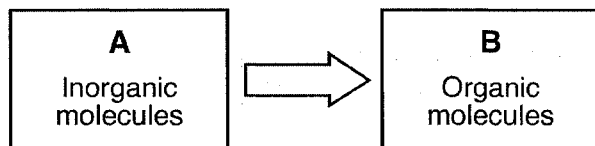


Biochem Review

1. The diagram below represents a biological process



Which set of molecules is best represented by letters *A* and *B*?

- 1) A: oxygen and water
B: glucose
 - 2) A: glucose
B: carbon dioxide and water
 - 3) A: carbon dioxide and water
B: glucose
 - 4) A: glucose
B: oxygen and water
2. Most organisms contain
- 1) organic compounds, only
 - 2) inorganic compounds, only
 - 3) both organic and inorganic compounds
 - 4) neither organic nor inorganic compounds
3. Water is classified as an inorganic compound because it
- 1) does not contain carbon
 - 2) does not contain nitrogen
 - 3) contains hydrogen
 - 4) contains oxygen
4. Which compound is inorganic?
- 1) glucose ($C_6H_{12}O_6$)
 - 2) carbon dioxide (CO_2)
 - 3) ethane (C_2H_6)
 - 4) stearic acid ($C_{18}H_{36}O_2$)

5. The chart below indicates the elements contained in four different molecules and the number of atoms of each element in those molecules.

Element	Number of Atoms			
	Molecule A	Molecule B	Molecule C	Molecule D
Hydrogen	12	0	3	0
Carbon	6	1	0	1
Nitrogen	0	0	1	0
Oxygen	6	2	0	3
Calcium	0	0	0	1

Which molecule can be classified as organic?

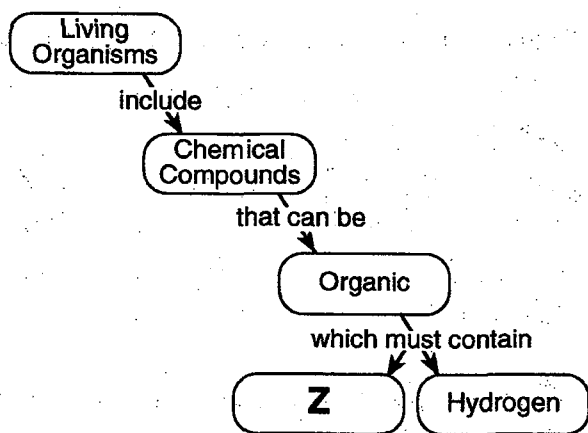
- 1) *A*
 - 2) *B*
 - 3) *C*
 - 4) *D*
6. Which formula represents an organic compound?
- 1) $Mg(OH)_2$
 - 2) $NaCl$
 - 3) $C_{12}H_{22}O_{11}$
 - 4) NH_3
7. Groups A and B in the table below contain molecular formulas of compounds.

Group A	Group B
$C_6H_{12}O_6$	$NaCl$
$C_{12}H_{22}O_{11}$	NH_3

How would the compounds in these groups be chemically classified?

- 1) group A - inorganic
group B - organic
- 2) group A - organic
group B - inorganic
- 3) group A - monosaccharides
group B - disaccharides
- 4) group A - disaccharides
group B - monosaccharides

8. In the diagram below, which substance belongs in area Z?



- 1) water
- 2) oxygen
- 3) nitrogen
- 4) carbon

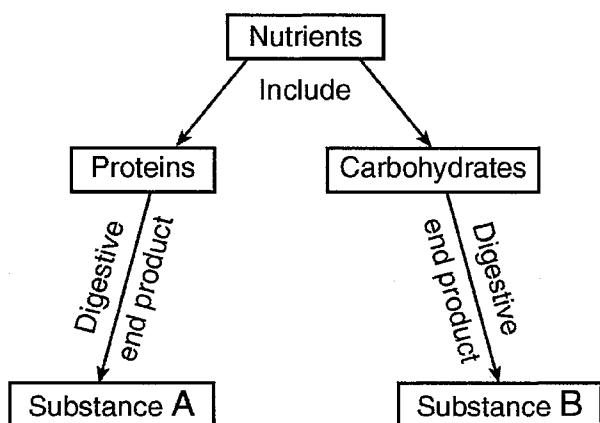
9. Which substances are inorganic compounds?

- 1) water and salts
- 2) proteins and carbohydrates
- 3) fats and oils
- 4) enzymes and hormones

10. Which elements are present in all organic compounds?

- 1) hydrogen and oxygen
- 2) nitrogen and oxygen
- 3) nitrogen and carbon
- 4) hydrogen and carbon

Base your answers to questions 11 and 12 on the information in the diagram below and on your knowledge of biology.



