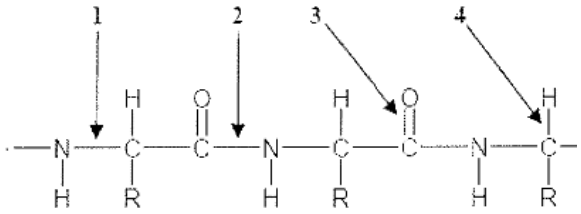
Practice Questions for Biochemistry Test

1. The quaternary structure of a protein is determined by:
A. interactions between distant amino acids of the same polypeptide.
B.interactions between close amino acids of the same polypeptide.
C.interactions between amino acids of different polypeptide chains.
D.the arrangement of the alpha helices and beta sheets in the protein.

2. A dog was kept in a room at a temperature of 40°C for two weeks. At the end of that time, it was determined that the dog was sterile. An investigator conjectured that the high temperature had caused the animal's sterility. In order to conjecture this hypothesis, an investigator should be able to show that:
A. a cat kept in the same room did not become sterile.
B. the dog had genetic factors for temperature sensitivity.
C. the dog was not sterile before the experimental period began.
D. the high temperature did not alter the dog's blood pressure.

3. What is the pH of a solution where the concentration of hydrogen ions is 2×10^{-6} molar? (Hint: You don't need a calculator!)
A .2 B. $2x10^{-6}$
C. 5.7 D. 6

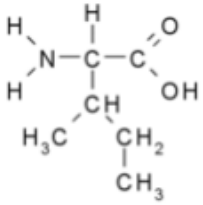
4. Consider the activity of pepsin in the process of digestion. Pepsin hydrolyzes proteins, producing individual amino acids. Below is the structural formula of a segment of a polypeptide. Which bond in the polypeptide (1 - 4) does pepsin hydrolyze?



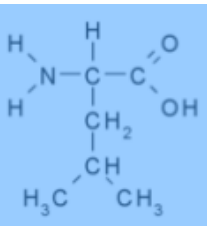
A. 1 B. 2 C. 3 D. 4

5. The tiny hairs on a gecko's toes enable it to climb walls. The hairs are made of hydrophobic keratin and adhere to surfaces via non-polar interactions. At the tiny interface where the gecko's toe hairs touch the surface it climbs, which amino acid are you LEAST likely to find?

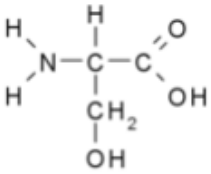
A. Isoleucine



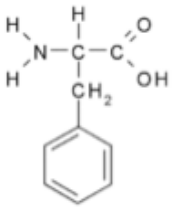
B. Leucine



C. Serine



D. Phenylalanine



6. Which of the following four statements about lipids is *false*?
   a) Lipids are made up of polymers of fatty acids.
   b) Lipids are hydrophobic.
   c) Lipids that are made up of fatty acids with a high degree of saturation are more likely to be solids at room temperature.
   d) Lipids contain multiple ester functional groups.

7. A solution with a pH of 10 is how many times more basic than a solution with a pH of 8?
   a) 2 b) 4 c) 10 d) 100

8. All of the following contribute to the unique qualities of water except
   a) cohesion
   b) low heat capacity
   c) polarity
   d) capillary action

9. Phosphorous is found in all of the following except
   a) polypeptides
   b) nucleic acids
   c) cell membranes
   d) nucleotides

10. A particular polypeptide contains 90 amino acids. When the polypeptide is completely hydrolyzed, how many water molecules must be added in the process?
    a) 45 b) 89 c) 90 d) 91

11. All of the following organic compounds are polymers except
    a) starch
    b) cellulose
    c) glycogen
    d) triglyceride

12. An amino acid contains which of the following groups?
    a) carboxyl group and amino group
    b) carbonyl group and amino group
    c) hydroxyl group and amino group
    d) carboxyl group and hydroxyl group

13. A solution that has a pH of 2 is how many times more acidic than one with a pH of 5?
    a) 3 b) 10 c) 30 d) 1000

14. Egg whites contain large amounts of the protein albumin, which looks clear when uncooked eggs are opened. Cooking the whites at high temperatures changes the structure of the albumin, turning the "whites" white. Which of the following terms correctly identifies this process?

    a) Hydrolysis
    b) Saturation
    c) Synthesis
    d) Denaturation

15. A starch molecule is formed from monosaccharides. All of the following are true except

    a) Glucose was polymerized, and water molecules were formed.
    b) The reactants (substrates) are water soluble.
    c) A larger molecule was made from smaller molecules.
    d) This process could have happened in a muscle cell.

