UNIT I PHYSIOLOGICAL CHEMISTRY AND PROCESSES

Acid and Base, Buffers, Henderson-Hasselbalch Equation

1. **What is the pH of a neutral solution at 25°C?**

    a. 0
    b. 7
    c. 14
    d. 1
2. **Which of the following is a strong acid?**
    a. Acetic acid
    b. Hydrochloric acid
    c. Citric acid
    d. Carbonic acid
3. **Which of the following is a characteristic of a base?**
    a. Sour taste
    b. Donates H+ ions
    c. Slippery feel
    d. Turns red litmus paper blue
4. **Buffers work best when the pH is close to:**
    a. pKa
    b. pKb
    c. pH 14
    d. pH 7
5. **The Henderson-Hasselbalch equation is used to:**
    a. Calculate the pH of a strong acid
    b. Calculate the pH of a buffer solution
    c. Determine the pKa of a strong base
    d. Calculate the concentration of a salt
6. **What is the pH of a solution where the concentration of H+ ions is 1×10−41 \times 10^{-4}1×10−4 M?**
    a. 4
    b. 7
    c. 10
    d. 14
7. **A solution with a pH of 3 is:**
    a. Acidic
    b. Basic
    c. Neutral
    d. None of the above
8. **Which of the following substances can act as both an acid and a base?**
    a. HCl
    b. NaOH
    c. H2O
    d. CH4

9. **The pKa of acetic acid is 4.76. What is the pH of a buffer solution containing 0.1 M acetic acid and 0.1 M sodium acetate?**
    a. 4.76
    b. 7.00
    c. 3.00
    d. 9.00
10. **Which of the following represents a weak acid?**
    a. HCl
    b. HNO3
    c. H2SO4
    d. CH3COOH

Classification of Carbohydrates

11. **Glucose is an example of a:**
    a. Monosaccharide
    b. Disaccharide
    c. Oligosaccharide
    d. Polysaccharide
12. **Which of the following is a disaccharide?**
    a. Glucose
    b. Fructose
    c. Sucrose
    d. Starch
13. **Lactose is composed of which two monosaccharides?**
    a. Glucose and Fructose
    b. Glucose and Galactose
    c. Glucose and Sucrose
    d. Glucose and Maltose
14. **Which of the following is a polysaccharide?**
    a. Glucose
    b. Lactose
    c. Cellulose
    d. Sucrose
15. **Maltose is a disaccharide formed from which two monosaccharides?**
    a. Glucose and Fructose
    b. Glucose and Galactose
    c. Two Glucose units
    d. Glucose and Sucrose
16. **Which of the following is not a monosaccharide?**
    a. Glucose
    b. Galactose
    c. Fructose
    d. Sucrose
17. **Oligosaccharides are composed of how many monosaccharide units?**
    a. 1-2

b. 3-10
c. 11-20
d. More than 20

18. **Which carbohydrate is the primary energy source in humans?**
    a. Cellulose
    b. Glucose
    c. Sucrose
    d. Glycogen
19. **Which of the following is an example of a storage polysaccharide?**
    a. Glycogen
    b. Cellulose
    c. Chitin
    d. Peptidoglycan
20. **Which of the following is the main structural polysaccharide in plants?**
    a. Glycogen
    b. Starch
    c. Cellulose
    d. Amylopectin

Metabolic Pathways and Bioenergetics

21. **Glycolysis occurs in the:**
    a. Mitochondria
    b. Cytoplasm
    c. Nucleus
    d. Golgi apparatus
22. **The end product of glycolysis is:**
    a. Glucose
    b. Pyruvate
    c. Acetyl-CoA
    d. Citrate
23. **How many ATP molecules are produced during glycolysis?**
    a. 1
    b. 2
    c. 4
    d. 36
24. **Which of the following is a key regulatory enzyme in glycolysis?**
    a. Hexokinase
    b. Glucose-6-phosphatase
    c. Pyruvate dehydrogenase
    d. Acetyl-CoA carboxylase
25. **The TCA cycle occurs in the:**
    a. Cytoplasm
    b. Mitochondria
    c. Nucleus
    d. Endoplasmic reticulum