11. In a heterotrophic organism, substance A could be used directly for

- 1) photosynthesis
- 2) synthesis of enzymes
- 3) a building block of starch
- 4) a genetic code

12. In an autotrophic organism, substance B functions as a

- 1) source of energy
- 2) hormone
- 3) vitamin
- 4) biotic resource

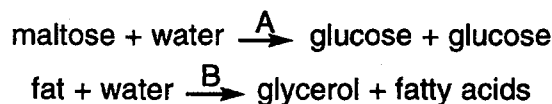
13. All cells of an organism are engaged in many different chemical reactions. This fact is best supported by the presence in each cell of thousands of different kinds of

- 1) enzymes
- 2) nuclei
- 3) chloroplasts
- 4) organelles

14. Which statement describes all enzymes?

- 1) They control the transport of materials.
- 2) They provide energy for chemical reactions.
- 3) They affect the rate of chemical reactions.
- 4) They absorb oxygen from the environment.

15. Two chemical equations are shown below.



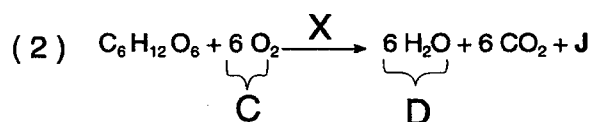
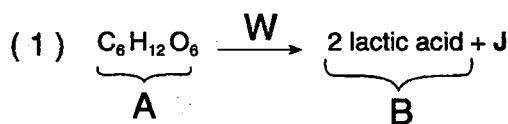
What do letters A and B represent?

- 1) A – lipase; B – protease
- 2) A – protease; B – maltase
- 3) A – maltase; B – lipase
- 4) A – maltase; B – protease

16. Which statement about enzymes is not correct?

- 1) Enzymes are composed of polypeptide chains.
- 2) Enzymes form a temporary association with a reactant.
- 3) Enzymes are destroyed when they are used and must be synthesized for each reaction.
- 4) Enzymes are specific because of their shape and catalyze only certain reactions.

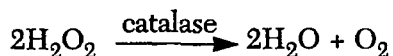
Base your answers to questions 17 and 18 on the chemical reactions below and on your knowledge of biology.



17. The enzymes needed for these chemical reactions are indicated by letters?

- 1) W and X
- 2) A and C
- 3) B and D
- 4) B and C

18. What is the chemical compound represented by letter *J*?
- 1) a protease
 - 2) a polysaccharide
 - 3) ATP
 - 4) ADP
-
19. Lipase, maltase, and protease are members of a group of catalysts known as
- 1) enzymes
 - 2) hormones
 - 3) carbohydrates
 - 4) fats
20. Hydrogen peroxide (H_2O_2) is a toxic by-product of cellular metabolism in aerobic organisms. The reaction below occurs within the cells to prevent the accumulation of hydrogen peroxide.



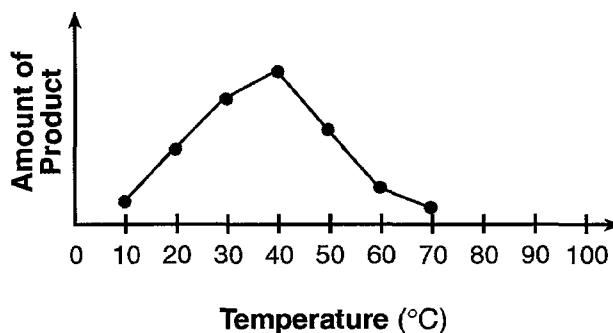
In this reaction, catalase functions as an

- 1) enzyme in the breakdown of hydrogen peroxide
 - 2) enzyme in the synthesis of hydrogen peroxide
 - 3) emulsifier in the digestion of hydrogen peroxide
 - 4) indicator in the detection of hydrogen peroxide
21. The enzyme beta-galactosidase is involved in a certain body reaction. What will most likely happen if beta-galactosidase is not available?
- 1) A different enzyme will be used in the reaction.
 - 2) The rate of the reaction will change.
 - 3) Different chemicals will be used in the reaction to replace the enzyme.
 - 4) Coenzymes will produce beta-galactosidase.
22. The sweet taste of freshly picked corn is due to the high sugar content in the kernels. Enzyme action converts about 50% of the sugar to starch within one day after picking. To preserve its sweetness, the freshly picked corn is immersed in boiling water for a few minutes, and then cooled.