16. Protein synthesis always produces which of the following as a product?
    a) ammonia b) carbon dioxide
    c) water d) urea

17. The properties of water are directly attributable to all of the following except
a) It is polar.
b) Water contains 2 polar, covalent bonds.
c) Hydrogen bonds are the only bonds broken when water evaporates.
d) Water can form hydrogen bonds with itself.

18. The bonding of two amino acid molecules to form a larger molecule requires
a) the release of a water molecule
b) the release of a carbon dioxide molecule
c) the addition of a nitrogen molecule
d) the addition of a water molecule

19. A liquid that is highly stable and relatively unaffected by large changes in environmental temperature
a) functions as a universal solvent
b) has its maximum density at 15 degrees Celsius
c) has a high heat capacity
d) is a small non-polar molecule

20. All of the following are properties of water except
a) water is an excellent solvent
b) water has a high heat capacity
c) water has low surface tension
d) as water freezes it becomes less dense than its liquid form.

21. Water sustains all life on Earth by all of the following properties except
a) low surface tension from double covalent bonds
b) strong capillary action from cohesion and adhesion
c) neutral pH from the equal concentrations of H^+ and OH^- ions
d) Low density of its solid form because of hydrogen bonds.

22. Water dissolves all of the following except
a) amino acids b) carbon dioxide
c) long chained fatty acids
d) monosaccharides

23. Which of the following is a polymer?
a) simple sugar
b) nucleotide
c) glycogen
d) glucose

NUTRITIONAL DATA SUPPLIED ON THE SIDE OF A POPULAR CEREAL BOX

	1 Cup Cereal	1 Cup Cereal + 8-oz Skimmed Milk	1 Cup Cereal + 8-oz Whole Milk
Calories	110	150	180
Protein (grams)	3	7	7
Carbohydrate (grams)	31	37	37
Fats (grams)	1	1	5
		Cereal	Cereal + Milk
Starch and Relative Carbohydrates (grams)		15	15
Sucrose and Other Sugars (grams)		12	18
Dietary Fibers (grams)		4	4
Total Carbohydrates (grams)		31	37

Questions 24-27 are based on the table above.

24. From the available data one can conclude that
a) a cup of whole milk has 70 more calories than a cup of skim milk
b) two cups of skimmed milk have more calories than one cup of whole milk
c) one cup of whole milk has 15 grams of starch and relative carbohydrate
d) one cup of whole milk has 4 grams of dietary fiber.

25. The difference in total carbohydrate between cereal and cereal + milk comes from
a) starch and relative carbohydrate
b) sucrose and other sugars
c) the fat in whole milk
d) the proteins in whole milk.

26. Another conclusion to be drawn from the available data is

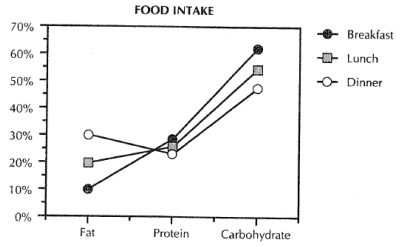
a) whole milk has more protein than skimmed milk
b) one cup of skimmed milk has 1 gram of fat
c)one cup of whole milk has 6 grams of sucrose and other sugars
d) skimmed milk has more fat than cereal.

27. The available data leads to the conclusion that

a) cereal + whole milk has more protein than cereal + skimmed milk
b) cereal + whole milk is less fattening than cereal + skimmed milk
c) cereal alone is less fattening than cereal + milk
d) cereal + whole milk provides less energy than cereal + skimmed milk

Questions 28 and 29 are based on the following:

Questions 13 and 14 are based on the following graph.



28. Based on the graph, which of the following statements about food intake is correct?
    a) The average protein/fat ratio consumed was about 3/1.
    b) The average fat/protein ratio consumed was about 3/1
    c) The average protein/carbohydrate ratio consumed was about 2/1
    d) The average protein/carbohydrate ratio consumed was about 1:2

29. If the atomic number of an element is 8 and the atomic weight 18, then the number of neutrons in the nucleus of the atom is
    a) 8 b) 18 c) 10 d) 26

30. A quaternary protein is composed of

a) an amino acid sequence only
b) a double sequence of nucleotides coupled together with weak hydrogen bonds
c) an amino-acid sequence that is coiled and folded into a complicated spherical, or globular shape.
d) a number of independently folded polypeptide chains.

