CHAPTER 10

WATER & ELECTROLYTE BALANCE

1. The total body water in various subjects is relatively constant when expressed as percentage of the lean body mass and is about

(A). 30% (B) 40%
(C) 50% (D) 70%

2.. The percentage of water contained in the body of an individual is less because of

(A) High fat content (B) Low fat content
(C) High protein content (D) Low protein content

3. In intracellular compartment the fluid present in ml/kg body weight is about

(A) 100 (B) 200
(C) 200 (D) 330

4. In extra cellular compartment, the fluid present in ml/kg of body weight is about

(A) 120 (B) 220
(C) 270 (D) 330

5. Fluid present in dense connective tissue and cartilage in ml/kg body weight is about

(A) 10 (B) 20
(C) 45 (D) 55

6. The total body water in ml/kg body weight in average normal young adult male is about

(A) 200 (B) 400
(C) 600 (D) 1000

7. The fluid present in bones which can not be exchanged readily because of relative avascularity is about

(A) 20 ml/kg (B) 25 ml/kg
(C) 45 ml/kg (D) 60 ml/kg

8. Water derived in gm from complete oxidation of each gm of carbohydrate is about

(A) 0.15 (B) 0.25
(C) 0.35 (D) 0.55

9. The oxidation of 100 gm of fat yields

(A) 50 gm water (B) 107 gm water
(C) 150 gm water (D) 200 gm water

10. Each gm of protein on complete oxidation yields

(A) 0.21 gm water (B) 0.31 gm water
(C) 0.41 gm water (D) 0.51 gm water

11. The daily total body water derived from oxidation of food stuffs is about

(A) 100 ml (B) 300 ml
(C) 600 ml (D) 1000 ml

12. The daily water allowance for normal infant is about

(A) 100–200 ml (B) 250–300 ml
(C) 330–1000 ml (D) 1000–2000 ml

13. The daily water allowance for normal adult (60 kg) is about

(A) 200–600 ml (B) 500–800 ml
(C) 800–1500 ml (D) 1800–2500 ml

14. Insensible loss of body water of normal adult is about

(A) 50–100 ml (B) 100–200 ml
(C) 300–500 ml (D) 600–1000 ml

15. The predominant cation of plasma is

(A) Na^+ (B) K^+
(C) Ca^+ (D) Mg^{++}

16. The predominant action of plasma is

(A) HCO_3– (B) Cl–
(C) HPO_4– – (D) SO_4 – –

17. Vasopressin (ADH)

(A) Enhance facultative reabsorption of water
(B) Decreases reabsorption of water
(C) Increases excretion of calcium
(D) Decreases excretion of calcium

18. Enhanced facultative reabsorption of water by Vasopressin is mediated by

(A) Cyclic AMP (B) Ca^{++}
(C) Cyclic GMP (D) Mg^{++}

19. Action of kinins is to

(A) Increase salt excretion
(B) Decrease salt retention
(C) Decrease water retention
(D) Increase both salt and water excretion

20. The activity of kinins is modulated by

(A) Prostaglandins
(B) Ca^{++}
(C) Increased cAMP level
(D) Increased cGMP level

21. An important cause of water intoxication is

(A) Nephrogenic diabetes insipidus
(B) Renal failure
(C) Gastroenteritis
(D) Fanconi syndrome

22. Minimum excretory urinary volume for waste products elimination during 24 hrs is

(A) 200–300 ml (B) 200–400 ml
(C) 500–600 ml (D) 800 ml

23. In primary dehydration

(A) Intracellular fluid volume is reduced
(B) Intracellular fluid volume remains normal
(C) Extracellular fluid volume is much reduced
(D) Extracellular fluid volume is much increased

24. An important cause of secondary dehydration is

(A) Dysphagia
(B) Oesophageal varices
(C) Oesophageal varices
(D) Gastroenteritis