Which statement most likely explains why the boiled corn kernels remain sweet?

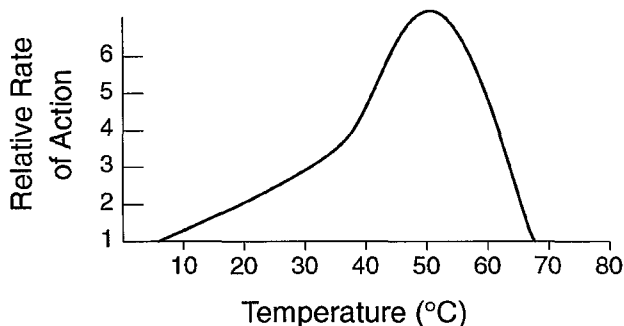
- 1) Boiling destroys sugar molecules so they cannot be converted to starch.
- 2) Boiling kills a fungus on the corn that is needed to convert sugar to starch.
- 3) Boiling activates the enzyme that converts amino acids to sugar.
- 4) Boiling deactivates the enzyme responsible for converting sugar to starch

23. Meat tenderizer contains an enzyme that interacts with meat. If meat is coated with tenderizer and then placed in a refrigerator for a short time, how would the enzyme be affected?
- 1) It would be broken down.
 - 2) Its activity would slow down.
 - 3) Its shape would change.
 - 4) It would no longer act as an enzyme.
24. The graph below illustrates the relative amounts of product formed by the action of an enzyme in a solution with a pH of 6 at seven different temperatures.



Which statement best expresses the amount of product that will be formed at each temperature if the experiment is repeated at a pH of 4?

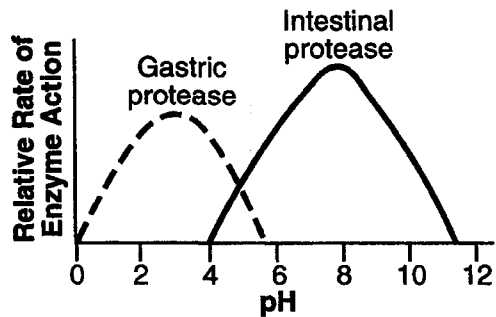
- 1) The amount of product formed will be equal to that produced at pH 6.
 - 2) The amount of product formed will be greater than that produced at pH 6.
 - 3) The amount of product formed will be less than that produced at pH 6.
 - 4) The amount of product formed can *not* be accurately predicted.
25. The graph below shows the effect of temperature on the relative rate of action of enzyme *X* on a protein.



Which change would *not* affect the relative rate of action of enzyme *X*?

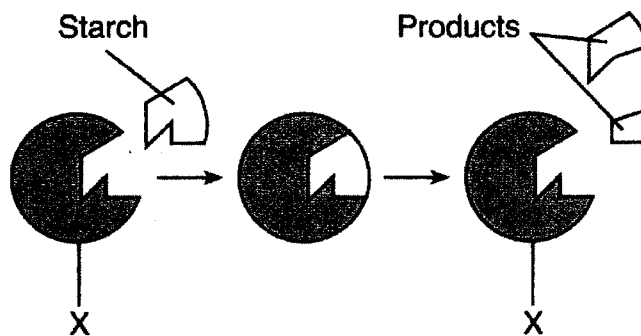
- 1) the addition of cold water when the reaction is at 50°C
- 2) an increase in temperature from 70°C to 80°C
- 3) the removal of the protein when the reaction is at 30°C
- 4) a decrease in temperature from 40°C to 10°C

Base your answers to questions 31 and 32 on the graph below and on your knowledge of biology.



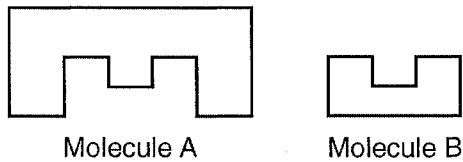
31. What is the optimum pH for the action of intestinal protease?
- 1) 5
 - 2) 8
 - 3) 10
 - 4) 12
32. The contents of the small intestine have a basic pH. When gastric protease enters the small intestine, the activity of this enzyme will most likely
- 1) increase, only
 - 2) increase and then decrease
 - 3) decrease, only
 - 4) remain the same

Base your answers to questions 33 and 34 on the diagram below, which represents stages in the digestion of a starch, and on your knowledge of biology.



