



Exploring the World of Science

2020 - SSSS

Food Science

SCIOLY SUMMER STUDY SESSION

School Name: _____

Team Number: _____

Competitor(s): _____

Directions:

- Please DO NOT open this exam until given direction to do so.

Part I: Multiple Choice-

Select the answer choice you think is correct.

- The term anaerobic means:
 - Without CO₂
 - Without ATP
 - Without O₂
 - With O₂
- What function does ATP carry out in living things?
 - Aids in protein folding and coiling
 - It is the energy currency for cells
 - Identifies DNA start sequences for transcription
 - Helps maintain the fluidity of cell membranes
- What do both glycolysis and fermentation have in common?
 - They require oxygen
 - They produce energy
 - They require glucose
 - They produce ATP
- Which process allows glycolysis to continue in the absence of oxygen?
 - Chemosynthesis
 - Pasteurization
 - Cellular respiration
 - Fermentation
- Which organisms use alcoholic fermentation to allow glycolysis to continue to produce ATP?
 - Reptiles
 - Plants
 - Yeasts
 - Mammals
- The end product of glycolysis is:
 - Pyruvate
 - Acetyl-CoA
 - Lactate
 - H₂
- What are the two types of fermentation?
 - Electron transport chain and photosynthesis
 - Alcoholic and lactic acid
 - Cellular respiration and anaerobic
 - Krebs cycle and Aerobic
- How many ATPs (the net gain) does the cell directly gain from one molecule of glucose going through glycolysis?
 - 2
 - 4
 - 11
 - 14

9. During aerobic respiration, oxygen is:
- Formed
 - Oxidized
 - Increased
 - Reduced
10. Macromolecules are large molecules. The four different kinds of macromolecules are:
- Deoxyribose, amino acids, pentose and oils
 - Fatty acids, amino acids, DNA and oil
 - Carbohydrates, Proteins, Nucleic acids and DNA
 - Sugars, Proteins, Disaccharides, Lipids
11. Which temperature is in the “Danger Zone” for food?
- 138° C
 - 138° F
 - 32° F
 - 220° F
 - 175° F
12. The minimum percentage of milk fat in butter is:
- 20%
 - 30%
 - 40%
 - 80%
13. Shape of the stamp indicating meat safety is a:
- Circle
 - Square
 - Triangle
 - Rectangle
14. Skim milk cannot have more than how much milk fat?
- 0.2%
 - 0.3%
 - 0.4%
 - 0.5%
15. Respiration _____, and cellular respiration _____.
- uses glucose . . . produces glucose
 - produces glucose . . . produces oxygen
 - is gas exchange . . . produces ATP
 - produces ATP . . . is gas exchange
16. What is not a name given for the Krebs cycle here?
- Citric acid cycle
 - TCA cycle
 - Acetic acid cycle
 - Tricarboxylic acid cycle
17. What does ETC stand for?
- Electron transport chain
 - Et. cetra
 - Electronic toll collection
 - Electronic traction control

18. Do all pickles get fermented
- Yes
 - No
19. What substance is used in salinity?
- Sugar
 - Salt
 - Oil
 - Grease
20. Which of these doesn't cause denaturation?
- Strong acid
 - Concentrated inorganic salt
 - Organic solvent
 - Sugar
21. In which form is water the purest?
- Solid ice
 - Clear water
 - Steam Vapor
 - Mix of ice and water
22. The hydrologic cycle is a term which describes:
- The eventual loss of all water from the earth
 - Why three-fourths of the earth's surface is covered by water
 - When we can expect heavy rains and floods
 - The continuous natural recycling of water on the earth
23. Which of the following cannot denature a protein?
- Iodoacetic acid
 - SDS detergent
 - Urea
 - Heating to 90°C
24. What is the pH range for strongly alkaline soils?
- 7.4 – 7.8
 - 7.9 – 8.4
 - 8.5 – 9.0
 - > 9
25. Carbohydrates are composed of ____ and ____.
- Hydrogen, oxygen
 - Carbon, water
 - Zinc, aluminum
 - Gold, calcium
26. Most pathogenic bacteria are classified as ____.
- psychrotrophic
 - thermotropic
 - psychrophilic
 - mesophilic

Part II: Matching-

Match the word to its definition.

Food Preservation Processes

1. Drying	A. Preserving food in low temperatures. These procedures slow down or stop most bacteria from dividing and thereby multiplying, but do not kill them.
2. Refrigeration	B. A method of food preservation where a technology that improves the safety and extends the shelf life of foods by reducing or eliminating microorganisms and insects.
3. Fermentation	C. A method of food preservation in which food is dried which inhibits the growth of a method of food preservation in which food is dried
4. Canning	D. A food processing method of preserving food by lowering the temperature to inhibit microorganism growth.
5. Pasteurization	E. A metabolic process that produces chemical changes in organic substrates through the action of enzymes.
6. Freezing	F. A method of preserving food in which the food contents are processed and sealed in an airtight container
7. Irradiation	G. A process in which packaged and non-packaged foods are treated with mild heat to eliminate pathogens and extend shelf life.