25. Important finding of secondary dehydration is

(A) Intracellular oedema
(B) Cellular dehydration
(C) Thirst
(D) Muscle cramps

26. Urine examination in secondary dehydration shows

(A) Ketonuria
(B) Low specific gravity
(C) High specific gravity
(D) Albuminuria

27. The total calcium of the human body is about

(A) 100–150 g (B) 200–300 g
(C) 1–1.5 kg (D) 2–3 kg

28. Daily requirement of calcium for normal adult human is

(A) 100 mg (B) 800 mg
(C) 2 g (D) 4 g

29. Normal total serum calcium level varies between

(A) 4–5 mg (B) 9–11 mg
(C) 15–20 mg (D) 50–100 mg

30. The element needed in quantities greater than 100 mg for human beings is

(A) Calcium (B) Zinc
(C) Selenium (D) Cobalt

31. The mineral present in the human body in larger amounts than any other cation is

(A) Sodium (B) Calcium
(C) Potassium (D) Iron

32. The percentage of the total body calcium present in bones is

(A) 1 (B) 11
(C) 55 (D) 99

33. The percentage of calcium present in extracellular fluid is

(A) 1 (B) 5
(C) 10 (D) 50

34. The physiologically active form of calcium is

(A) Protein bond
(B) Ionised
(C) Complexed with citrate
(D) Complexed with carbonate

35. The normal concentration of calcium in C.S.F is

(A) 1.5–2.5 mg/100 ml
(B) 2.5–4 mg/100 ml
(C) 4.5–5 mg/100 ml
(D) 9–10 mg/100 ml

36. Absorption of calcium is increased on a

(A) High protein diet (B) Low protein diet
(C) High fat diet (D) Low fat diet

37. Calcium absorption is interfered by

(A) Protein in diet
(B) Phytic acid in cereals
(C) Alkaline intestinal pH
(D) Vitamin D

38. Calcium absorption is increased by

(A) Vitamin D (B) Vitamin C
(C) Vitamin K (D) Vitamin E

39. In serum product of Ca x p (in mg/100ml) in children is normally

(A) 20 (B) 30
(C) 50 (D) 60

40. In ricket, the product of Ca x p (in mg/100 ml) in serum is below

(A) 30 (B) 50
(C) 70 (D) 100

41. In man, the amount of calcium in gms filtered in 24 hrs period by the renal glomeruli is

(A) 5 (B) 10
(C) 15 (D) 20

42. The percentage of the calcium eliminated in feces is

(A) 10–20 (B) 30–40
(C) 50–60 (D) 70–90

43. The maximal renal tubular reabsorptive capacity for calcium (Tmca) in mg/min is about

(A) 1.5 ± 0.1 (B) 4.99 ± 0.21
(C) 5.5 ± 1.2 (D) 10.2 ± 2.2

44. Renal ricket is caused by renal tubular defect (usually inherited) which interferes with reabsorption of

(A) Calcium (B) Phosphorous
(C) Sodium (D) Chloride

45. After operative removal of the parathyroid glands resulting into hypoparathyroidism the concentration of the serum calcium may drop below

(A) 11 mg (B) 10 mg
(C) 9 mg (D) 7 mg

46. One of the principal cations of soft tissue and body fluids is

(A) Mg (B) S
(C) Mn (D) Co

47. The normal concentration of magnesium in whole blood is

(A) 0–1 mg/100 ml (B) 1–2 mg/100 ml
(C) 2–4 mg/100 ml (D) 4–8 mg/100 ml

48. The normal concentration of magnesium in C.S.F is about

(A) 1 mg/100 ml (B) 3 mg/100 ml
(C) 5 mg/100 ml (D) 8 mg/100 ml

49. The magnesium content of muscle is about

(A) 5 mg/100 ml (B) 10 mg/100 ml
(C) 21 mg/100 ml (D) 50 mg/100 ml

50. Intestinal absorption of magnesium is increased in

(A) Calcium deficient diet
(B) High calcium diet
(C) High oxalate diet
(D) High phytate diet

51. Deficiency of magnesium may occur with

(A) Alcoholism
(B) Diabetes mellitus
(C) Hypothyroidism
(D) Advanced renal failure

52. Hypermagnesemia may be observed in

(A) Hyperparathyroidism
(B) Diabetes mellitus
(C) Kwashiorkar
(D) Primary aldosteronism