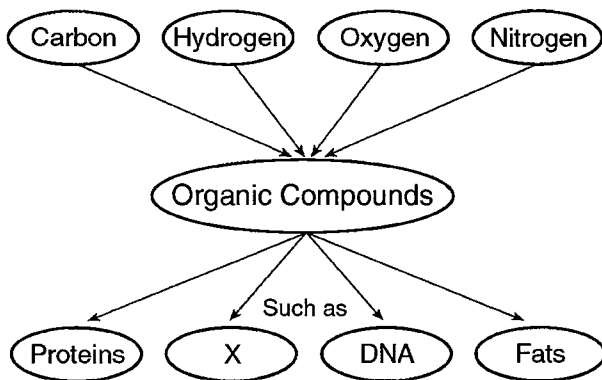
33. The structure labeled *X* most likely represents
- 1) an antibody
 - 2) a receptor molecule
 - 3) an enzyme
 - 4) a hormone
34. The products would most likely contain
- 1) simple sugars
 - 2) fats
 - 3) amino acids
 - 4) minerals

35. Enzyme molecules normally interact with substrate molecules. Some medicines work by blocking enzyme activity in pathogens. These medicines are effective because they
- 1) are the same size as the enzyme
 - 2) are the same size as the substrate molecules
 - 3) have a shape that fits into the enzyme
 - 4) have a shape that fits into all cell receptors
36. The diagram below represents two molecules that can interact with each other to cause a biochemical process to occur in a cell.



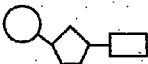
Molecules *A* and *B* most likely represent

- 1) a protein and a chromosome
 - 2) a receptor and a hormone
 - 3) a carbohydrate and an amino acid
 - 4) an antibody and a hormone
37. In plants, simple sugars are *least* likely to be
- 1) linked together to form proteins
 - 2) broken down into carbon dioxide and water
 - 3) used as a source of energy
 - 4) stored in the form of starch molecules
38. What substance could be represented by the letter *X* in the diagram below?



- 1) carbohydrates
- 2) ozone
- 3) carbon dioxide
- 4) water

Base your answers to questions 39 through 41 on the chart below and on your knowledge of biology.

Class of Substance	Basic Unit of Structure	One Possible Function	Examples
A	$ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{N}-\text{C}-\text{C} \\ \quad \quad \\ \text{R} \quad \text{O} \\ \quad \quad \text{OH} \end{array} $	B	C
Carbohydrate	D	Structural component of cell walls	E
F	G	Structural component of cell membranes	Fats, waxes
H		Protein synthesis	I

39. In which section of the chart do the substances starch and glycogen belong?

1) A

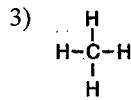
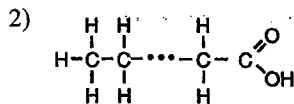
2) E

3) C

4) I

40. Which belongs in section G?

1) $\text{O}=\text{C}=\text{O}$



4) $\text{H}-\text{O}-\text{H}$

41. In which section of the chart do nucleic acids belong?

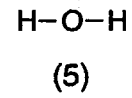
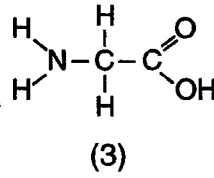
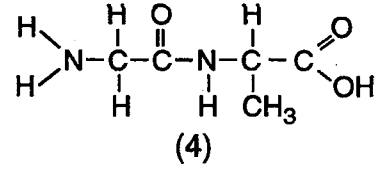
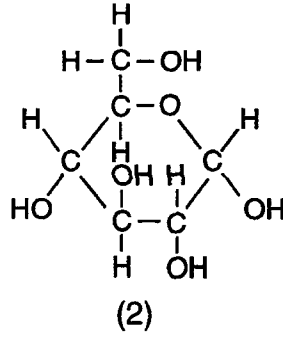
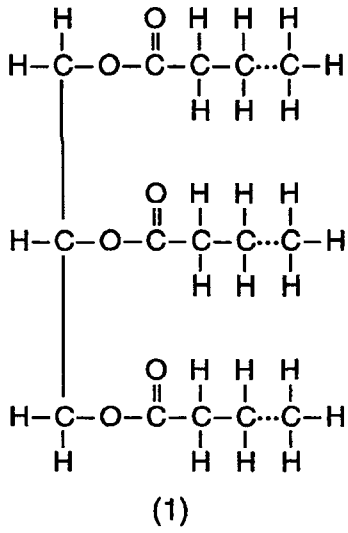
1) F

2) B

3) H

4) D

Base your answers to questions 42 and 43 on the diagram below. For each of the following phrases, select the molecule, chosen from those shown below, which is best described by that phrase.