26. **The TCA cycle is also known as the:**
    a. Urea cycle
    b. Calvin cycle
    c. Krebs cycle
    d. Pentose phosphate pathway
27. **Which of the following is a key product of the TCA cycle?**
    a. Pyruvate
    b. Glucose
    c. Acetyl-CoA
    d. NADH
28. **The electron transport chain is located in the:**
    a. Cytoplasm
    b. Mitochondrial matrix
    c. Inner mitochondrial membrane
    d. Outer mitochondrial membrane
29. **Which molecule is the final electron acceptor in the electron transport chain?**
    a. Oxygen
    b. Carbon dioxide
    c. Water
    d. NADH
30. **Which of the following pathways is anaerobic?**
    a. Glycolysis
    b. TCA cycle
    c. Electron transport chain
    d. Oxidative phosphorylation

Classification of Lipids

31. **Which of the following is a simple lipid?**
    a. Triglyceride
    b. Phospholipid
    c. Glycolipid
    d. Steroid
32. **What is the primary function of triglycerides?**
    a. Structural component of cell membranes
    b. Energy storage
    c. Hormone production
    d. Insulation
33. **Phospholipids are primarily found in:**
    a. Adipose tissue
    b. Blood plasma
    c. Cell membranes
    d. Bone marrow
34. **Which of the following is a compound lipid?**
    a. Triglyceride
    b. Cholesterol

c. Phospholipid
d. Fatty acid

35. **Steroids are classified as:**
    a. Simple lipids
    b. Compound lipids
    c. Derived lipids
    d. None of the above
36. **Which of the following is a derived lipid?**
    a. Triglyceride
    b. Phospholipid
    c. Cholesterol
    d. Glycolipid
37. **Glycolipids are primarily found in:**
    a. Nervous tissue
    b. Blood cells
    c. Muscle tissue
    d. Bone tissue
38. **What is the major function of cholesterol in the body?**
    a. Energy storage
    b. Precursor to steroid hormones
    c. Transport of lipids
    d. Structural component of proteins
39. **Which of the following is a characteristic of fatty acids?**
    a. Always saturated
    b. Always unsaturated
    c. May be either saturated or unsaturated
    d. Only found in animals
40. **Which of the following lipids is essential for forming the myelin sheath of nerves?**
    a. Phospholipids
    b. Triglycerides
    c. Cholesterol
    d. Glycolipids

Mixed Topics

41. **Which of the following sugars is a reducing sugar?**
    a. Sucrose
    b. Maltose
    c. Fructose
    d. Starch
42. **Which of the following is a non-reducing sugar?**
    a. Glucose
    b. Lactose
    c. Sucrose
    d. Maltose
43. **Which enzyme is responsible for converting pyruvate to Acetyl-CoA?**

a. Pyruvate dehydrogenase
b. Hexokinase
c. Citrate synthase
d. ATP synthase

44. **How many molecules of CO_2 are produced per acetyl-CoA molecule in the TCA cycle?**
    a. 1
    b. 2
    c. 3
    d. 4
45. **Which of the following is the main storage form of lipids in the human body?**
    a. Cholesterol
    b. Phospholipids
    c. Triglycerides
    d. Fatty acids
46. **The process of breaking down triglycerides into fatty acids and glycerol is called:**
    a. Lipolysis
    b. Lipogenesis
    c. Beta-oxidation
    d. Glycolysis
47. **Which of the following is an intermediate in both glycolysis and gluconeogenesis?**
    a. Pyruvate
    b. Oxaloacetate
    c. Glyceraldehyde-3-phosphate
    d. Citrate
48. **Which of the following molecules directly enters the TCA cycle?**
    a. Glucose
    b. Pyruvate
    c. Acetyl-CoA
    d. NADH
49. **What is the primary purpose of the TCA cycle?**
    a. Generate glucose
    b. Produce ATP
    c. Produce NADH and FADH2 for the electron transport chain
    d. Synthesize fatty acids
50. **Which of the following lipids is a precursor for vitamin D synthesis?**
    a. Triglycerides
    b. Cholesterol
    c. Phospholipids
    d. Glycolipids

Answers

1. B

2. B
3. D
4. A
5. B
6. A
7. A
8. C
9. A
10. D
11. A
12. C
13. B
14. C
15. C
16. D
17. B
18. B
19. A
20. C
21. B
22. B
23. B
24. A
25. B
26. C
27. D
28. C
29. A
30. A
31. A
32. B
33. C
34. C
35. C
36. C
37. A
38. B
39. C
40. D
41. B
42. C
43. A
44. B
45. C
46. A
47. C

48. C
49. C
50. B