53. Na^+/K^+-ATPase along with ATP requires

(A) Ca (B) Mn
(C) Mg (D) Cl

54. The principal cation in extracellular fluid is

(A) Sodium (B) Potassium
(C) Calcium (D) Magnesium

55. The normal concentration of sodium (in mg/100 ml) of human plasma is

(A) 100 (B) 200
(C) 250 (D) 330

56. A decrease in serum sodium may occur in

(A) Adrenocortical insufficiency
(B) Hypoparathyroidism
(C) Hyperparathyroidism
(D) Thyrotoxicosis

57. Hypernatremia may occur in

(A) Diabetes insipidus
(B) Diuretic medication
(C) Heavy sweating
(D) Kidney disease

58. The metabolism of sodium is regulated by the hormone:

(A) Insulin (B) Aldosterone
(C) PTH (D) Somatostatin

59. The principal cation in intracellular fluid is

(A) Sodium (B) Potassium
(C) Calcium (D) Magnesium

60. The normal concentration of potassium in whole blood is

(A) 50 mg/100 ml (B) 100 mg/100 ml
(C) 150 mg/100 ml (D) 200 mg/100 ml

61. The normal concentration of potassium in human plasma in meq/l is about

(A) 1 (B) 2
(C) 3 (D) 5

62. The normal concentration of potassium in cells in ng/100 ml is about

(A) 100 (B) 200
(C) 350 (D) 440

63. Potassium content of nerve tissue in mg/100 ml is about

(A) 200 (B) 330
(C) 400 (D) 530

64. Potassium content of muscle tissue in mg/100 ml is about

(A) 50–100 (B) 100–150
(C) 250–400 (D) 150–200

65. One of the symptoms of low serum potassium concentration includes

(A) Muscle weakness
(B) Confusion
(C) Numbness
(D) Tingling of extremities

66. Potassium metabolism is regulated by the hormone:

(A) Aldosterone (B) PTH
(C) Somatostatin (D) Estrogen

67. A high serum potassium, accompanied by a high intracellular potassium occurs in

(A) Adrenal insufficiency
(B) Any illness
(C) Gastrointestinal losses
(D) Cushing's syndrome

68. Hypokalemia occurs in

(A) Cushing's syndrome
(B) Addison's disease
(C) Renal failure
(D) Advanced dehydration

69. Cardiac arrest may occur due to over doses of

(A) Sodium (B) Potassium
(C) Zinc (D) Magnesium

70. The normal concentration of chloride in mg/100 ml of whole blood is about

(A) 200 (B) 250
(C) 400 (D) 450

71. The normal concentration of chloride in mg/100 ml of plasma is about

(A) 100 (B) 200
(C) 365 (D) 450

72. The normal concentration of chlorine in mg/100 ml of C.S.F is about

(A) 200 (B) 250
(C) 300 (D) 440

73. Hypokalemia with an accompanying hypochloremic alkalosis may be observed in

(A) Cushing's syndrome (B) Addison's disease
(C) Hyptothyroidism (D) Malnutrition

74. Hypercholremia is associated with

(A) Hyponatremia (B) Hypernatremia
(C) Metabolic alkalosis (D) Respiratory acidosis

75. The exclusive function of iron in the body is confined to the process of

(A) Muscular contraction
(B) Nerve excitation
(C) Cellular respiration
(D) Blood coagulation

76. The normal pH of the blood is

(A) 7.0 (B) 7.1
(C) 7.2 (D) 7.4

77. The normal concentration of bicarbonate in blood is

(A) 21 meq/L (B) 24 meq/L
(C) 26 meq/L (D) 30 meq/L

78. At the pH of blood 7.4, the ratio between the carbonic acid and bicarbonate fractions is

(A) 1 : 10 (B) 1 : 20
(C) 1 : 30 (D) 1 : 40

79. A 0.22 M solution of lactic acid (pK_a 3.9) was found to contain 0.20 M in the dissociated form and 0.02 M undissociated form, the pH of the solution is

(A) 2.9 (B) 3.3
(C) 4.9 (D) 5.4

80. Important buffer system of extracellular fluid is

(A) Bicarbonate/carbonic acid
(B) Disodium hydrogen phosphate/sodium dihydrogen phosphate
(C) Plasma proteins
(D) Organic Phosphate

81. The pH of body fluids is stabilized by buffer systems. The compound which will be the most effective buffer at physiologic pH is