42. An example of a carbohydrate

1) 1

2) 2

3) 3

4) 4

5) 5

43. A molecule that results from all dehydration synthesis reactions

1) 1

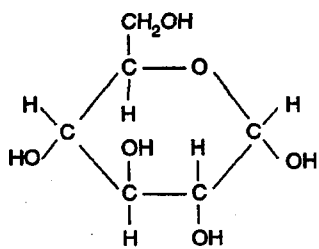
2) 2

3) 3

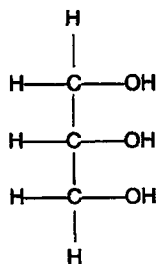
4) 4

5) 5

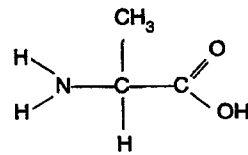
44. Some structural formulas of organic molecules are shown below.



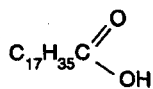
(1)



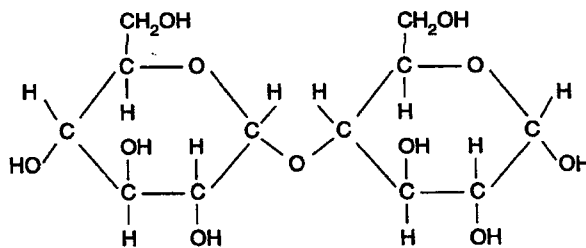
(2)



(3)



(4)



(5)

Which structural formulas represent carbohydrate molecules?

1) 1 and 5

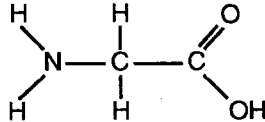
2) 2 and 4

3) 3 and 2

4) 4 and 3

45. Base your answer to the following question on the information in the chart below and on your knowledge of biology.

Class of Compound	Characteristic
A	Has glycerol as a building block
B	Contains both acid groups and amino groups
C	Formed from subunits containing a nitrogenous base, a phosphate, and ribose
D	Includes sugars and starches



What is another characteristic of the compounds in class D?

- 1) They are composed of basic subunits known as nucleotides.
- 2) They contain the atoms carbon, hydrogen, and oxygen, with the hydrogen and oxygen in a 2:1 ratio.
- 3) They transfer amino acids to ribosomes during protein synthesis.
- 4) They include chemical compounds such as insulin and hemoglobin.

46. Which chemical formula represents a carbohydrate?

- 1) CH_4
- 2) $\text{C}_3\text{H}_7\text{O}_2\text{N}$
- 3) $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
- 4) CO_2

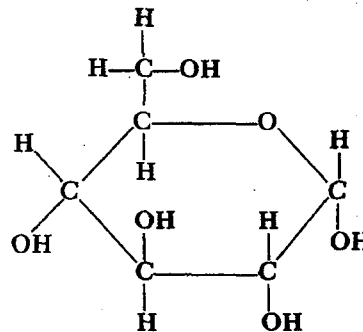
47. What is the ratio of hydrogen atoms to oxygen atoms in a molecule of glucose?

- 1) 1:1
- 2) 2:1
- 3) 3:1
- 4) 1:2

48. Which compound is a polysaccharide?

- 1) glucose
- 2) maltase
- 3) ribose
- 4) starch

Base your answers to questions 49 through 52 on the structural formula below and on your knowledge of biology.



49. Which high-molecular-weight substances are made up of repeating units of these molecules?

- 1) starch and cellulose
- 2) hemoglobin and protease
- 3) fats and oils
- 4) polypeptides and nucleic acids

50. The complete aerobic oxidation of this compound produces

- 1) amino acids and urea
- 2) carbon dioxide and water
- 3) ethyl alcohol and carbon dioxide
- 4) glycerol and fatty acids

51. The process by which two or more of these molecules are bonded together in a muscle cell is known as
- 1) enzymatic hydrolysis
 - 2) anaerobic respiration
 - 3) dehydration synthesis
 - 4) carbon fixation

52. The structural formula represents a molecule of
- 1) glucose
 - 2) glycerol
 - 3) maltose
 - 4) alanine

53. Which group of organic molecules includes glycogen and glucose?

- 1) carbohydrates
- 2) lipids
- 3) nucleic acids
- 4) proteins

54. Two examples of carbohydrates are

- 1) fatty acids and glycerol
- 2) fats and waxes
- 3) sugars and starches
- 4) amino acids and alcohol

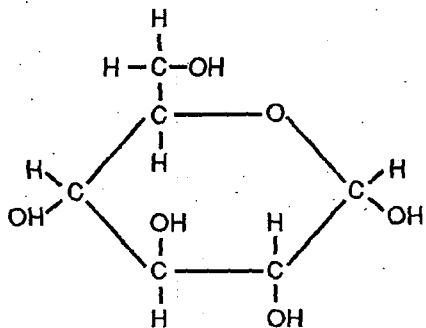
55. In which type of molecule is the ratio of hydrogen to oxygen usually 2 to 1?

