1. Which statement best explains why fluid balance is tightly linked to electrolyte balance?

A. Electrolytes are the main source of metabolic water

B. Electrolytes determine osmotic gradients across compartments

C. Electrolytes prevent diffusion between compartments

D. Electrolytes are stored mainly in bones

2. The primary factor that determines ECF volume under normal physiological conditions is:

A. Rate of metabolic water production

B. Renal loss of potassium

C. Urinary loss of sodium and chloride

D. Capillary oncotic pressure

3. Cells neither shrink nor swell under normal conditions because:

A. Intracellular fluid has higher osmolarity

B. Interstitial and intracellular osmolarities are equal

C. Sodium easily diffuses into cells

D. Potassium channels prevent osmotic changes

4. Excessive water intake without adequate electrolyte replacement results in cellular swelling because:

A. ADH secretion rises dramatically

B. Interstitial osmolarity decreases

C. Sodium shifts into the cells directly

D. Plasma proteins increase water retention

5. In dehydration, the initial stimulus that activates the thirst center is mainly:

A. Drop in blood potassium

B. Increased interstitial volume

C. Increased osmolarity of body fluids

D. Overactivity of ANP

6. Which hormonal combination promotes the greatest retention of sodium?

A. High ANP, high ADH

B. High aldosterone, low ANP

C. Low aldosterone, high ANP

D. Low ADH, low aldosterone

7. A patient with hyponatremia will show decreased ADH secretion primarily to:

A. Promote sodium secretion

B. Increase water excretion

C. Stimulate aldosterone release

D. Expand intracellular fluid volume

8. Chloride concentration is closely tied to sodium concentration because:

A. They share identical renal transporters

B. Chloride is actively pumped with potassium

C. Chloride follows sodium due to electrical neutrality

D. Sodium cannot cross membranes without chloride

9. Potassium plays a crucial role in pH regulation mainly by:

A. Exchanging with hydrogen ions across cell membranes

B. Increasing bicarbonate buffer activity

C. Controlling renal water reabsorption

D. Stimulating carbonic anhydrase

10. Hyperkalemia can be fatal because it:

A. Causes respiratory alkalosis

B. Depresses action potential initiation

C. Triggers ventricular fibrillation

D. Prevents calcium release in muscles

11. Bicarbonate levels rise in systemic venous blood because:

A. C■ binds directly to hemoglobin

B. Carbonic acid dissociates as C■ enters the blood

C. Kidneys release bicarbonate during exercise

D. Pulmonary capillaries absorb bicarbonate

12. The kidneys regulate bicarbonate by:

A. Filtering it freely with no reabsorption

B. Only secreting it into the urine

C. Forming new bicarbonate or excreting excess

D. Exchanging it for potassium in the nephron

13. The strongest physiological stimulus for PTH secretion is:

A. Hyperphosphatemia

B. Low plasma calcium

C. High calcitriol levels

D. Low sodium intake

14. PTH decreases blood phosphate because it:

A. Inhibits absorption in the intestines

B. Blocks bone resorption

C. Inhibits renal tubular phosphate reabsorption

D. Converts phosphate into bicarbonate

15. Magnesium deficiency may impair PTH secretion because magnesium:

A. Is stored mainly in the liver

B. Acts as a cofactor for PTH release

C. Is a major extracellular cation

D. Blocks calcium channels in the parathyroid glands

16. The phosphate buffer system is most effective in:

A. Blood plasma

B. The cytosol

C. Synovial fluid

D. Cerebrospinal fluid

17. Protein buffering capacity is high because proteins:

A. Are highly abundant and contain both acidic and basic groups

B. Are easily filtered into urine

C. Form strong acids when dissociated

D. Cannot bind hydrogen ions

18. Hemoglobin is a powerful buffer because it:

A. Increases bicarbonate filtration

B. Binds hydrogen ions when deoxygenated

C. Converts CO■ into bicarbonate

D. Releases OH■ during oxygenation

19. The carbonic acid–bicarbonate buffer system cannot compensate for:

A. Metabolic acidosis

B. Respiratory disturbances

C. Metabolic alkalosis

D. Excessive bicarbonate loss

20. Hyperventilation leads to alkalosis because:

A. CO■ accumulates

B. Bicarbonate is converted to carbonic acid

C. Hydrogen ion concentration decreases

D. Carbonic anhydrase becomes inactive

21. Hypoventilation results in acidosis due to:

A. Loss of bicarbonate in urine

B. Retention of CO■ and increased hydrogen ions

C. Excess chloride retention

D. Increased renal filtration of acids

22. A patient with pH 7.30 and high CO■ is likely experiencing:

A. Metabolic alkalosis

B. Respiratory acidosis

C. Metabolic acidosis

D. Respiratory alkalosis

23. Compensation for respiratory acidosis involves:

A. Hyperventilation

B. Renal excretion of hydrogen ions

C. Increased PTH release

D. Decreased bicarbonate production

24. Someone breathing into a paper bag helps correct respiratory alkalosis because:

A. It increases oxygen levels

B. It increases inhaled C□■

C. It reduces metabolic acid production

D. It enhances bicarbonate secretion

25. Severe diarrhea may cause metabolic acidosis because of:

A. Excessive loss of hydrogen ions

B. Excessive loss of bicarbonate

C. Increased renal bicarbonate release

D. Increased aldosterone secretion

26. In metabolic acidosis, the primary respiratory response is:

A. Slow shallow breathing

B. Rapid deep breathing

C. Irregular breathing

D. Breath holding

27. Metabolic alkalosis may result from:

A. Excess carbon dioxide retention

B. Inability to excrete bicarbonate

C. Loss of gastric hydrochloric acid

D. Increased production of lactic acid

28. The buffer system that acts within fractions of a second is the:

A. Respiratory mechanism

B. Renal excretion

C. Chemical buffer systems

D. Gastrointestinal buffering

29. A rise in C□■ concentration in the blood causes the reaction to shift:

A. Toward decreased hydrogen ions

B. Toward formation of carbonic acid

C. Toward decreased carbonic acid

D. Toward decreased bicarbonate

30. Which condition would most likely cause overexcitability of neurons?

A. Metabolic acidosis

B. Severe hyperkalemia

C. Respiratory alkalosis

D. Hyponatremia

31. ANP promotes sodium loss primarily by:

A. Increasing ADH secretion

B. Increasing GFR and inhibiting sodium reabsorption

C. Stimulating aldosterone secretion

D. Increasing potassium secretion

32. Excessive sweating without electrolyte replacement typically leads to:

A. Hypernatremia

B. Hypokalemia

C. Hypermagnesemia

D. Hyponatremia

33. Which electrolyte imbalance can directly impair action potential repolarization?

A. Hypocalcemia

B. Hyperkalemia

C. Hypermagnesemia

D. Hyponatremia

34. The major intracellular cation responsible for membrane potential stability is:

A. Sodium

B. Calcium

C. Potassium

D. Magnesium

35. A patient with low HCO■■ and normal CO■ likely has:

A. Respiratory acidosis

B. Metabolic acidosis

C. Respiratory alkalosis

D. Metabolic alkalosis

----- END OF QUESTIONS -----

Answer Key:

1. B
2. C
3. B
4. B
5. C
6. B
7. B
8. C
9. A
10. C
11. B
12. C
13. B
14. C
15. B
16. B
17. A
18. B
19. B
20. C
21. B
22. B
23. B
24. B
25. B
26. B
27. C

28. C
29. B
30. C
31. B
32. D
33. B
34. C
35. B

28. C
29. B
30. C
31. B
32. D
33. B
34. C
35. B