(A) Na_2HPO_4 pK_a = 12.32
(B) Na_2HPO_4 pK_a=7.21
(C) NH_4OH pK_a = 7.24
(D) Citric acid pK_a = 3.09

82. The percentage of CO_2 carrying capacity of whole blood by hemoglobin and oxyhemoglobin is

(A) 20 (B) 40
(C) 60 (D) 80

83. The normal serum CO_2 content is

(A) 18–20 meq/L (B) 24–29 meq/L
(C) 30–34 meq/L (D) 35–38 meq/L

84. The carbondioxide carrying power of the blood residing within the red cells is

(A) 50% (B) 60%
(C) 85% (D) 100%

85. Within the red blood cells the buffering capacity contributed by the phosphates is

(A) 5% (B) 10%
(C) 20% (D) 25%

86. The normal ratio between the alkaline phosphate and acid phosphate in plasma is

(A) 2 : 1 (B) 1 : 4
(C) 20 : 1 (D) 4 : 1

87. The oxygen dissociation curve for hemoglobin is shifted to the right by

(A) Decreased O_2 tension
(B) Decreased CO_2 tension
(C) Increased CO_2 tension
(D) Increased pH

88. Bohr effect is

(A) Shifting of oxyhemoglobin dissociation curve to the right
(B) Shifting of oxyhemoglobin dissociation curve to the left
(C) Ability of hemoglobin to combine with O_2
(D) Exchange of chloride with carbonate

89. Chloride shift is

(A) H ions leaving the RBC in exchange of Cl^-
(B) Cl^- leaving the RBC in exchange of bicarbonate
(C) Bicarbonate ion returns to plasma and exchanged with chloride which shifts into the cell
(D) Carbonic acid to the plasma

90. Of the total body water, intracellular compartment contains about

(A) 50% (B) 60%
(C) 70% (D) 80%

91. Osmotically active substances in plasma are

(A) Sodium (B) Chloride
(C) Proteins (D) All of these

92. Osmotic pressure of plasma is

(A) 80–100 milliosmole/litre
(B) 180–200 milliosmole/litre
(C) 280–300 milliosmole/litre
(D) 380–400 milliosmole/litre

93. Contribution of albumin to colloid osmotic pressure of plasma is about

(A) 10% (B) 50%
(C) 80% (D) 90%

94. The highest concentration of proteins is present in

(A) Plasma (B) Interstitial fluid
(C) Interstitial fluid (D) Transcellular fluid

95. Oncotic pressure of plasma is due to

(A) Proteins (B) Chloride
(C) Sodium (D) All of these

96. Oncotic pressure of plasma is about

(A) 10 mm of Hg (B) 15 mm of Hg
(C) 25 mm of Hg (D) 50 mm of Hg

97. Oedema can occur when

(A) Plasma Na and Cl are decreased
(B) Plasma Na and Cl are increased
(C) Plasma proteins are decreased
(D) Plasma proteins are increased

98. Colloid osmotic pressure of intracellular fluid is

(A) Equal to that of plasma
(B) More than that of plasma
(C) More than that of plasma
(D) Nearly zero

99. The water produced during metabolic reactions in an adult is about

(A) 100 ml/day (B) 300 ml/day
(C) 500 ml/day (D) 700 ml/day

100. The daily water loss through gastrointestinal tract in an adult is about

(A) Less than 100 ml/day
(B) 200 ml/day
(C) 300 ml/day
(D) 400 ml/day

101. Recurrent vomiting leads to loss of

(A) Potassium (B) Chloride
(C) Bicarbonate (D) All of these

102. Obligatory reabsorption of water

(A) Is about 50% of the total tubular reabsorption of water
(B) Is increased by antidiuretic hormone
(C) Occurs in distal convoluted tubules
(D) Is secondary to reabsorption of solutes

103. Antidiuretic hormone

(A) Is secreted by hypothalamus
(B) Secretion is increased when osmolality of plasma decreases
(C) Increases obligatory reabsorption of water
(D) Acts on distal convoluted tubules and collecting ducts

104. Urinary water loss is increased in

(A) Diabetes mellitus
(B) Diabetes insipidus
(C) Chronic glomerulonephritis
(D) All of these

