1. The major buffer of blood is hemoglobin because:
   a. it has a heme group
   b. it binds O₂
   c. it has large numbers of histidine residues with an effective pKₐ of 7.3
   d. it binds CO₂
   e. it catalyzes the reaction between CO₂ and H₂O

2. The primary buffer of plasma is:
   a. albumin
   b. phosphate
   c. bicarbonate
   d. hemoglobin
   e. all of the above

3. Respiratory alkalosis can be seen in patients with:
   a. severe diarrhea
   b. pneumonia
   c. hysterical hyperventilation
   d. hyperkalemia
   e. morphine poisoning

4. The usual, primary, compensatory response to a metabolic acid-base disorder is renal.
   a. true
   b. false

5. The major waste metabolite of cells is CO₂, which is carried in RBC’s to the lungs for removal.
   a. true
   b. false

6. A patient’s pH, HCO₃, PCO₂ are 7.42, 24, and 40 respectively. How would you expect these values to change, if at all, if the patient subsequently had a serum lactate of 31.5 mEq/l?
   a. pH increases, HCO₃ increases
   b. pH increases, HCO₃ decreases
   c. pH and HCO₃ remain the same
   d. pH decreases, HCO₃ increases
   e. pH decreases, HCO₃ decreases

7. A three year old boy was brought unconscious into the emergency room. Blood gases were performed. This patient demonstrates:
   a. metabolic alkalosis
   b. metabolic acidosis
   c. respiratory acidosis
   d. respiratory alkalosis
e. compensated metabolic acidosis

pH 7.26
PCO₂ 54 mm Hg
HCO₃ 38 mEq/L
Base excess +14 mEq/L

8. The red cell contains more Cl⁻ in:
   a. arterial blood than venous blood
   b. venous blood than arterial blood
   c. no difference between a and b

9. Given: pH = 7.2, PCO₂ = 83 mm Hg, PO₂ = 53 mm Hg, [HCO₃] = 31 mEq/L. The most probable diagnosis is:
   a. uncompensated respiratory acidosis
   b. partially compensated metabolic acidosis
   c. uncompensated respiratory alkalosis
   d. totally compensated metabolic alkalosis
   e. laboratory error

10. Given: pH = 7.47, PCO₂ = 75, PO₂ = 93, [HCO₃] = 37 mEq/L. The most probable diagnosis is:
    a. uncompensated respiratory acidosis
    b. partially compensated metabolic acidosis
    c. uncompensated respiratory alkalosis
    d. partially compensated metabolic alkalosis
    e. laboratory error

11. Given: pH = 7.4, PCO₂ = 85 mm Hg, PO₂ = 85 mm Hg, [HCO₃] = 67 mEq/L. The most probable diagnosis is:
    a. uncompensated respiratory acidosis
    b. partially compensated metabolic acidosis
    c. uncompensated respiratory alkalosis
    d. totally compensated metabolic alkalosis
    e. laboratory error

FOR QUESTIONS 12 - 14:
Given the following laboratory information on patient:

- pH = 7.1
- PO₂ = 100 mm Hg
- pKₐ = 6.1
- PCO₂ = 20 mm Hg
- a = 0.031
• BUN = 20 mm Hg
• Creat. = 16 mg/L
• Glucose = 6450 mg/L
• Protein = 86 g/L

12. What is the [HCO$_3^-$] in mEq/L in this patient?
   a. 36.8
   b. 26.8
   c. 16.8
   d. 6.3
   e. 0.68

13. What is the total CO$_2$ content (in mEq/L) of this patient’s serum?
   a. 17.5
   b. 6.9
   c. 27.5
   d. 37.5
   e. 20.7

14. This person is most likely in a:
   a. metabolic alkalosis
   b. respiratory alkalosis
   c. metabolic acidosis
   d. respiratory acidosis
   e. cannot tell with information given

15. Which of the following terms can be used to further describe this patient’s acid-base condition?
   a. uncompensated
   b. totally compensated

