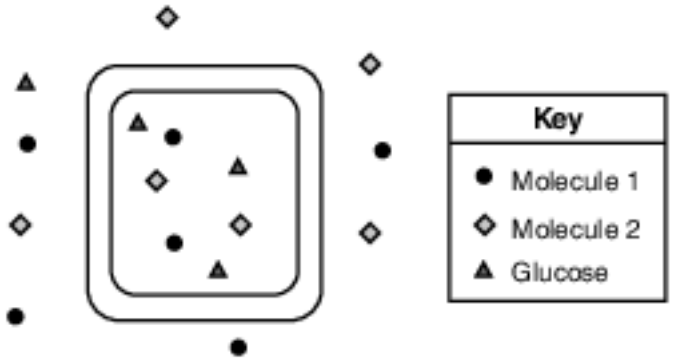
(Nysed) Sugar

Base your answers to questions 1 on the information and diagram below and on your knowledge of biology. The diagram represents a plant leaf cell and two different molecules used in the process of glucose synthesis.



1 Which statement best describes a function of glucose in plant cells?
(1) It is converted into solar energy in the chloroplasts.
(2) It can be used directly as a building block in protein synthesis.
(3) It can be used during the digestion of fats.
(4) It is used during cellular respiration in the mitochondria.

2 There are over 2000 kinds of edible insects in the world, and they are becoming an increasingly popular source of protein. One cup of cricket flour contains over 28 grams of protein. The building blocks of the protein in cricket flour are
(1) amino acids
(2) water
(3) simple sugars
(4) carbohydrates

3 Which substance can enter a cell by diffusion without having to be digested?
(1) water
(2) protein
(3) starch
(4) fat

4 Before starch can enter a cell, it must be
(1) absorbed by simple sugars
(2) diffused into simple sugars
(3) digested to form simple sugars
(4) actively transported by simple sugars

5 In order to enter cells and be useful to the body, starch must be
(1) absorbed through the skin
(2) broken down into fats and water
(3) digested into simple sugars
(4) converted to carbon dioxide and ATP

6 Which row in the chart below correctly pairs a food molecule with its building block?

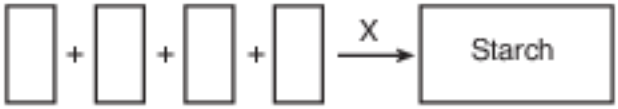
Row	Food Molecule	Building Block
(1)	starch	amino acid
(2)	sugar	starch
(3)	protein	amino acid
(4)	amino acid	sugar

(1) 1 (3) 3
(2) 2 (4) 4

7 Which process must first take place in order for the proteins in foods to be used by body cells?
(1) digestion (3) synthesis
(2) storage (4) excretion

8 Which two terms are considered to be opposite processes?
(1) photosynthesis and autotrophic nutrition
(2) cloning and mitosis
(3) digestion and synthesis
(4) dynamic equilibrium and homeostasis

Base your answers to questions 9 on the diagram below, which represents a metabolic process, and on your knowledge of biology.



9 This process best represents
(1) the bonding of amino acids to form a starch molecule
(2) the digestion of amino acids to form a starch molecule
(3) the bonding of simple sugars to form a starch molecule
(4) the digestion of simple sugars to form a starch molecule

Base your answers to questions 10 on the information below and on your knowledge of biology.

The Venus flytrap is a plant that uses specialized leaves in order to capture and digest small insects.

Source: https://www.britannica.com/plant/Venus-flytrap

10 Enzymes secreted by cells in the leaves of the Venus flytrap can digest
(1) proteins into amino acids
(2) sugars into starches
(3) amino acids into fats
(4) proteins into sugars

11 Which group consists entirely of organic molecules?
(1) protein, oxygen, fat
(2) protein, starch, fat
(3) water, carbon dioxide, oxygen
(4) water, starch, protein

Base your answer to question 12-16 on the information below and on your knowledge of biology.

A student has a sandwich for lunch. The bread contains starch molecules and various other molecules. After chewing and swallowing some of the sandwich, the starch moves along the digestive system and is digested. The sequence below represents what takes place next.

digested starch → bloodstream → cell → cell structure → ATP

12-16 Explain what occurs, beginning with the digestion of starch and ending with ATP production. In your answer, be sure to:
• identify the molecules that are used to digest the starch [1]
• identify the molecules produced when starch is digested [1]
• explain why starch must be digested before its building block molecules can enter the bloodstream [1]
• identify the structure in the cell that will produce ATP from the starch building blocks [1]
• state why ATP is important to cells [1]

Base your answers to questions 17 on the passage below and on your knowledge of biology.