Types of Enzymes

1. Oxidoreductases	A. Enzymes that catalyze the cleavage of a covalent bond using water.
2. Amylases	B. It is a complex set of enzymes produced in the stomachs of ruminant mammals.
3. Hydrolases	C. An enzyme that catalyzes the transfer of electrons from one molecule to another.
4. Rennet	D. It is any enzyme that catalyzes the hydrolysis of fats. They are a subclass of the esterases.
5. Isomerases	E. An enzyme that catalyzes the hydrolysis of starch into sugars. It is present in the saliva of humans and some other mammals, where it begins the chemical process of digestion.
6. Lipases	F. An enzyme that catalyzes the conversion of a specified compound to an isomer.
7. Protease	G. An enzyme that breaks down proteins into amino acids.

Types of Sugars

1. Glucose	A. A sugar present in milk. It is a disaccharide containing glucose and galactose units.
2. Fructose	B. It is a monosaccharide sugar that is about as sweet as glucose, and about 65% as sweet as sucrose.
3. Galactose	C. It is common sugar. It is a disaccharide, a molecule composed of two monosaccharides: glucose and fructose. It is produced naturally in plants, from which table sugar is refined.
4. Mannose	D. Fruit sugar, is a simple ketonic monosaccharide found in many plants, where it is often bonded to glucose to form the disaccharide sucrose.
5. Sucrose	E. A sugar produced by the breakdown of starch, e.g. by enzymes found in malt and saliva. It is a disaccharide consisting of two linked glucose units.
6. Lactose	F. A simple sugar which is an important energy source in living organisms and is a component of many carbohydrates.
7. Maltose	G. It is packaged as a nutritional supplement, and is a sugar monomer of the aldohexose series of carbohydrates. It is a C-2 epimer of glucose. Mannose is important in human metabolism, especially in the glycosylation of certain proteins.

Part III: True or False-

Write T or F on the answer sheet.

1. Water is a nonpolar molecule and as such accounts for much of its properties in foods. ____
2. Food borne illnesses are caused by contaminated food. ____
3. Meat, milk, and poultry products are the only types of food that can be contaminated with microbes. ____
4. Viruses, bacteria, fungi, and parasites are all types of microorganisms that can contaminate food. ____
5. Keeping food colder than 40 degrees Fahrenheit or heating it to greater than 140 degrees Fahrenheit inhibits the growth of microbes. ____
6. Microbes prefer foods that are highly acidic. ____
7. Free amino acids are mostly responsible for the functional qualities of proteins. ____
8. Lactose intolerance represents a true food allergy. ____
9. Children typically outgrow their allergies to peanuts, tree nuts, fish and shrimp, while allergies to milk, egg, soy and wheat usually are not outgrown. ____
10. Cryptosporidium, Cyclospora, and Giardia are examples of bacteria that are only transmitted to humans by washing organic produce at home and storing foods in airtight containers at room temperature. ____

Part IV: Free Response Questions

1. Detail the progression of ETC?

2. Identify 3 factors leading to spoilage of perishable food?

Part V: Matching “Math” Questions!

1. If the average American consumer consumes 17 tsp of sugar (1 tsp = 4.2g) per day how much sugar is consumed by the average American consumer in a year in kilograms?.	a. 110
2. What is the high range of normal blood sugar?	b. 67
3. How many grams of sugar are there in a 20 oz. can of Coke in grams? (0.8 g/oz)	c. 26,061
4. What is the low figure for normal blood sugar?	d. 33
5. Fermentation typically occurs are ____ °C.	e. 70
6. Sucrose contains ____% fructose.	f. 50

Part VI: Lab Application Questions

(Since the 2021 season may have no on-site/ hands-on lab component these are lab based application questions).

1. The yeast cells used in **fermentation** can tolerate a **pH** of 4.0 to 8.5 but work best when the **pH** is between _____.
2. Botulinum is usually avoided by maintaining a pH below _____.
3. The range of the acid ph scale is between _____.
4. During the lab component of the test, competitors for the 2019-20 tournaments were permitted to bring as many salinometers as they liked. True or False. _____
5. For Regional competitions, participants will be expected to perform all three lab tests (or to be able to answer questions related to all three of the hands-on tests. True or False. _____
6. The **percentage** equivalent of the ratio of the weight of **water** (W_w) to the total weight of the food material is known as _____.
7. Gloves are required by all participants. True or False. _____

pH Vocabulary

8. pH	A. A compound that contains hydrogen ions, it tastes sour and conducts electricity.
9. Acid	B. A compound with a pH of 7.
10. Alkalinity	C. A compound that changes color in the presence of an acid or a base
11. Indicator	D. A measurement of how acidic or alkalinity a substance is.
12. Neutral Substance	E. A compound that that contains hydroxide ions, it tastes bitter and dissolves oil and fat