**现代生命科学导论C**

**课后习题一**

一、选择题（共30题）

1) Knowing the atomic mass of an element allows inferences about which of the following?

A) the number of electrons in the element

B) the number of protons in the element

C) the number of protons plus electrons in the element

D) the number of protons plus neutrons in the element

2) Bonds between two atoms that are equally electronegative are \_\_\_\_\_.

A) hydrogen bonds

B) polar covalent bonds

C) nonpolar covalent bonds

D) ionic bonds

3) Which of the following statements correctly describes *cis-trans* isomers?

A) They have an asymmetric carbon that makes them mirror images.

B) They have variations in arrangement around a double bond.

C) They have the same chemical properties.

D) They have different molecular formulas.

4) What determines whether a carbon atom's covalent bonds to other atoms are in a tetrahedral configuration or a planar configuration?

A) the presence or absence of bonds with oxygen atoms

B) the presence or absence of double bonds between the carbon atom and other atoms

C) the polarity of the covalent bonds between carbon and other atoms

D) the solvent in which the organic molecule is dissolved

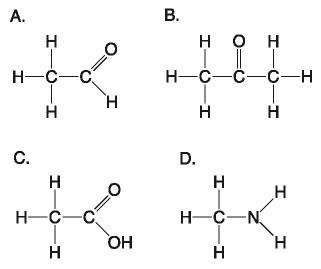
5) A hydrocarbon skeleton is covalently bonded to an amino group at one end and a carboxyl group at the other end. When placed in water this molecule would function \_\_\_\_\_.

A) only as an acid because of the carboxyl group

B) only as a base because of the amino group

C) as neither an acid nor a base

D) as an acid and a base



6) Which molecule(s) shown above is (are) ionized in a cell?

A) A

B) B and D

C) C and D

D) D

7) Which of the following is NOT a polymer?

A) cellulose

B) starch

C) glucose

D) DNA

8) What is the difference between an aldose sugar and a ketose sugar?

A) the number of carbons

B) the position of the carbonyl group

C) the position of the hydroxyl groups

D) One is a ring form, the other is a linear chain/

9) Phospholipids and triglycerides both \_\_\_\_\_.

A) contain serine or some other organic compound

B) have three fatty acids

C) have a phosphate

D) have a glycerol backbone

10) The label on a container of margarine lists "hydrogenated vegetable oil" as the major ingredient. Hydrogenated vegetable oil \_\_\_\_\_.

A) has fewer trans fatty acids

B) has more "kinks" in the fatty acid chains

C) is solid at room temperature

D) is less likely to clog arteries

11) You disrupt all hydrogen bonds in a protein. What level of structure will be preserved?

A) primary structure

B) secondary structure

C) tertiary structure

D) quaternary structure

12) What is the term used for a protein molecule that assists in the proper folding of other proteins?

A) chaperonin

B) tertiary protein

C) renaturing protein

D) denaturing protein

13) Which of the following includes all of the pyrimidines found in RNA and DNA?

A) cytosine and uracil

B) cytosine and thymine

C) cytosine, uracil, and guanine

D) cytosine, uracil, and thymine

14) When nucleotides polymerize to form a nucleic acid \_\_\_\_\_.

A) a hydrogen bond forms between the sugar of one nucleotide and the phosphate of a second

B) a covalent bond forms between the sugar of one nucleotide and the phosphate of a second

C) covalent bonds form between the bases of two nucleotides

D) hydrogen bonds form between the bases of two nucleotides

15) A new organism is discovered in the forests of Costa Rica. Scientists there determine that the polypeptide sequence of hemoglobin from the new organism has 72 amino acid differences from humans, 65 differences from a gibbon, 49 differences from a rat, and 5 differences from a frog. These data suggest that the new organism is more closely related to \_\_\_\_\_.

A) frogs than to humans

B) humans than to frogs

C) rats than to frogs

D) gibbons than to rats

16) Which term most precisely describes the cellular process of breaking down large molecules into smaller ones?

A) metabolism

B) catabolism (catabolic pathways)

C) anabolism (anabolic pathways)

D) dehydration

17) Which of the following types of reactions would decrease the entropy within a cell?

A) catabolic reactions

B) hydrolysis

C) digestion

D) anabolic reactions

18) The mathematical expression for the change in free energy of a system is Δ*G* =Δ*H* - *T*Δ*S*. Which of the following is (are) correct?

A) Δ*G* is the change in free energy.

B) Δ*H* is the change in entropy, the energy available to do work.

C) Δ*S* is the change in enthalpy, a measure of randomness.

D) *T* is the temperature in degrees Celsius.

19) Which of the following is most similar in structure to ATP?

A) a pentose sugar

B) an RNA nucleotide

C) a DNA nucleotide

D) an amino acid with three phosphate groups attached

20) Which of the following is true of enzymes?

A) Enzyme function is increased if the 3- D structure or conformation of an enzyme is altered.

B) Enzyme function is independent of physical and chemical environmental factors such as pH and temperature.

C) Enzymes increase the rate of chemical reaction by providing activation energy to the substrate.

D) Enzymes increase the rate of chemical reaction by lowering activation energy barriers.

21) A noncompetitive inhibitor decreases the rate of an enzyme reaction by \_\_\_\_\_.

A) binding at the active site of the enzyme

B) changing the free energy change of the reaction

C) changing the shape of the enzyme's active site

D) acting as a coenzyme for the reaction

22) Which of the following is an example of cooperativity?

A) the binding of an end product of a metabolic pathway to the first enzyme that acts in the pathway

B) one enzyme in a metabolic pathway passing its product to act as a substrate for the next enzyme in the pathway

C) binding of an ATP molecule along with one of the substrate molecules in an active site

D) a molecule binding at one unit of a tetramer, allowing faster binding at each of the other three

23) The oxygen consumed during cellular respiration is involved directly in which process or event?