Our [Nitrogen] Fertilized World

It is the engine of agriculture, the key to plenty in our crowded, hungry world. … …Enter modern chemistry. Giant factories capture inert nitrogen gas from the vast stores in our atmosphere and force it into a chemical union with the hydrogen in natural gas, creating the reactive compounds that plants crave. That nitrogen fertilizer – more than a hundred million tons applied worldwide every year – fuels bountiful harvests. Without it, human civilization in its current form could not exist. Our planet's soil simply could not grow enough food to provide all seven billion of us our accustomed diet. In fact, almost half of the nitrogen found in our bodies' muscle and organ tissue started out in a fertilizer factory.

Source: National Geographic, May 2013

17 Nitrogen fertilizers are used by plants to synthesize amino acids. State one reason why a supply of amino
acids is important for the survival of complex organisms. [1]

Base your answers to questions 18 on the information below and on your knowledge of biology.

Enzyme Investigation

An enzyme was isolated from digestive juices taken from the small intestine. An experiment was set up to test the ability of the enzyme to break down protein. Two test tubes, labeled A and B, were placed in a hot water bath at 37°C, human body temperature.

Test tube A contained only protein and test tube B contained protein and the enzyme. The chart below shows the set-up.

Test Tube	Contents
A	protein
B	protein, enzyme

After two hours, the contents of both test tubes were analyzed. Test tube A showed only the presence of protein. Test tube B showed the presence of the end products of protein digestion, indicating the enzyme had successfully broken down the protein.

18 Identify the end products of protein digestion that made up the contents of test tube B after the two hours. [1]

Base your answers to questions 19 on the information below and on your knowledge of biology.

Folic acid is a type of vitamin that is essential for the normal growth and development of cells in the body. If a woman consumes folic acid in her diet before and during the earliest stages of pregnancy, it can help to reduce her baby's risk for developing a type of birth defect called a neural tube defect. Early in pregnancy, the neural tube forms the brain and spinal cord. If the neural tube does not form properly, serious birth defects may result.

19 Many foods, such as breads, cereals, pastas, and rice, are fortified or enriched with folic acid. Explain why adding folic acid to foods is an advantage to people other than pregnant women. [1]

Answer Keys

1 4

2 1

3 1

4 3

5 3

6 3

7 1

8 3

9 3

10 1

11 2

12-16 The student’s response to the bulleted items in the question need not appear in the following order.

- 12. Allow 1 credit for identifying the molecules that are used to digest the starch. Acceptable
- responses include, but are not limited to:
- — enzymes
- — biological catalysts
- — amylase molecules
- 13. Allow 1 credit for identifying the molecules produced when starch is digested. Acceptable
- responses include, but are not limited to:
- — glucose molecules
- — simple sugars
- — monosaccharides
- — sugars
- 14. Allow 1 credit for explaining why starch must be digested before its building block molecules can
- enter the bloodstream. Acceptable responses include, but are not limited to:
- — Starch molecules are too large.
- — They are too big to get from the digestive tract into the blood.
- — Large molecules cannot diffuse through cell membranes.
- 15. Allow 1 credit for identifying the structure in the cell that will produce ATP from the starch
- building blocks as the mitochondrion (mitochondria).
- 16. Allow 1 credit for stating why ATP is important to cells. Acceptable responses include, but are not
- limited to:
- — ATP is the molecule that supplies usable energy for all the activities of a cell.
- — ATP molecules provide energy for cells.

17 Allow 1 credit. Acceptable responses include, but are not limited to:

- — Amino acids are the building blocks of protein.
- — Amino acids are found in enzymes, which regulate chemical activity in complex organisms.
- — Amino acids are found in our bodies’ muscle and organ tissue.

18 Allow 1 credit. Acceptable responses include, but are not limited to:

- — amino acids
- — dipeptides

19 Allow 1 credit. Acceptable responses include, but are not limited to:

- — Folic acid is essential for normal growth and development of cells.
- — More individuals will get folic acid, an important vitamin for cell growth and development.
- — Fewer people will suffer from a deficiency of folic acid.