31. A compound that contributes hydrogen ions to a solution is identified as a/an
a) acid b) base
c) nucleotide d) neutral salt

32. A base, when added to water, will
a) lower the pH of the water
b) neutralize all of the water
c) raise the pH of the water
d) acidify the water

33. Forms of the same element that differ in the number of neutrons are called
a) ions b) isomers
c) isotopes d) cations

34. All enzymes are known to be
a) tertiary proteins with specific active sites.
b) polysaccharides in plant cells but carbohydrates in animal cells.
c) capable of self-reproduction. exclusive of any other living system
d) long chains of nucleotides.

35. A substance that has a pH of 6.3 would be expected to be a
a) strong acid with a sour taste
b) weak acid with a sour taste
c) weak acid with a sweet taste
d) weak base with a sour taste

36. A change in pH from 5 to 3 indicates a change in concentration of H^+ ions by a factor of
a) 2 b) 20 c) 50 d) 100

37. All of the following are important characteristics of water in biology except
a) cohesion provides surface tension.
b) it is a non-polar solvent.
c) It is a medium for complex chemical reactions in organisms.
d) It has a high specific heat that stabilizes ambient temperature

38. Which is NOT a characteristic of proteins?
a) Can function as enzymes
b) Contain peptide bonds
c) are important in cell communication
d) contain nitrogenous bases

39. Which of the following best corresponds to the four levels of protein structure, moving from primary to quaternary structure?

a) Polypeptide folds, aggregation of polypeptide subunits, side chain bonding, sequence of amino acids

b) Polypeptide folds, side chain bonding, sequence of amino acids, aggregation of polypeptide subunits

c) Sequence of amino acids, side chain bonding, aggregation of polypeptide subunits, polypeptide folds

d) Sequence of amino acids, polypeptide folds, side chain bonding, aggregation of polypeptide subunits

40. Which of the following molecules is correctly paired with its function?
a) glycogen – enegy storage in plants
b) cellulose – main component of insect exoskeletons
c) chitin – major component of fungi cell walls
d) amylose – energy reserve stored in animal liver

41. Which of the following functional groups are typically found in an amino acid?
a) amino and hydroxyl
b) amino and aldehyde
c) carboxyl and ketone
d) amino and carboxyl

42. The formation of a peptide bond involves
a) release of nitrogen
b) dehydration synthesis
c) an increase in energy
d) addition of nitrogen

43. The following relationships between structure and its defining feature are correct EXCEPT
a) primary structure – amino acid sequence
b) secondary structure – β-pleated sheet
c) tertiary structure – hydrophobic interactions
d) quaternary structure – hydrophobic interactions

44. Lipid molecule hydrolysis produces
a) glycerol and fatty acids
b) water and amino acids
c) water and fatty acids
d) glycerol and water

45. In phospholipids, at least one fatty acid chain is "kinked", resulting in a bent structure. This phenomenon, which gives fluidity to cell membranes, is caused by

a) excess hydrogens around the bond
b) hydrophobic interactions
c) multiple double bonds
d) sulfhydryl group interactions

46. The phase at which a lipid exists at room temperature is determined by
a) the number of fatty acid chains it contains
b) the number of hydrogen it contains
c) the number of double bonds it contains
d) the presence of sulfur

47. What is the main difference between saturated and unsaturated fats?
a) saturated fats are liquid at room temperature
b) Saturated fats do not have double bonds
c) Unsaturated fats do not have double bonds
d) In unsaturated fats, the double bonds allow them to pack closely together.

48. Which of the following nucleotides is not present in DNA?
a) adenine b) thymine
c) guanine d) uracil

49. Which of the following is not a function of nucleic acids?
a) They store hereditary information
b) They are responsible for evolutionary changes
c) They function in protein synthesis
d) They link together amino acids as polymers

50. The attraction between hydrogen of one H_2O molecule and the oxygen of another H_2O molecule is an example of
a) a polar covalent bond
b) a hydrophobic interaction
c) a hydrogen bond
d) a non-polar covalent bond

51. Which of the groups is correctly attached to its formula?
a) carbonyl – COOH
b) Carboxyl –COH
c) sulfhydryl – SH_2
d) phosphate – PO_4^{2-}

52. Which of the following is true of a ^{12}C atom and a ^{14}C atom?
a) They have a different number of electrons
b) They have the same number of neutrons
c) They have the same number of protons
d) They have different kinds of atoms

53. When attached to organic molecules, all of the following functional groups are hydrophilic and polar EXCEPT
a) carboxyl group
b) amino group
c) methyl group
d) carbonyl group