- 1) lipid
- 2) protein
- 3) carbohydrate
- 4) glycerol

56. Molecules consisting only of carbon, hydrogen, and oxygen atoms make up a large part of a plant cell wall. These molecules are classified as

- 1) dipeptides
- 2) proteins
- 3) vitamins
- 4) carbohydrates

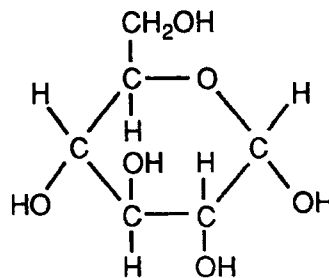
57. Two molecules of the type illustrated below are combined by dehydration synthesis.



Combining these two molecules produces

- 1) a protein
- 2) a lipid
- 3) maltose
- 4) starch

58. Which compound has the structural formula shown below?



- 1) starch
- 2) PGAL
- 3) ATP
- 4) glucose

59. Which organic compound consists of the elements carbon, hydrogen, and oxygen, and has hydrogen and oxygen atoms in a 2:1 ratio?

- 1) maltose
- 2) DNA
- 3) maltase
- 4) ATP

60. Plants store carbohydrates in the form of

- 1) amino acids
- 2) fatty acids
- 3) starch
- 4) nucleic acids

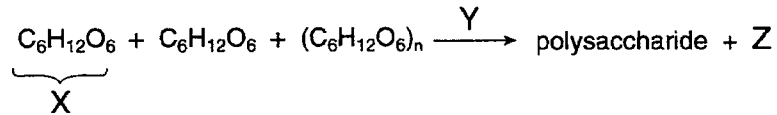
61. In humans, excess glucose is stored as the polysaccharide known as

- 1) glycogen
- 2) glycerol
- 3) maltose
- 4) cellulose

62. Most of the starch stored in the cells of a potato is composed of molecules that originally entered these cells as

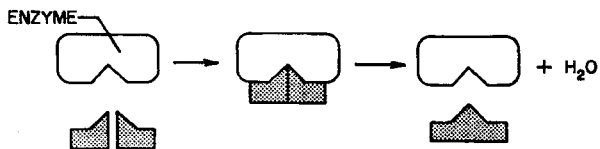
- 1) enzymes
- 2) simple sugars
- 3) amino acids
- 4) minerals

Base your answers to questions 63 through 65 on the chemical reaction represented below and on your knowledge of biology.



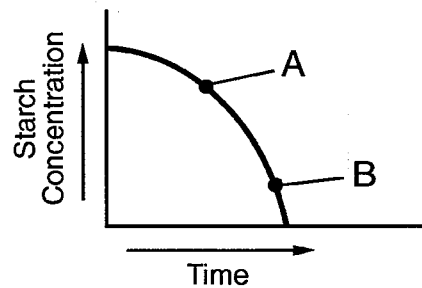
63. Letter Z most likely represents molecules of
 1) water 2) plant hormones 3) glycogen 4) nucleic acids
64. If this reaction takes place in an organism that requires sunlight to produce substance X, the organism must be
 1) a heterotroph 2) an annelid 3) an autotroph 4) a fungus
65. Letter Y most likely represents
 1) a neurotransmitter 2) a hormone 3) a lipid 4) an enzyme

66. Which process is represented by the reactions illustrated in the diagram below?



- 1) hydrolysis 3) chemical digestion
 2) dehydration synthesis 4) absorption
67. The process by which glucose is converted to starch is known as
 1) protein hydrolysis 3) chemical digestion
 2) dehydration synthesis 4) cellular respiration

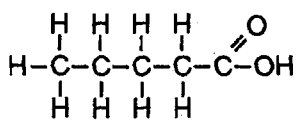
68. The graph below represents data obtained from an experiment on starch digestion.



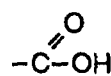
Which statement best describes point A and point B on the graph?