105. Diabetes insipidus results from

(A) Decreased insulin secretion
(B) Decreased ADH secretion
(C) Decreased aldosterone secretion
(D) Unresponsiveness of osmoreceptors

106. Thiazide diuretics inhibit

(A) Carbonic anhydrase
(B) Aldosterone secretion
(C) ADH secretion
(D) Sodium reabsorption in distal tubules

107. Furosemide inhibits reabsorption of sodium and chloride in

(A) Proximal convoluted tubules
(B) Loop of Henle
(C) Distal convoluted tubules
(D) Collecting ducts

108. A diuretic which is an aldosterone antagonist is

(A) Spironolactone (B) Ethacrynic acid
(C) Acetazolamide (D) Chlorothiazide

109. In a solution having a pH of 7.4, the hydrogen ion concentration is

(A) 7.4 nmol/L (B) 40 nmol/L
(C) 56 nmol/L (D) 80 nmol/L

110. At pH 7.4, the ratio of bicarbonate : dissolved CO_2 is

(A) 1 : 1 (B) 10 : 1
(C) 20 : 1 (D) 40 : 1

111. Quantitatively, the most significant buffer system in plasma is

(A) Phosphate buffer system
(B) Carbonic acid-bicarbonate buffer system
(C) Lactic acid-lactate buffer system
(D) Protein buffer system

112. In a solution containing phosphate buffer, the pH will be 7.4, if the ratio of monohydrogen phosphate : dihydrogen phosphate is

(A) 4 : 1 (B) 5 : 1
(C) 10 : 1 (D) 20 : 1

113. pK_a of dihydrogen phosphate is

(A) 5.8 (B) 6.1
(C) 6.8 (D) 7.1

114. Buffering action of haemoglobin is mainly due to its

(A) Glutamine residues
(B) Arginine residues
(C) Histidine residues
(D) Lysine residues

115. Respiratory acidosis results from

(A) Retention of carbon dioxide
(B) Excessive elimination of carbon dioxide
(C) Retention of bicarbonate
(D) Excessive elimination of bicarbonate

116. Respiratory acidosis can occur in all of the following except

(A) Pulmonary oedema
(B) Hysterical hyperventilation
(C) Pneumothorax
(D) Emphysema

117. The initial event in respiratory acidosis is

(A) Decrease in pH
(B) Increase in pCO_2
(C) Increase in plasma bicarbonate
(D) Decrease in plasma bicarbonate

118. Respiratory alkalosis can occur in

(A) Bronchial asthma
(B) Collapse of lungs
(C) Hysterical hyperventilation
(D) Bronchial obstruction

119. The primary event in respiratory alkalosis is

(A) Rise in pH
(B) Decrease in pCO_2
(C) Increase in plasma bicarbonate
(D) Decrease in plasma chloride

120. Anion gap is the difference in the plasma concentrations of

(A) (Chloride) – (Bicarbonate)
(B) (Sodium) – (Chloride)
(C) (Sodium + Potassium) – (Chloride + Bicarbonate)
(D) (Sum of cations) – (Sum of anions)

121. Normal anion gap in plasma is about

(A) 5 meq/L (B) 15 meq/L
(C) 25 meq/L (D) 40 meq/L

122. Anion gap is normal in

(A) Hyperchloraemic metabolic acidosis
(B) Diabetic ketoacidosis
(C) Lactic acidosis
(D) Uraemic acidosis

123. Anion gap is increased in

(A) Renal tubular acidosis
(B) Metabolic acidosis resulting from diarrhoea
(C) Metabolic acidosis resulting from intestinal obstruction
(D) Diabetic ketoacidosis

124. Anion gap in plasma is because

(A) Of differential distribution of ions across cell membranes
(B) Cations outnumber anions in plasma
(C) Anions outnumber cations in plasma
(D) Of unmeasured anions in plasma

125. Salicylate poisoning can cause

(A) Respiratory acidosis
(B) Metabolic acidosis with normal anion gap
(C) Metabolic acidosis with increased anion gap
(D) Metabolic alkalosis