16. A 34 year old woman entered the emergency room comatose. She was suspected of taking an overdose of an unknown drug. Her blood gas results are below. This patient demonstrates:
   a. metabolic alkalosis
   b. metabolic acidosis
   c. respiratory alkalosis
   d. respiratory acidosis
   e. compensated metabolic acidosis

\[
\begin{array}{ll}
pH & 7.15 \\
PCO_2 & 80 \text{ mm Hg} \\
HCO_3^- & 28 \text{ mEq/L}
\end{array}
\]
Base excess
-5 mEq/L

PO₂
60 mm Hg

Oxygen saturation
80%

17. If a sample had a total CO₂ of 40 mmol/L and a PCO₂ of 28 mm Hg, the blood pH would probably:
   a. indicate an acidemia
   b. indicate an alkalemia
   c. indicate a normal value
   d. not be able to be calculated from the available data
   e. indicate lab error

18. A person’s blood buffering capacity is not dependent upon hemoglobin levels, but upon the plasma ratio of HCO₃⁻ /(\alpha)PCO₂:
   a. true
   b. false

Use the following Key to answer Questions 18 - 27:
   a. 1, 2, and 3 are correct
   b. 1 and 3 are correct
   c. 2 and 4 are correct
   d. only 4 is correct
   e. all are correct

19. On a blood gas instrument, which of the following are directly measured values?
   1. H₂CO₃
   2. total CO₂
   3. [HCO₃⁻]
   4. pH

20. Which of the following statements is (are) true concerning measurement of oxygen saturation?:
   1. can be estimated by a blood-gas instrument
   2. can be measured directly by a blood-gas instrument
   3. can be measured spectrophotometrically
   4. can be measured by enzymatic analysis

21. Which of the following can cause a "shift to the right" of the hemoglobin-oxygen dissociation curve?:
   1. decreased pH
   2. increased CO₂
   3. increased 2,3 diphosphoglycerate (2,3 DPG)
   4. increased temperature
22. Ventilation is controlled by:
   1. pH sensitive receptors of the kidney
   2. pH chemoreceptors in the carotid artery
   3. pH chemoreceptors in the lung
   4. pH sensitive receptors of the brain

23. CO₂ can be transported in the following forms:
   1. covalently bound to protein
   2. as dissolved CO₂
   3. as bicarbonate
   4. as a hemoglobin-bicarbonate complex

24. The major difference(s) between expired air and atmospheric air is (are):
   1. expired air has lower PO₂
   2. expired air has lower PCO₂

25. The renal compensatory responses to a metabolic acidosis are:
   1. increased sodium excretion
   2. increased bicarbonate reabsorption
   3. to produce an alkaline urine
   4. increased hydrogen ion excretion

26. Which of the following can lead to an acidosis?
   1. ingestion of methanol
   2. renal dysfunction
   3. diarrhea
   4. hypochloremia

27. An elevated anion gap is associated with which of the following disorders:
   1. Diabetic ketoacidosis
   2. Lactic acidosis
   3. Dehydration
   4. Asthma

28. Which of the following is not a cause of asthma?:
   a. cockroaches
   b. dogs
   c. cats
   d. plastic ware
   e. plant pollen

29. Allergic response to latex products can be a problem for laboratory workers using disposable gloves?
   a. True
b. False

**Answer:**

1. c (p. 465)
2. c (p. 464)
3. c (p. 475)
4. b (p. 473)
5. b (p. 465)
6. e (p. 471, 473)
7. c (p. 473-474)
8. b (p. 465, 468)
9. a (p. 473-474)
10. d (p. 474-475)
11. e (p. 473)
12. d (p. 464, 471)
13. b (p. 464, 467)
14. c (p. 471, 473)
15. a (p. 473)
16. d (p. 473-474)
17. e (p. 473)
18. b (p. 464, 467)
19. d (p. 471)
20. b (p. 469-470)
21. e (p. 468)
22. c (p. 466)
23. a (p. 465, 467)
24. b (p. 466)
25. c (p. 469, 473)
26. a (p. 471-473)
27. a (p. 470)
28. d (p. 473-474)
29. a (p. 474, 33-34)