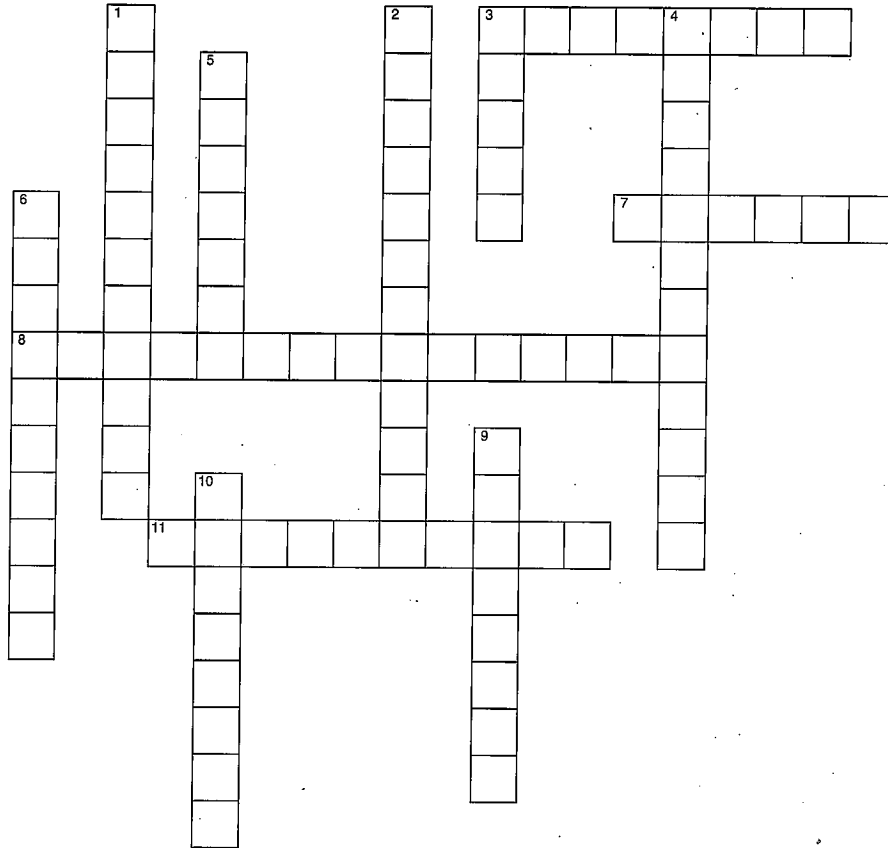
ATP	Conduction	Liver
Adipose	Convection	Minerals
BMR	Evaporation	Proteins
Bile	Fats	Radiation
Carbohydrates	Glycerol	TMR
Catabolism	Glycolysis	Vitamins

DID YOU KNOW?

If the tubules in a kidney were stretched out and untangled, there would be 70 miles of them.

URINARY SYSTEM

Fill in the crossword puzzle.



Across

3. Bladder infection
7. Absence of urine
8. Passage of a tube into the bladder to withdraw urine
11. Network of blood capillaries tucked into Bowman's capsule

Down

1. Urination
2. Ultrasound generator used to break up kidney stones
3. Division of the renal pelvis
4. Voiding involuntarily
5. Area on posterior bladder wall free of rugae
6. Glucose in the urine
9. Large amount of urine
10. Scanty urine

CHECK YOUR KNOWLEDGE

Multiple Choice

Circle the correct answer.

1. Which of the following is *true* of urinary catheterization?
 - A. It can be used to treat retention.
 - B. It requires aseptic technique.
 - C. It can lead to cystitis.
 - D. All of the above
2. Which of the following processes are used by the artificial kidney to remove waste materials from blood?
 - A. Pinocytosis
 - B. Dialysis
 - C. Catheterization
 - D. Active transport
3. Failure of the kidneys to remove wastes from the blood will result in which of the following?
 - A. Retention
 - B. Anuria
 - C. Incontinence
 - D. Uremia
4. Hydrogen ions are transferred from blood back into the nephron during which of the following processes?
 - A. Secretion
 - B. Filtration
 - C. Reabsorption
 - D. All of the above
5. Which of the following conditions would be considered normal in an infant under 2 years of age?
 - A. Retention
 - B. Cystitis
 - C. Incontinence
 - D. Anuria
6. Which of the following steps involved in urine formation allows the blood to retain most body nutrients?
 - A. Secretion
 - B. Filtration
 - C. Reabsorption
 - D. All of the above