126. Anion gap of plasma can be due to the presence of all the following except

(A) Bicarbonate (B) Lactate
(C) Pyruvate (D) Citrate

127. All the following features are found in blood chemistry in uncompensated lactic acidosis except

(A) pH is decreased
(B) Bicarbonate is decreased
(C) pCO_2 is normal
(D) Anion gap is normal

128. All the following statements about renal tubular acidosis are correct except

(A) Renal tubules may be unable to reabsorb bicarbonate
(B) Renal tubules may be unable to secrete hydrogen ions
(C) Plasma chloride is elevated
(D) Anion gap is decreased

129. All the following changes in blood chemistry can occur in severe diarrhoea except

(A) Decreased pH
(B) Decreased bicarbonate
(C) Increased pCO_2
(D) Increased chloride

130. During compensation of respiratory alkalosis, all the following changes occur except

(A) Decreased secretion of hydrogen ions by renal tubules
(B) Increased excretion of sodium in urine
(C) Increased excretion of bicarbonate in urine
(D) Increased excretion of ammonia in urine

131. Blood chemistry shows the following changes in compensated respiratory acidosis:

(A) Increased pCO_2
(B) Increased bicarbonate
(C) Decreased chloride
(D) All of these

132. Metabolic alkalosis can occur in

(A) Severe diarrhoea
(B) Renal failure
(C) Recurrent vomiting
(D) Excessive use of carbonic anhydrase inhibitors

133. Which of the following features are present in blood chemistry in uncompensated metabolic alkalosis except?

(A) Increased pH
(B) Increased bicarbonate
(C) Normal chloride
(D) Normal pCO_2

134. One joule is the energy required to

(A) Raise the temperature of 1 gm of water by 1°C
(B) Raise the temperature of 1 kg of water by 1°C
(C) Move a mass of 1 gm by 1 cm distance by a force of 1 Newton
(D) Move a mass of 1 kg by 1 m distance by a force of 1 Newton

135. Organic compound of small molecular size is

(A) Urea (B) Uric acid
(C) Creatinine (D) Phosphates

136. Organic substance of large molecular size is

(A) Starch (B) Insulin
(C) Lipids (D) Proteins

137. Body water is regulated by the hormone:

(A) Oxytocin (B) ACTH
(C) FSH (D) Epinephrine

138. Calcium is required for the activation of the enzyme:

(A) Isocitrate dehydrogenase
(B) Fumarase
(C) Succinate thiokinase
(D) ATPase

139. Cobalt is a constituent of

(A) Folic acid (B) Vitamin B_{12}
(C) Niacin (D) Biotin

140. Calcium absorption is inferred by

(A) Fatty acids (B) Amino acids
(C) Vitamin D (D) Vitamin B_{12}

141. The average of pH of urine is

(A) 5.6 (B) 6.0
(C) 6.4 (D) 7.0

ANSWERS

1. D	2. A	3. D	4. C	5. C	6. C
7. C	8. D	9. B	10. C	11. B	12. C
13. D	14. D	15. A	16. B	17. A	18. A
19. D	20. A	21. B	22. C	23. A	24. D
25. A	26. B	27. C	28. B	29. B	30. A
31. B	32. D	33. A	34. B	35. C	36. A
37. B	38. A	39. C	40. A	41. B	42. D
43. B	44. B	45. D	46. A	47. C	48. B
49. C	50. A	51. A	52. B	53. C	54. A
55. D	56. A	57. A	58. B	59. B	60. D
61. D	62. D	63. D	64. C	65. A	66. A
67. A	68. A	69. B	70. B	71. C	72. D
73. A	74. B	75. C	76. D	77. C	78. B
79. C	80. A	81. B	82. C	83. B	84. C
85. D	86. D	87. C	88. A	89. C	90. C
91. D	92. C	93. C	94. C	95. A	96. C
97. C	98. B	99. B	100. A	101. B	102. D
103. D	104. D	105. B	106. D	107. B	108. A
109. B	110. C	111. B	112. A	113. C	114. C
115. A	116. B	117. B	118. C	119. B	120. C
121. B	122. A	123. B	124. B	125. C	126. A
127. D	128. D	129. C	130. D	131. D	132. C
133. D	134. D	135. A	136. D	137. A	138. D
139. B	140. A	141. B			