- 1) The concentration of sugars is greater at point A than it is at point B.
 2) The concentration of sugars is greater at point B than it is at point A.
 3) The starch concentration is the same at point A as it is at point B.
 4) The starch concentration is greater at point B than it is at point A.
69. Which organic compound is produced when three fatty acid molecules bond to one glycerol molecule?
 1) glycogen 3) PGAL
 2) ATP 4) a lipid

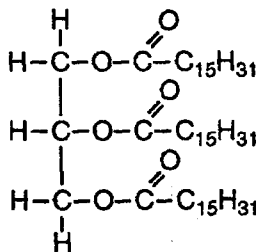
70. Molecular structures are represented in the diagrams below.



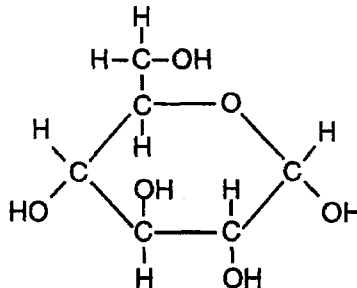
(1)



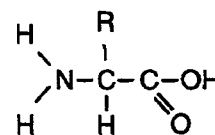
(2)



(3)



(4)

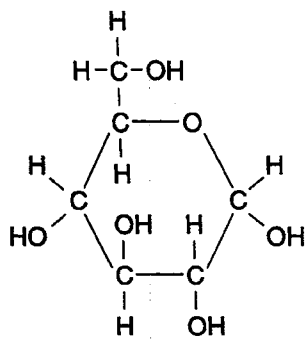


(5)

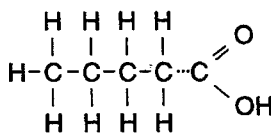
Structure 2 represents a chemical component of

- 1) molecule 1, only 2) molecules 1 and 5, only 3) molecules 1, 3, and 4, only 4) molecules 1, 3, 4, and 5

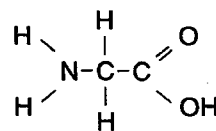
71. The diagrams below represent four different molecules.



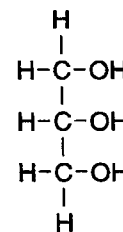
A



B



C



D

Which two diagrams represent the building blocks of lipids?

- 1) A and B 2) B and D 3) C and D 4) A and C

72. Animals commonly store energy in the form of

- 1) fat and glycogen 2) waxes and oils 3) minerals and urea 4) water and carbon dioxide

73. In living organisms, lipids function mainly as

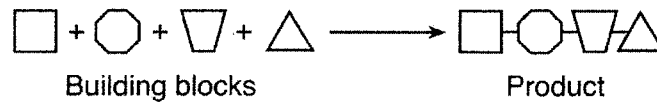
- 1) sources of stored energy and transmitters of genetic information
2) sources of stored energy and components of cellular membranes
3) transmitters of genetic information and catalysts of chemical reactions
4) catalysts of chemical reactions and components of cellular membranes

74. Vegetable oils, such as corn oil, belong to which general class of organic substances?
- 1) lipids
 - 2) proteins
 - 3) carbohydrates
 - 4) salts
75. Base your answer to the following question on the chart below which gives incomplete information about certain biochemical reactions and on your knowledge of biology.

Reactants	Products	Enzyme Involved
maltose, water	<i>A</i>	maltase
<i>B</i>	amino acids	protease
lipids, water	fatty acids, glycerol	<i>C</i>

The enzyme represented by letter *C* is known as

- 1) ATPase
 - 2) lipase
 - 3) sucrase
 - 4) amylase
76. The diagram below represents the synthesis of a portion of a complex molecule in an organism.



Which row in the chart could be used to identify the building blocks and product in the diagram?

Row	Building Blocks	Product
(1)	starch molecules	glucose
(2)	amino acid molecules	part of protein
(3)	sugar molecules	ATP
(4)	DNA molecules	part of starch

1) 1

2) 2

3) 3

4) 4

77. The function of most proteins depends primarily on the

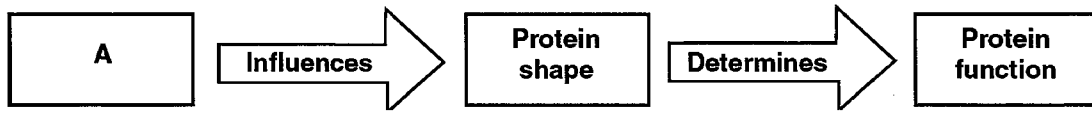
- 1) type and order of amino acids
- 2) environment of the organism
- 3) availability of starch molecules
- 4) nutritional habits of the organism

78. Two proteins in the same cell perform different functions.

This is because the two proteins are composed of

- 1) chains folded the same way and the same sequence of simple sugars
- 2) chains folded the same way and the same sequence of amino acids
- 3) chains folded differently and a different sequence of simple sugars
- 4) chains folded differently and a different sequence of amino acids