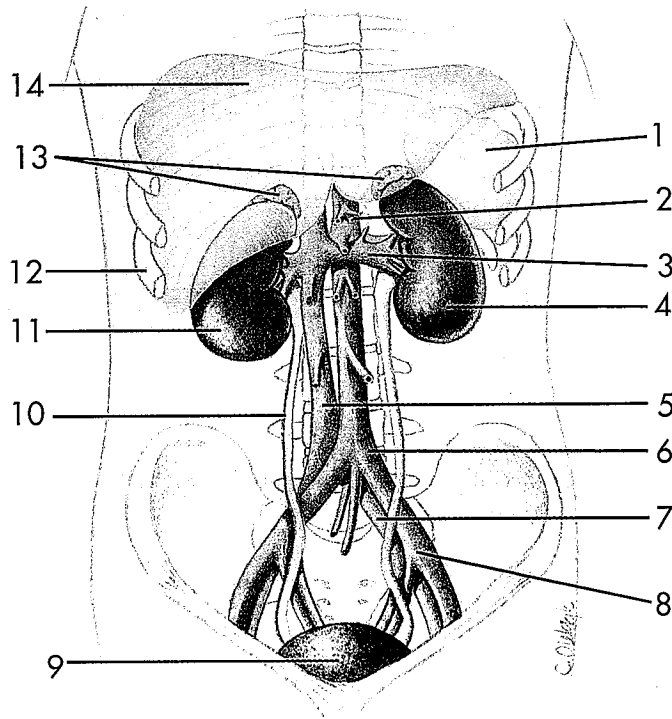
7. Voluntary control of micturition is achieved by the action of which of the following?
 - A. Internal urethral sphincter
 - B. External urethral sphincter
 - C. Trigone
 - D. Bladder muscles
8. What is the structure that carries urine from the kidney to the bladder called?
 - A. Urethra
 - B. Bowman's capsule
 - C. Ureter
 - D. Renal pelvis
9. What are the capillary loops contained within Bowman's capsule called?
 - A. Convoluted tubules
 - B. Glomeruli
 - C. Limbs of Henle
 - D. Collecting ducts
10. The triangular divisions of the medulla of the kidney are known as:
 - A. Pyramids
 - B. Papillae
 - C. Calyces
 - D. Nephrons

Matching

Match the term on the left with the proper selection on the right.

- | | |
|---|---|
| <p>_____ 11. Retention</p> <p>_____ 12. Anuria</p> <p>_____ 13. Cystitis</p> <p>_____ 14. Micturition</p> <p>_____ 15. Oliguria</p> <p>_____ 16. Polyuria</p> <p>_____ 17. Incontinence</p> <p>_____ 18. Proteinuria</p> <p>_____ 19. Suppression</p> <p>_____ 20. Reabsorption</p> | <p>A. Involuntary voiding</p> <p>B. Movement of substance out of the renal tubules and into the blood</p> <p>C. Absence of urine</p> <p>D. Urination</p> <p>E. Bladder does not empty</p> <p>F. Inflammation of the urinary bladder</p> <p>G. Large amount of protein in urine</p> <p>H. Large amount of urine</p> <p>I. Kidneys not producing urine</p> <p>J. Scanty amount of urine</p> |
|---|---|