A) glycolysis

B) the oxidation of pyruvate to acetyl CoA

C) the citric acid cycle

D) accepting electrons at the end of the electron transport chain

24) Starting with one molecule of glucose, the energy-containing products of glycolysis are \_\_\_\_\_.

A) 2 NAD+, 2 pyruvate, and 2 ATP

B) 2 NADH, 2 pyruvate, and 2 ATP

C) 2 FADH2, 2 pyruvate, and 4 ATP

D) 6 CO2, 2 pyruvate, and 2 ATP

25) Most of the CO2 from the catabolism of glucose is released during \_\_\_\_\_.

A) glycolysis

B) the citric acid cycle

C) chemiosmosis

D) electron transport

26) Which of the following events takes place in the electron transport chain?

A) the breakdown of glucose into two pyruvate molecules

B) the breakdown of an acetyl group to carbon dioxide

C) substrate-level phosphorylation

D) the extraction of energy from high-energy electrons remaining from glycolysis and the citric acid cycle

27) During aerobic respiration, electrons travel downhill in which sequence?

A) glucose → pyruvate → ATP → oxygen

B) glucose → NADH → electron transport chain → oxygen

C) glucose → ATP → electron transport chain → NADH

D) food → glycolysis → citric acid cycle → NADH → ATP

28) Which of the following normally occurs regardless of whether or not oxygen (O2) is present?

A) glycolysis

B) fermentation

C) citric acid cycle

D) oxidative phosphorylation (chemiosmosis)

29) In the absence of oxygen, yeast cells can obtain energy by fermentation, resulting in the production of \_\_\_\_\_.

A) ATP, NADH, and pyruvate

B) ATP, CO2, and lactate

C) ATP, CO2, and ethanol (ethyl alcohol)

D) ATP, pyruvate, and acetyl CoA

30) A young dog has never had much energy. He is brought to a veterinarian for help and she decides to conduct several diagnostic tests. She discovers that the dog's mitochondria can use only fatty acids and amino acids for respiration, and his cells produce more lactate than normal. Of the following, which is the best explanation of the dog's condition?

A) His cells lack the enzyme in glycolysis that forms pyruvate.

B) His cells cannot move NADH from glycolysis into the mitochondria.

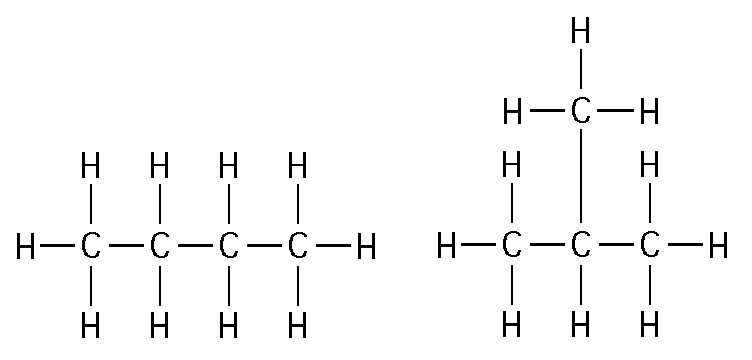
C) His mitochondria lack the transport protein that moves pyruvate across the outer mitochondrial membrane.

D) His cells have a defective electron transport chain, so glucose goes to lactate instead of to acetyl CoA.

二、填空题（共10题）

31) What is the maximum number of covalent bonds that an oxygen atom with atomic number 8 can make with hydrogen? \_\_\_\_\_.

32) The two molecules shown in the figure below are best described as \_\_\_\_\_.



33) If a DNA sample were composed of 10% thymine, what would be the percentage of guanine? \_\_\_\_\_.

34) Water molecules are attracted to one another by \_\_\_\_\_.

35) Reactants capable of interacting to form products in a chemical reaction must first overcome a thermodynamic barrier known as the reaction's \_\_\_\_\_.

36) Zinc, an essential trace element for most organisms, is present in the active site of the enzyme carboxypeptidase. The zinc most likely functions as \_\_\_\_\_.

37) Substrate-level phosphorylation occurs in \_\_\_\_\_ and \_\_\_\_\_.

38) Which electron carrier(s) function in the citric acid cycle? \_\_\_\_\_ and \_\_\_\_\_.

39) Where are the proteins of the electron transport chain located? \_\_\_\_\_.

40) Approximately how many molecules of ATP are produced from the complete oxidation of one molecule of glucose (C6H12O6) in aerobic cellular respiration? \_\_\_\_\_.

三、简答题（共6题）

41) What are the differences between DNA and RNA?

42) The R-group, or side chain, of the amino acid serine is -CH2-OH. The R-group, or side chain, of the amino acid leucine is -CH2-CH-(CH3)2. Where would you expect to find these amino acids in a globular protein in aqueous solution?

43) Carbon-12 is the most common isotope of carbon and has a mass number of 12. However, the average atomic mass of carbon found on a periodic table is slightly more than 12 daltons. Why?

44) When ATP releases some energy, it also releases inorganic phosphate. What happens to the inorganic phosphate in the cell?

45) The free energy for the oxidation of glucose to CO2 and water is -686 kcal/mol and the free energy for the reduction of NAD+ to NADH is +53 kcal/mol. Why are only two molecules of NADH formed during glycolysis when it appears that as many as a dozen could be formed?

46) In liver cells, the inner mitochondrial membranes are about five times the area of the outer mitochondrial membranes. What purpose must this serve?

**答题页**

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二、填空题

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