79. The diagram below provides some information concerning proteins.



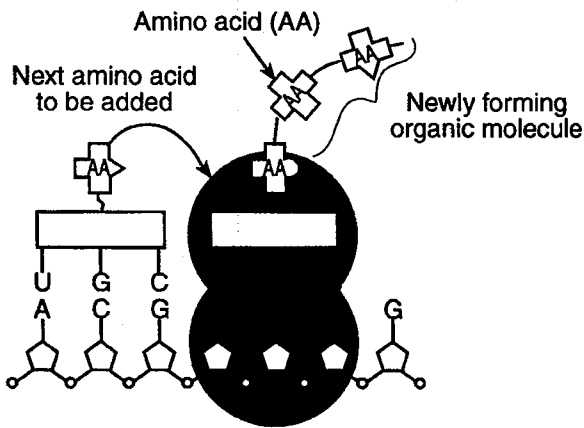
Which phrase is represented by *A*?

- 1) sequence of amino acids
- 2) sequence of simple sugars
- 3) sequence of starch molecules
- 4) sequence of ATP molecules

80. Which statement concerning proteins is not correct?

- 1) Proteins are long, usually folded, chains.
- 2) The shape of a protein molecule determines its function.
- 3) Proteins can be broken down and used for energy.
- 4) Proteins are bonded together, resulting in simple sugars.

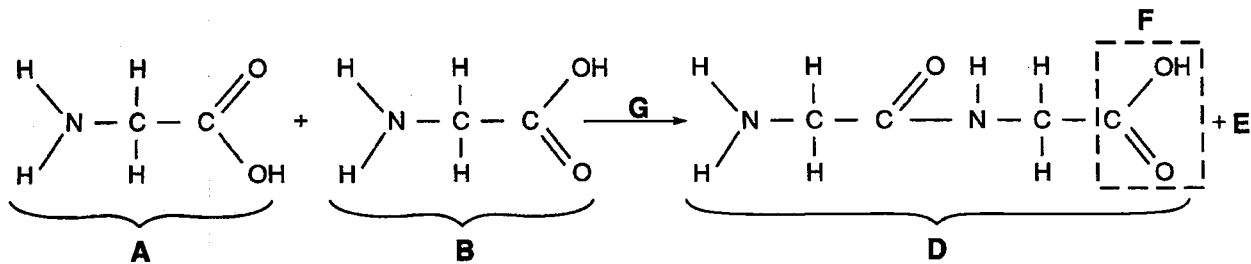
81. The diagram below represents a process that occurs within a cell in the human pancreas.



This process is known as

- 1) digestion by enzymes
- 2) protein synthesis
- 3) energy production
- 4) replication of DNA

Base your answers to questions 82 through 85 on the chemical reaction represented below.



82. Letter *E* represents a molecule of

- 1) oxygen
- 2) carbon dioxide
- 3) glycerol
- 4) water

83. This reaction is an example of

- 1) hydrolysis
- 2) aerobic respiration
- 3) dehydration synthesis
- 4) deamination

84. Amino acids are indicated by letters

1) *A* and *B*

2) *A* and *G*

3) *G* and *D*

4) *B* and *D*

85. The portion of the molecule in box *F* is known as

1) an amino group

2) a carboxyl group

3) a polymer

4) a monosaccharide

86. The bond that joins two amino acids together is known as

1) a double bond

3) an ionic bond

2) a hydrogen bond

4) a peptide bond

87. The equations below represent two biochemical processes, *A* and *B*.

Equations

(*A*) glucose + glucose → maltose + water

(*B*) amino acid + amino acid → dipeptide + water

Which statement about processes *A* and *B* is correct?

- 1) Process *A* requires energy, but process *B* does not.
- 2) Process *B* requires enzymes, but process *A* does not.
- 3) Processes *A* and *B* are examples of hydrolysis.
- 4) Processes *A* and *B* are examples of dehydration synthesis.

88. Which substance is most likely represented by letter *X* in the equation below?

amino acid + amino acid → dipeptide + *X*

1) salt

3) water

2) hydrochloric acid

4) fatty acid

89. When a dipeptide is synthesized, a chemical bond forms between

1) an oxygen atom of a glucose molecule and a carbon atom of a lipid molecule

2) a carbon atom and a hydrogen atom

3) a variable side group and a nitrogen atom

4) a nitrogen atom in an amino group and a carbon atom in a carboxyl group