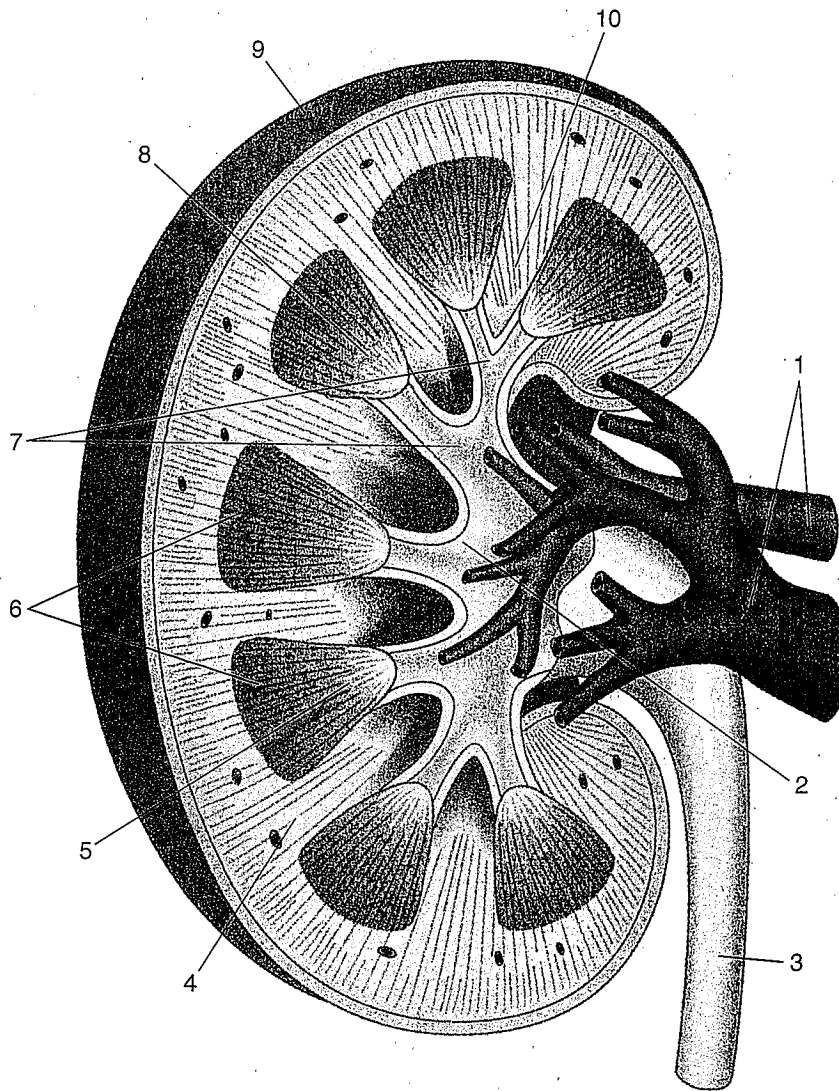
Urinary System



1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____

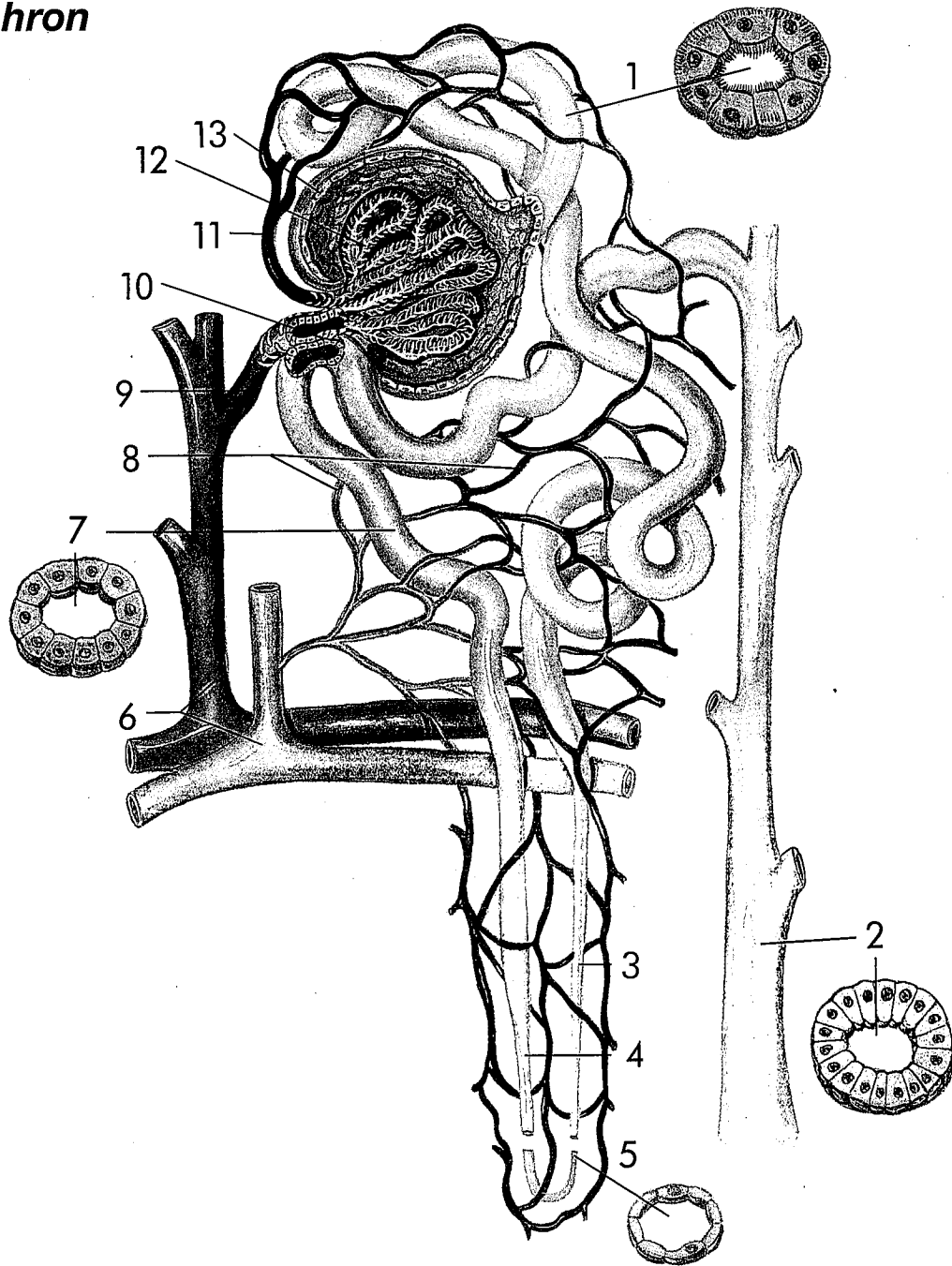
Kidney



- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____

- 6. _____
- 7. _____
- 8. _____
- 9. _____
- 10. _____

Nephron



1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

8. _____
9. _____
10. _____
11. _____
12. _____
13. _____